Freshwater Management Unit options for consideration by the Collaborative Stakeholder Group

Collaborative Stakeholder Group
Healthy Rivers: Wai Ora Project
1 August 2014

Technical Leaders Group report for discussion at CSG workshop 5

Introduction

The Technical Leaders Group have been asked to provide options for delineating Freshwater Management Units in the Waikato and Waipa Catchments to support the Healthy Rivers: Plan for Change/Wai Ora: He Rautaki Whakapaipai Project.

Freshwater Management Units (FMU) adopts the terminology of the National Policy Statement Freshwater Management 2014 (NPS-FM), for subdividing the catchments into units for the purposes of setting limits and targets.

The NPS-FM provides the following definitions:

Freshwater management unit *(FMU) is the water body, multiple water bodies or any part of a water body determined by regional council as the appropriate spatial scale for setting freshwater objectives and limits and for freshwater accounting and management purposes.*

Freshwater quality accounting system *means a system that, for each freshwater management unit, records, aggregates and keeps regularly updated, information on the measured, modelled or estimated:*

- *loads and/or concentrations of relevant contaminants;*
- *sources of relevant contaminants;*
- *amount of each contaminant attributable to each source; and*
- *where limits have been set, proportion of the limit that is being used.*

The NPS-FM requires a range of matters in relation to FMUs, including the ability to:

- set objectives and limits for each FMU;
- identify values for each FMU (must include compulsory values but appropriateness of other national and regional values to be determined);
- describe each FMU in terms of its current state and anticipated future state on the basis of past and current resource use;
- be accountable as per definition above i.e. measure, model or estimate contaminant loads and sources.

The definition of FMUs implies discretion as to: scale; spatial extent for setting objectives and limits; and for fresh water accounting and management. Note the difference between the spatial scale to which policy objectives might apply (Vision and Strategy - safe to swim in and take food from over its entire length) and the spatial scale for setting limits (e.g. nutrient limits in one FMU, sediment limits in others, or the location of water bodies that may require special management if they do not meet national bottom lines). Also note the requirement for accounting which must be based around a monitoring site or a point that can be modelled or estimated.

The FMU for which objectives are being set in this project is the Waikato catchment below Huka falls including the Waipa and other important rivers (e.g. Reporoa, Manganoua, Mangawhara, Opuatia, Whakapipi) and numerous shallow lowland lakes. The specification of limits and their accounting may vary spatially depending on the community values applied to the water body and the water quality characteristics that are being managed to achieve the values.

Guidance from the Vision and Strategy

The Vision and Strategy promotes integrated management of the Waikato River. Strategy (i) of the Vision and Strategy states:

> *"Encourage and foster a 'whole of river' approach to the restoration and protection of the Waikato River, including the development, recognition, and promotion of best practice methods for restoring and protecting the health and wellbeing of the Waikato River".*

Options for establishing Freshwater Management Units

Principles

Good natural resource management practice suggests that simplicity should be pursued (spatial homogeneity of policy) and that complexity should be added only as necessary to provide a greater prospect of achieving the policy objectives (restore and protect the Waikato and Waipa rivers). Policy implementation is primarily undertaken by land owners and business owners, supported and guided by regulatory agencies. Consistency provides certainty and efficiency for land and business owners. Too often regulatory agencies receive complaints that 'the rules are different everywhere' and that 'it is hard for business to operate without certainty and efficiency'. Increasing the number of FMUs increases the likelihood that an individual property spans more than one FMU, resulting in additional complexity of management.

Policy considerations

Good policy should provide clear objectives for a FMU, be applied equitably, be implementable and provide appropriate incentives for compliance. Policy objectives should be consistent across management units, where possible, while rules and other methods are likely to differ among FMUs reflecting the different community values, landforms, riverine processes, and inherent water quality and ecology. Some policy methods require many participants to be effective (e.g. economic instruments such as cap and trade systems). The rules and other methods in the plan need to be practical, implementable and enforceable and the scale of FMUs should reflect that.

Other Considerations

FMUs are required to be linked to monitoring and subsequent evaluation requirements of the NPS-FM (i.e. sampling must represent each FMU and simultaneously recognise the importance of long term monitoring). The NPS-FM also provides specific monitoring requirements for dissolved oxygen and for this attribute to be sampled below point sources. A tension exists as current monitoring sites, from which long term records have been obtained, are not designed to measure the dissolved oxygen minima below point source discharges.

Another consideration is the interrelationships between the FMUs and water allocation (quantity) and managing within limits (NPS-FM Policies B1 – B7). The NPS-FM does not require alignment of water quantity elements and FMUs, but it could be desirable to combine them for efficiency and consistency of monitoring and evaluation.

Another matter is the implication that the entire region be covered by FMUs as information is required to ensure the overall quality of freshwater within a region is maintained or improved.

All these matters support an extensive rather than intensive selection of FMUs.

Possible basis for delineating FMU

There are many characteristics on which FMUs could be based:

- community of interest (e.g. TA boundaries);
- iwi boundaries;
- geomorphic or geological divisions (land forms, hill slopes, inland basins);
- catchments;
- lake catchments (e.g. lower Waikato lakes perhaps nested within larger FMUs);
- location of established monitoring sites (to facilitate accounting and reporting requirements);
- current or historical management units (e.g. current zone committee structures);
- location of community land care groups; and
- the location of large infrastructure (e.g. dams or water supply takes).

Although the definition of FMU refers to limits and a spatial scale, FMUs defined by the time to reach the limit (i.e. target) are not excluded, i.e. the same limit might apply over a large part or all of the catchment but a FMU is defined by the time and methods required to achieve the limit.

Table 1 presents a range of possible FMU for the Waikato and Waipa catchments based on the criteria above.

Table 1: Possible delineation of FMU

Basis for FMU	No. of FMUs	FMU description	Detail/Comments
Whole catchment	1	Waikato and Waipa Rivers	Whole catchment of Waikato River.
Entire large rivers	2	Waikato River Waipa River	Whole river catchments.
Above and below dams on Waikato R.	3	Upper Waikato Lower Waikato Waipa	Split Waikato into two, Karapiro provides physical feature/easy to identify/above and below dams. Significant change in riverine processes caused by water impoundment.
Two or three on Waikato, and two or three on Waipa	4-6	Upper, Central, Lower Waikato Upper, Lower Waipa	Waikato split on catchment zones or above and below dams; Waipa split on towns e.g. above/below Otorohanga or on rivers e.g. above/below Puniu confluence or on catchment eg Puniu and rest of Waipa.
Current management units (Catchment zones)	4	RCS catchment zones: Upper Waikato Central Waikato Lower Waikato Waipa	Waikato catchment management zone boundaries: - below confluence of Waipa at Ngaruawahia - Ngaruawahia to Karapiro dam - above Karapiro dam. Basis for zones is management – looked for points in the catchment where a boundary could be readily identified, with similar physical parameters, and reflecting communities of interest and funding policy.
Catchment subzones/management areas/priority areas	19	RCS subzones within catchment zones	Waipa zone is split into four management areas for the purposes of river and catchment management. The management areas are Ngaruawahia to Pirongia; Pirongia to Otorohanga; Otorohanga to Toa bridge; Upper Waipa above Toa bridge. The Waikato River catchment has 15 subzones based on Project Watershed catchment management areas.
Catchment subzones based on special features of management requirements	>6	RCS zones plus layers within some areas for priority areas or specialised treatment e.g. shallow lakes	Allows for few FMUs but with identified water quality management issues, such as sediment or nutrients, treated separately.
Delineation by drainage management (surrogate for catchment geomorphology)	many	Hydrological basis for identifying areas e.g. drainage districts, peat areas, lakes in Waikato Central zone	Drainage districts (predominantly flat areas of land where there are minimal drainage outlets) located within the Central Waikato zone (Rotomanuka, Hautapu, Fencourt, Mangaonua and Ngaruawahia); areas of peat including the peat area by Te Awamutu and Collins Road which contribute flows to the Waikato River. Undrained areas treated as separate FMU.
Stream order	many	Specified stream order	Catchments subdivided based on stream order (specified e.g >3 or >4). Delineation has hydrological basis.
NPS-FM attribute states	many	Current state or sensitivity of receiving water or type of water body e.g. shallow lakes	Split catchment into sub-catchments of water bodies which meet each of states A, B, C, D, or some other combination e.g. A+B vs C vs D; A+B+C vs D.

Variation 6 sub-catchments	4	Huka Falls to Karapiro Karapiro to Huntly mixing zone Downstream of Huntly mixing zone Waipa	Has the advantage of aligning water quality with basis used for water quantity rules (Variation 6) – might be useful when water quality plan change triggers review of allocation and takes.
Iwi boundaries	3	Areas A, B, C	Defined by river co-management areas. See comment below.
JMA boundaries	4	Joint Management agreement areas for Maniopoto, Raukawa, TARIT, Waikato Tainui	Note that rohe boundaries were included in early Var 6 documents but were withdrawn based on iwi objections.
WRISS sub-regions	4	Upper Waikato Middle Waikato Lower Waikato Waipa	Boundaries at Karapiro and Ngaruawahia.
Combination of any of the above	>4 - many		Allows particular characteristics or features to be taken into account, for example: - combine catchments in Variation 6 with priority areas for Waipa - combine hydrological and management factors.

Proposed options

Four options from the approaches indicated in Table 1 are proposed for further consideration. The four options are based pragmatically on:

- communities of interest (sub catchments);
- degree of water impoundment (dams and lakes);
- geomorphology (location within the broad Waikato river channel and fan);
- availability of representative monitoring sites; and
- commonality of management issues.

Note that the Lake Taupo catchment is not considered in any option, although it remains a critical part of the overall Waikato-Waipa River system.

The proposed FMU options are:

Option 1:

1. Waikato hydrolakes - area above Karapiro and below Huka falls (Monitoring site at the Narrows for accounting)
2. Waipa River catchment (Monitoring site at Whatawhata for accounting)
3. Mid and lower Waikato catchment comprising the remainder of Waikato catchment between Karapiro and Taupiri (Mangawhara river, Komakarau stream, Mangaonua stream and Mystery creek) and all the Waikato Catchment below Taupiri (Monitoring site at Tuakau for accounting in combination with Huntly and Whatawhata to account for the Waipa inflows)
4. Selected lowland lakes nested within their local catchment (individual monitoring of lake condition for accounting)

Option 2:

1. Waikato hydrolakes - area above Karapiro and below Huka falls (Monitoring site at the Narrows for accounting)
2. Waipa River and Hamilton Basin above Taupiri and below Karapiro (Mangawhara river, Komakarau stream, Mangaonua stream and Mystery creek) (Monitoring site at Huntly for accounting with Whatawhata to account for inflows from the Waipa)
3. Waikato River below Taupiri (Monitoring site at Tuakau for accounting)
4. Selected lowland lakes nested within their local catchment (individual monitoring of lake condition for accounting)

Option 3

1. Waikato hydrolakes – area above Karapiro and below Huka falls (Monitoring site at the Narrows for accounting)
2. Waikato River from Karapiro to Ngaruawahia (confluence with Waipa) (monitoring site at Horotiu)
3. Waikato River below Ngaruawahia (Monitoring site at Tuakau for accounting)
4. Waipa River catchment (Monitoring site at Whatawhata for accounting)
5. Selected lowland lakes nested within their local catchment (individual monitoring of lake condition for accounting)

Option 4

1. Waikato hydrolakes – area above Karapiro and below Huka falls (Monitoring site at the Narrows for accounting)
2. Waikato River and Waipa River within Hamilton Basin below Karapiro and above Taupiri (monitoring site at Horotiu)
3. Waipa River above Hamilton Basin area
4. Waikato River below Taupiri (Monitoring site at Tuakau for accounting)
5. Selected lowland lakes nested within their local catchment (individual monitoring of lake condition for accounting)

Options 1 to 4 are shown in Maps 1 to 4, except that the selected lowland lakes and their catchments are shown separately in Map 5, which can be considered as an overlay for Maps 1 to 4. The lakes selected do not currently meet the NPS-FM bottom line for water quality (Appendix 1).

The four options are considered further in Table 2.

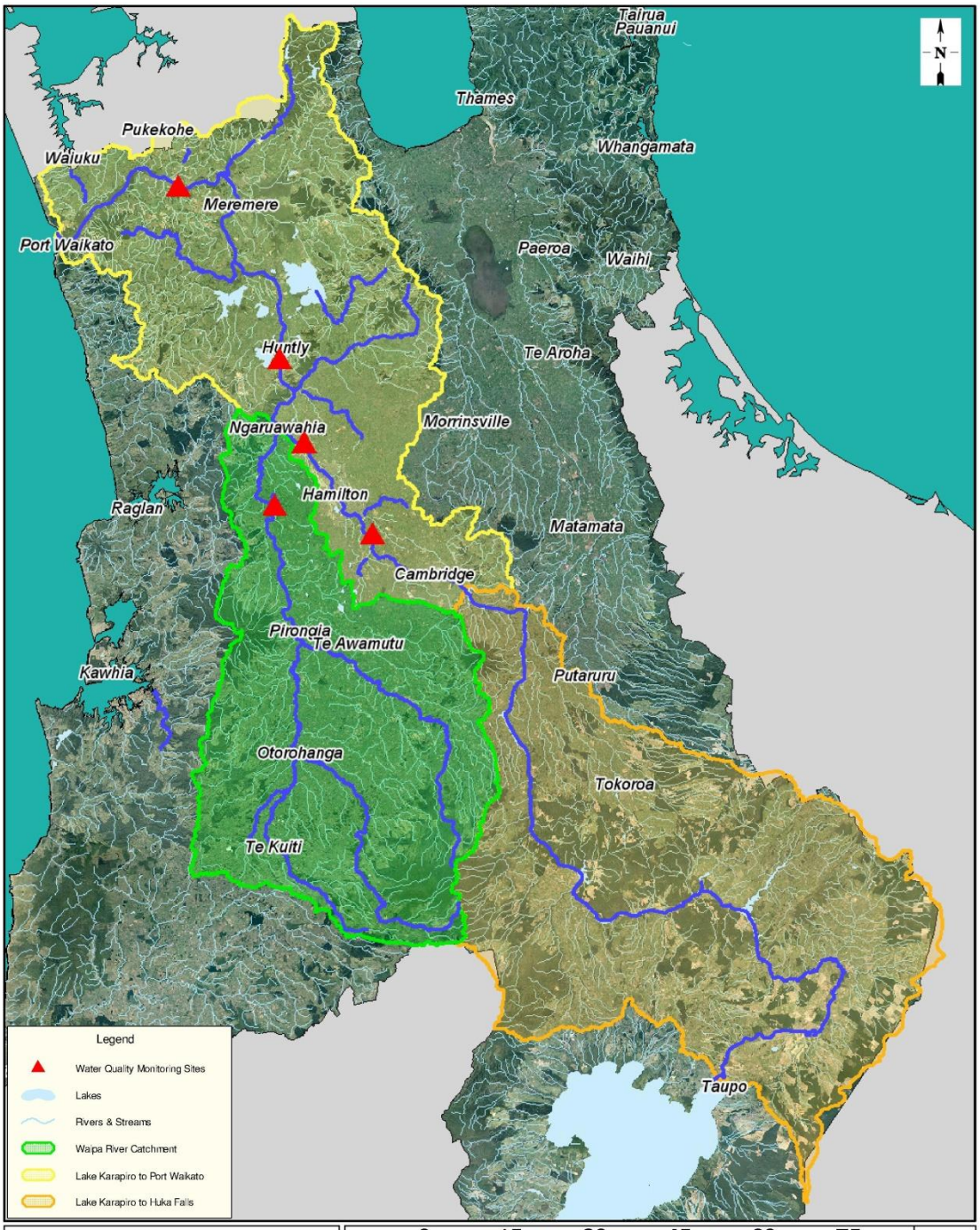
Table 2: Evaluation of the four options for identifying Freshwater Management Units

Characteristic	Option 1	Option 2	Option 3	Option 4
Simple, few FMU	yes	yes	less	less
Main catchments identified	yes	yes	yes	partly
Recognises impounded versus flowing water in the Waikato River	yes	yes	yes	yes
The Waipa catchment is separate from the Waikato catchment	yes	not completely	yes	not completely
Selected lakes can be treated separately	yes	yes	yes	yes
Aligns with catchment management zones	partly	poorly	yes	poorly
Clear boundaries for water quality/attribute state for development of policy	partly	mostly	yes	partly
Recognises Hamilton urban and peri-urban area	no	no	yes	no
Better combines geomorphic or hydro geological units (e.g. Hamilton Basin is not split between two FMU)	partly	partly	partly	yes
Monitoring sites representative of FMU	partly	partly	partly	poor
Aligns with Variation 6 boundaries	partly	partly	partly	partly
Reflects policy issues to be managed e.g. flood management, soil erosion, intensive land use	partly	partly	yes	yes
Aligns with WRISS sub-regions	mostly	partly	yes	partly

None of the options recognises or uses the following factors as a basis for delineating FMU.

- Stream order, because of the complexity that would result, including that it would identify bands or areas which would span a multitude of factors and which would cut catchments into small parts, resulting in potential management difficulties within individual properties.
- Iwi boundaries, recognising that this was not considered the best way of identifying sub-catchments when developing Variation 6.
- Small scale priority areas (such as those being developed in the Waipa catchment management plan). These areas might contribute to improving the whole FMU but add considerable complexity. Note that catchment plans might identify non-regulatory methods for such areas, additional to any methods established through the plan change.
- Size of FMU.

Map 1



Freshwater Management Units:

Option 1

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Projection: NZTM
Date: 28th July 2014

Status: Final
Request No.: 28257
File name:
S:\GISWork\GIS_Jobs\requests_ongoing\Regional Plan Change 1 - Healthy Rivers\28257_Catchment Split Options

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Kilometres
Scale- 1:900,000

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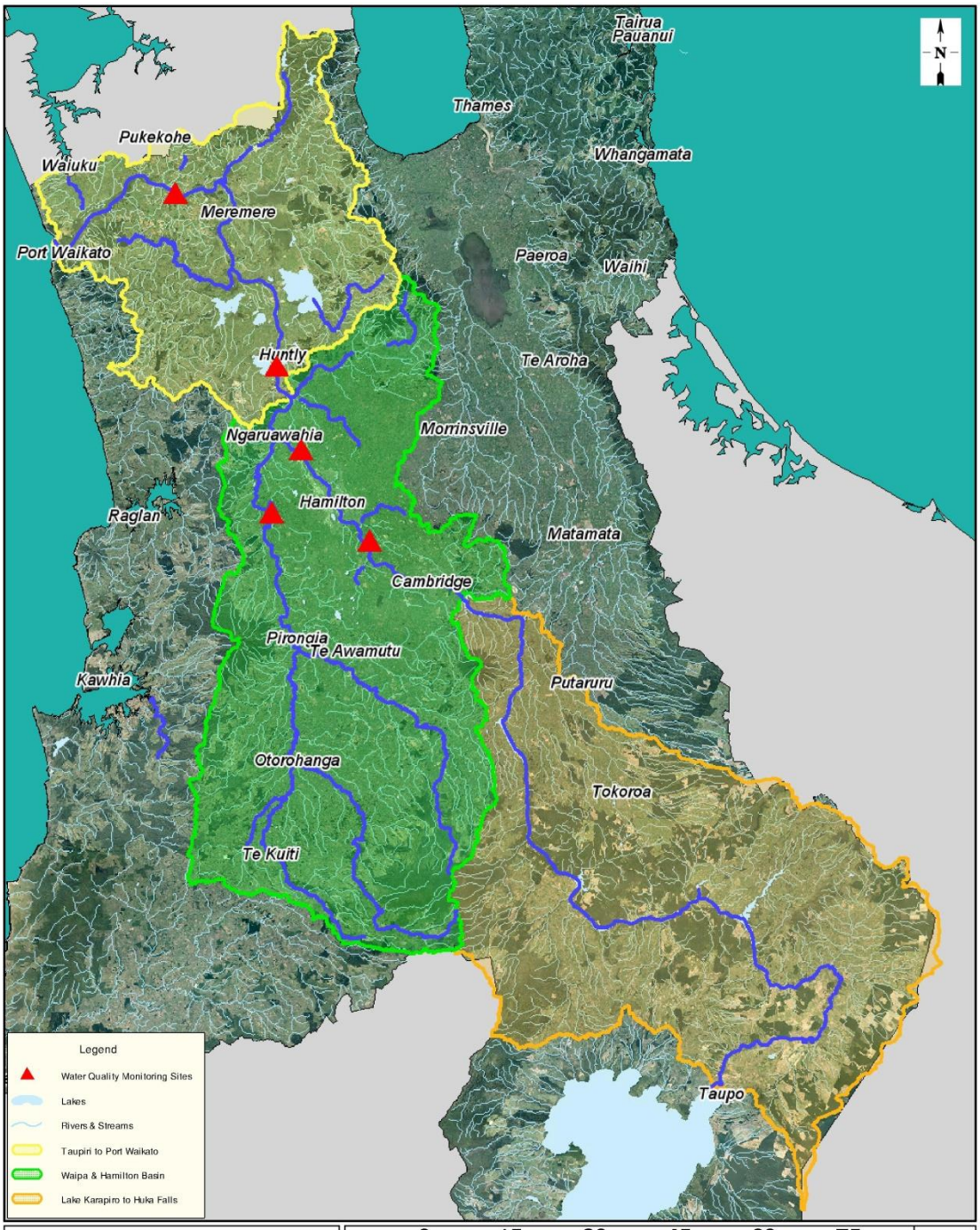
Map 2



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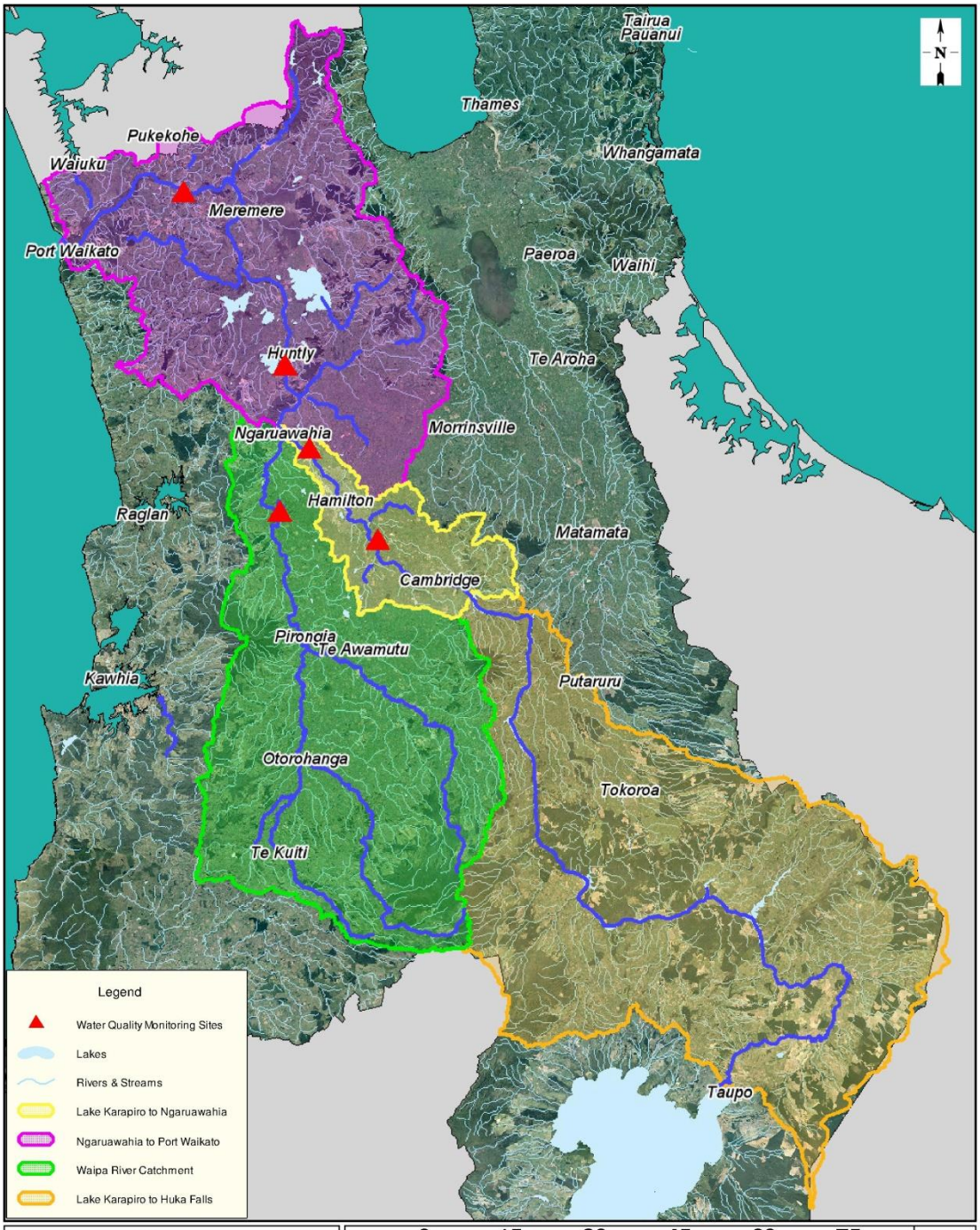
Map 3


Tairua
Pauanui
Thames
Whangamata
Pukekohe
Waiuku
Meremere
Port Waikato
Paeroa
Waihi
Huntly
Te Aroha
Morrinsville
Ngaruawahia
Hamilton
Raglan
Matamata
Cambridge
Pirongia
Te Awamutu
Kawhia
Putaruru
Otorohanga
Tokoroa
Te Kuiti
Taupo
N
Legend
Water Quality Monitoring Sites
Lakes
Rivers & Streams
Lake Karapiro to Ngaruawahia
Ngaruawahia to Port Waikato
Waipa River Catchment
Lake Karapiro to Huka Falls
Freshwater Management Units:
Option 3
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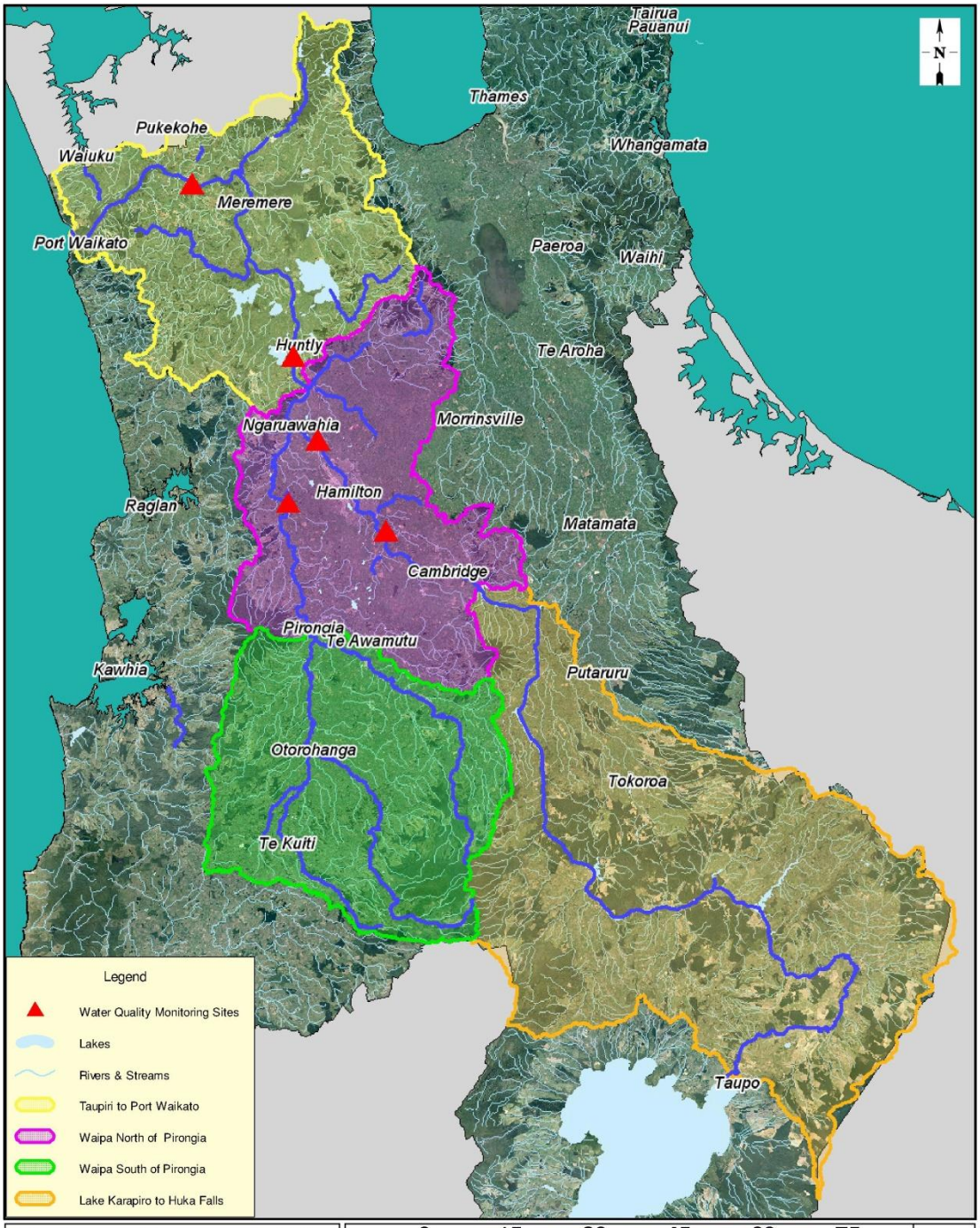
Map 4



Freshwater Management Units:

Option 4

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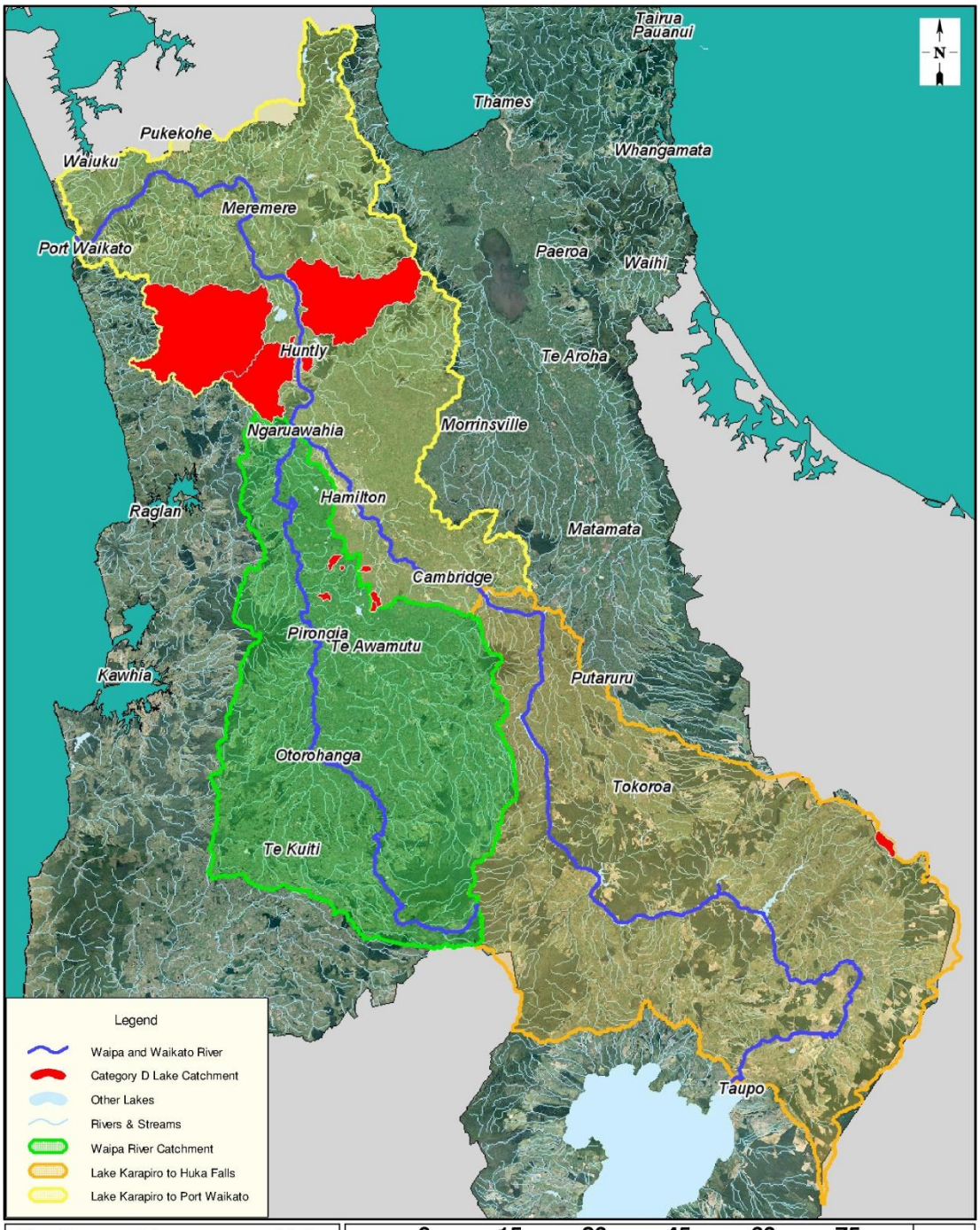
Map 5



Freshwater Management Units:

Monitored Lakes

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Selecting a preferred FMU

None of the proposed FMU options satisfies all of the factors that might be considered. The four proposed options were selected because they are relatively simple, and have a degree of alignment with previous sub-catchment decisions for policy or management purposes; have similar current-state water quality issues; and best reflect the requirements of the NPS-FM.

- All of the proposed FMU options have long-term monitoring sites that represent the FMU noting that none has an 'end point' monitoring site although approximations can be made using the existing site locations.

- All of the options recognise Karapiro as a boundary, separating impounded water and significant infrastructure from free-flowing water.

- Option 1 is simple and provides clear boundaries in water quality and attribute state for policy development.

- Option 2 partly recognises the similar geomorphology through the middle Waikato from Taupiri to Karapiro and reflects other policy issues to be managed, including flood management. The non-compliant lake catchments form much of the lower FMU, leaving a small lower Waikato River FMU.

- Option 3 is more complex than Options 1 and 2 but is the only option that recognises the urban and peri-urban area around Hamilton.

- Option 4 is more complex than Options 1 and 2. It combines areas with similar water quality issues, and recognises similar geomorphology, hydrology and drainage areas by separating the low lying alluvial plains forming the Hamilton basin from surrounding hill country.

Timing

Selecting the preferred FMU option now on the basis of available information will not preclude the Collaborative Stakeholder Group from refining the FMUs (fewer or more) later when considering limit and target scenarios in more detail.

The NPS-FM requires that the plan change sets objectives and limits for water quality, identifies values, describes current state and anticipated future state, and establishes and operates a freshwater quality accounting system for each FMU. Different FMU having the same objective(s) are not excluded by the direction given in the NPS-FM. Policies and methods may differ between FMU, and the NPS-FM does not exclude policies and methods differing for areas within a FMU, providing that there is a basis for that differentiation that relates to meeting the objectives of the policy.

Check list for delineating FMU

In considering a preferred FMU, the Collaborative Stakeholder Group may consider whether the FMUs:

- are adequately defined and enable policy to effectively achieve the objectives of the Vision and Strategy;
- are simple and intuitive for the community;
- take account of previous policies and policy development in similar circumstances (e.g. Lake Taupo (Variation 5), and Waikato Regional Plan Variation 6);
- incorporate ideas and experience from the "front line", from end users and policy implementers; and

- whether the FMUs are cost-effective and resilient to change especially in light of the NPS-FM, Vision and Strategy and other impending legislation (e.g. Environmental Reporting Bill).

Appendix 1:

Median concentrations (mg/m^3) of chlorophyll a, total nitrogen and total phosphorus in 20 shallow lakes in the Waikato region, 2008 - 12. The proposed National Bottom Lines (NBL) for these attributes in NZ lakes are also shown, with breaches of these shown in bold. Data from WRC's shallow lakes water quality indicator.

	Chlorophyll *a*	**Total nitrogen**	**Total phosphorus**
Otamatearoa	2	440	10
Harihari	4	350	9
Taharoa	4	480	19
Maratoto	8	**1970**	23
Rotoroa	9	710	21
Serpentine East	10	**1320**	26
Rotomanuka	11	**1010**	18
Serpentine North	**13**	**1280**	29
Tutaeinanga	**15**	**1600**	**160**
Serpentine South	**17**	**1100**	38
Waahi	**23**	**1100**	**62**
Milicich	**29**	**1610**	**75**
Ngahewa	**32**	**950**	**140**
Hakanoa	**37**	**1440**	**96**
Ohinewai	**49**	**2200**	**110**
Okowhao	**50**	**1700**	**120**
Whangape	**57**	**1860**	**119**
Mangahia	**66**	**3030**	**650**
Mangakaware	**83**	**1770**	**235**
Waikare	**91**	**2600**	**154**
Proposed NBL	12	750	50