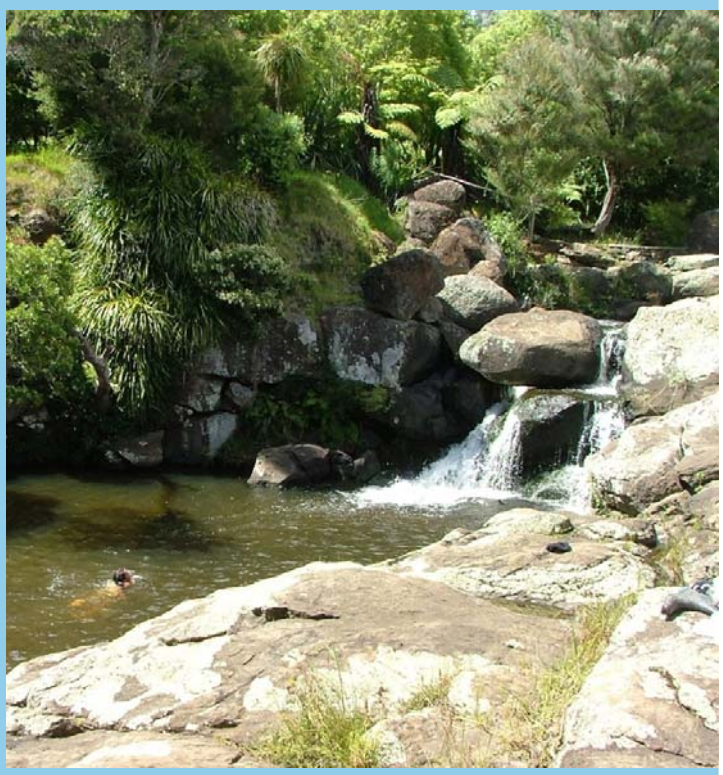
River Swimming in Northland:
Application of the River Values Assessment System (RiVAS and RiVAS+)



Prepared by:
Kay Booth
John Ballinger
Natalie Glover
Lynnell Greer
Darryl Jones
George Lewis
Reiner Mussle
Tamati Paraone

LEaP Research Paper No. 22
December 2013

Land Environment & People

Centre for Land Environment & People
A Lincoln University Research Centre.
New Zealand's specialist land-based university.

Lincoln University
Te Whare Wānaka o Aoraki
CHRISTCHURCH•NEW ZEALAND
New Zealand's specialist land-based university

River Swimming in Northland:
Application of the River Values Assessment System (RiVAS and RiVAS+)

Prepared by:
Kay Booth
John Ballinger
Natalie Glover
Lynnell Greer
Darryl Jones
George Lewis
Reiner Mussle
Tamati Paraone

Land Environment and People Research Paper No. 22

December 2013

ISSN 2230-4207 (online)
ISBN 978-0-86476-342-6 (online)

Lincoln University, Canterbury, New Zealand

Cover photo: Swimming at Karapiro Stream, Purerua Rd Bridge Source: Northland Regional Council

Acknowledgements

This work was funded by Northland Regional Council and we gratefully acknowledge their support. Thanks to Andrew Macdonald (GIS Officer, Northland Regional Council) who provided GIS support.

©LEaP, Lincoln University, New Zealand 2013
Contacts - email: leap@lincoln.ac.nz
web: http://www.lincoln.ac.nz/leap

This information may be copied or reproduced electronically and distributed to others without restriction, provided LEaP, Lincoln University is acknowledged as the source of information. Under no circumstances may a charge be made for this information without the express permission of LEaP, Lincoln University, New Zealand.

Series URL: http:hdl.handle.net/10182/3410

Executive Summary

The River Values Assessment System (RiVAS and RiVAS+) was applied by a River Expert Panel to eight resource and user attributes to assess 44 known river swimming locations in Northland. Few data were available, so the Expert Panel relied on their own assessments for most attributes. Revision was made to the algae attribute; with *E. coli* replacing blue-green algae (cyanobacteria) as an indicator of public health as *E. coli* is the bacteria measured in the annual recreational bathing water quality programme. The method differentiated swimming sites of local significance (n=39) from those of regional significance (n=5): Waipoua River at the Forest Visitor Centre; Forest Pools on the Waipapa River; sites on the Waimamaku River along the Wekaweka Gorge Road; Rainbow Falls on the Kerikeri River; and Raetea Camp Ground on the Victoria River. The RiVAS+ methodology was also applied to assess future potential value of two sites for swimming. This suggested that the swimming site above the Whāngārei Falls on the Hātea River could be of regional swimming value (rather than local significance in its existing state) if identified management actions were taken to enhance the site for swimming. However, the swimming site at the Waipu River bridge (by the Waipu Boat and Fishing Club) is likely to remain of local significance for swimming.

Contents

List of Tables

Chapter 1
Introduction

1.1 Purpose

This report presents the results from an application of the River Values Assessment System (RiVAS) for river swimming in Northland. A River Expert Panel (see Appendix 1) met on 20 May 2013 to apply the method to Northland rivers.

1.2 River Values Assessment System (RiVAS)

Hughey and Baker (2010) describe the RiVAS method including its application to river swimming. Table 1 provides a summary of the method.

Table 1
Summary of the River Values Assessment System method

Step		Purpose
1	Define river value categories and river segments	The river value may be subdivided into categories to ensure the method is applied at a meaningful level of detail. Rivers are listed and may be subdivided into segments or aggregated into clusters to ensure that the rivers/segments being scored and ranked are appropriate for the value being assessed. A preliminary scan of rivers in the region is undertaken to remove those rivers considered to be of 'no' or less-than-local level significance for the value being considered.
2	Identify attributes	All attributes are listed to ensure that decision-makers are cognisant of the various aspects that characterise the river value.
3	Select and describe the primary attributes	A subset of attributes (called primary attributes) is selected and described.
4	Identify indicators	An indicator is identified for each primary attribute using SMARTA criteria. Quantitative criteria are used where possible.
5	Determine indicator thresholds	Thresholds are identified for each indicator to convert indicator raw data to 'not present', 'low', 'medium', 'high' (scores 0-3)
6	Apply indicators and indicator thresholds	Indicators are populated with data (or data estimates from an expert panel) for each river. A threshold score is assigned for each indicator for each river.
7	Weight the primary attributes	Primary attributes are weighted. Weights reflect the relative contribution of each primary attribute to the river value. The default is that all primary attributes are weighted equally.
8	Determine river	Indicator threshold scores are summed to give a significance score (weightings applied where relevant).

Step		Purpose
	significance	Rivers are ordered by their significance scores to provide a list of rivers ranked by their significance for the river value under examination. Significance (national, regional, local) is assigned based on a set of criteria or cut off points.
9	Outline other relevant factors	Factors which cannot be quantified but influence significance are recorded to inform decision-making.
10 - 13	Apply to potential river scenarios (called RiVAS+)	Relevant steps are repeated for potential future river conditions.
14	Identify information requirements	Data desirable for assessment purposes (but not currently available) are listed to inform a river value research strategy.

Chapter 2
Application of the RiVAS method: current state of rivers

Step 1: Define the river value, river sites and levels of significance

The Expert Panel confirmed the definition of 'swimming' as:

1. Contact recreation (participants get wet).
2. Site-focused (participants get in and out of the water at the same location).
3. No commercial dimension (swimming is not offered as a stand-alone[1] commercial recreation opportunity).

This definition encompasses swimming, playing around in the water, paddling, and jumping from rocks, trees and bridges into the water. While these different activity styles may require different resource conditions (e.g., shallow slow-moving water compared with deep holes), the Expert Panel addressed them collectively.

Swimming is site-specific. A list of 44 swimming sites was compiled using information from the Council's water quality monitoring programme and sites known to the Expert Panel from their local knowledge (sites are mapped in Appendix 2 and listed in Appendix 3). Thirteen sites required follow-up consultation (post workshop) in order to assess them as Panel members were not familiar enough with them. People who knew the sites were identified and it was agreed that Darryl Jones would coordinate this input to ensure they were assessed consistently with the 31 sites addressed at the workshop. The additional 13 sites are identified in Appendix 3.

Swimming sites without public access were excluded from the analysis. Panel members noted that access to a few swimming locations has been denied in recent years; for example, some kiwifruit growers no longer give the public access across their land owing to concerns about the spread of the PSA disease.

Swimming sites in rivers within coastal lagoons were included in the analysis. These sites are popular because they provide a safe, warm river hole suitable for small children; they are often co-located with a beach. Expert Panel members commented on the high value of these sites, noting that beaches attract more swimmers than rivers in Northland.

Following the RiVAS method for swimming (Hughey and Baker 2010), it was agreed that the method would be used to identify regionally and locally significant swimming sites (not national significance). It was noted that swimming as an activity (or river value) is nationally significant.

Step 2: Identify attributes

Attributes to describe river swimming are presented in Appendix 4. These were adopted from the RiVAS swimming method (Booth et al. 2010) and describe the range of factors that influence the importance of a site for swimming. This list was not discussed at the workshop, but subsequently confirmed by the Panel.

1 Some commercial recreation trips may incorporate swimming as part of the experience.

Step 3: Select and describe primary attributes

Primary attributes are those attributes selected to represent swimming within the RiVAS method. These were adopted from the most recent application of RiVAS for river swimming (Gisborne District – Booth et al. 2012). Appendix 4 identifies the eight primary attributes (in bold) and describes them.

Steps 4 & 5: Identify indicators and determine indicator thresholds

The indicators adopted to measure each primary attribute are presented in Appendix 4, together with their thresholds, and indicators are assessed against SMARTA[2] criteria in Appendix 5. Indicators and thresholds were adopted from the most recent application of RiVAS for river swimming (Gisborne District – Booth et al. 2012), with an adjustment to the primary attribute 'algae' (see below). In the appendices, blue font indicates revisions made by the Northland Region Swimming Expert Panel.

Where the character of Northland rivers is likely to differ from other regions, this is noted below, together with any assumptions made by the Expert Panel.

1. *Water clarity:* Horizontal visibility
   Adopted existing indicators and thresholds. Northland rivers naturally carry a high sediment load, therefore, few rivers were expected to score highly (score 3).

2. *Swimming holes:* Maximum water depth
   Adopted existing indicators and thresholds. Assumed a best case scenario (e.g., at high tide). One guideline used by the Panel was whether swimmers jump off a high point into the swimming hole – the rationale was that this would indicate a deep (>3m) pool. Oftentimes estimates were based on consideration of the morphological structure of the site, as the actual depth was not known.

3. *Variable water depth:* Morphological variability
   Adopted existing indicators and thresholds.

4. *Algae:* Compliance with national guidelines
   The existing indicator was revised. This indicator was initially developed for RiVAS using the presence of both blue-green algae (cyanobacteria) – because it presents a public health issue – and other periphyton (filamentous algae and diatoms) – because they are a nuisance to swimmers and detract from aesthetic appeal.

   The Northland Regional Council, in conjunction with the three district councils (Far North, Whāngārei and Kaipara) and the Northland District Health Board, surveys water quality at some of the region's most popular freshwater swimming spots every summer. *Escherichia coli* (*E. coli*) is used as an indicator for assessing health risk in freshwater for humans. *E. coli* levels are compared to the microbiological water quality guidelines for recreational users (less than 550 *E. coli*/100mL) to determine whether the water is suitable for recreational use (MfE and MoH 2003). This information is then advertised on the Northland Regional Council's website

2 Specific, measurable, achievable, relevant, timely, and may be already in use

The Panel agreed to measure:

(1) *E. Coli* rather than cynobacteria, because it comprises the primary indicator used in the national guidelines for assessing sites' suitability for recreational bathing and because data on *E. Coli* levels are collected by Northland Regional Council (and most other councils). The metric was defined as percentage of time 'Very Low' *E. Coli* levels were achieved, as described in the *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas* (MfE and MoH 2003) – see Appendix 4;

and

(2) Nuisance periphyton, noting that they can be assessed by the Expert Panel, i.e. whether the rocks are slippery and weed is present. Based on their expert knowledge, the Panel used the rating scale: algae always present (score 1), sometimes present (score 2), never present (score 3).

Different 'algae' indicator options were assessed to judge what difference they made and which was the best option (see Appendix 3): (1) nuisance algae (only); (2) *E. Coli* data (only); (3) both nuisance algae and *E. Coli* data; (4) 50% nuisance algae + 50% *E. Coli* data. The Panel noted that the different options made little difference in river rankings (Step 8) and it was decided to use the indicator that comprised both *E. Coli* (50%) and nuisance algae (50%). This maintained congruence with previous RiVAS applications (with the exception that *E. Coli* replaces cyanobacteria) and greater rigour has been applied by dividing the indicator into two parts to show that 50% of the algae indicator relates to public health related algae and 50% to nuisance algae.

It was noted that many Northland rivers do not have much algae, particularly those with a sandy bottom (coastal river sites).

5. *Scenic attractiveness:* Overall rating
   Adopted existing indicators and thresholds. The site was assessed from the perspective of instream users. Attractive Northland swimming sites include those in the bush located near waterfalls, those by the coast (sometimes with a backdrop of pohutukawa trees), and those near the Stone Store in Kerikeri (their attractiveness related, in part, to historical heritage).

6. *Origin of users:* Kms travelled that day (from previous night's accommodation)
   Adopted existing indicators and thresholds. It was felt that few sites in Northland would attract people to travel >20 km (score 3) because they would go to the beach instead. Some discussion centred around the influence of camping areas – it was confirmed that campers who swam nearby would have travelled <10 km (score 1).

   A 'rule of thumb' threshold of one third of swimmers was chosen to trigger the score (e.g. if > 1/3 of swimmers travelled over 20 km, it would score 3). Where users were thought to come from both near and far, an average was taken (score 2).

7. *Levels of use:* Number of swimmer visits on a peak use day
   Adopted existing indicators and thresholds. It was clarified that the metric was number of swimmer visits rather than number of swimmers (e.g. if a person returned to the site later the same day, they should be counted twice). Use guidelines were adopted from

the most recent application of RiVAS for river swimming (Gisborne District – Booth et al. 2012):

1=low use: 1-2 carloads of people (<10 people)

2=medium use: between low and high use

3=high use: 50+ people.

8. *Presence of facilities*
   Adopted existing indicators and thresholds. Guidelines were adopted from the most recent application of RiVAS for river swimming (Gisborne District – Booth et al. 2012):

   1=no facilities

   2=toilet only **or** camp only (includes camper vans with toilets that operate under a permit system and are known to camp at certain sites)

   3=camp **and** toilet facilities (toilets must be available to all swimmers using the site).

   On the premise that campers would use a swimming site if it was very close (by foot), camping areas were defined by the Panel to include those within a short walk of the swimming site, as well as those immediately adjacent.

Step 6: Apply indicators and indicator thresholds

Expert Panel estimates were required for all indicators (Appendix 3). Data were available for 'algae – *E. Coli* bacteria'

Step 7: Weight the primary attributes

All indicators were kept as equal weight (Appendix 3). Different 'algae' indicator options were assessed, with the final selection being the indicator that comprised nuisance algae (50%) and *E. Coli* bacteria (50%).

Step 8: Determine river site significance (current state)

The spreadsheet was used to sum the indicator threshold scores for each swimming site and sort the sites into descending order (Appendix 3). The Expert Panel closely examined the ranked list of river sites and considered whether any sites looked out of place (expected to be higher or lower). One site had been assessed first (and used to explain the method): it was reassessed to better align with all subsequent site assessments.

Applications of the RiVAS swimming method conducted elsewhere have used a sum of 19 as the threshold for regional significance and this was found to fit Northland, i.e. the Panel's knowledge of sites suggested that those scoring 19 and above were of regional significance and those scoring below 19 were not. As a result, 5 sites were identified as regionally significant for river swimming: Waipoua River at the Forest Visitor Centre; Forest Pools on the Waipapa River; sites on the Waimamaku River along the Wekaweka Gorge Road; Rainbow Falls on the Kerikeri River; and Raetea Camp Ground on the Victoria River.

Step 9: Outline other factors relevant to the assessment of significance

This step comprises two parts: (1) identification of site characteristics desirable for swimming; and (2) discussion of factors which are not quantifiable but considered relevant to significance assessment (see Appendix 6).

The site characteristics identified as desirable for swimming in the most recent application of RiVAS for river swimming (Gisborne District – Booth et al. 2012) were adopted. In most (but not necessarily all) cases, a 'good' swimming site will have all of these characteristics. A change in any of them may affect the ability to undertake swimming at the site or the perception of its attractiveness to users. See Appendix 6.

Desirable site characteristics include:

1. Public access
2. Flow (velocity)
3. River width
4. Perception of safety
5. Beach

Chapter 3
Application of the RiVAS+ method: potential future state of rivers

Step 10: Identify rivers and interventions

Of the 31 swimming sites that were assessed at the workshop, two were assessed for their potential enhancement (see Appendix 3). One site (Whāngārei Falls,Hātea River) was of interest because it is within the Whāngārei harbour catchment, one of the three priority catchments chosen by the Northland Regional Council for establishing catchment specific freshwater objectives and freshwater quality and quantity limits under the National Policy Statement for Freshwater Management. The other location was considered a good example of a swimming site that could be enhanced for swimming (Waipu River, at the bridge by the Waipu Boat and Fishing Club).

Means by which river conditions may be enhanced for river swimming were discussed. A new intervention was suggested to the existing RiVAS interventions list – promotion/ advertising of a site (see 'Interventions' sheet in Appendix 3: this addition is shown in blue). This additional intervention resulted from discussion about the decrease in use of one swimming site that appeared to be related (caused) by the cessation of advertising by the Department of Conservation.

The Panel suggested that actions to improve water quality would be of greatest benefit for swimming. This would normally involve measures undertaken higher up in the catchment, e.g. reducing the incidence of stock in waterways and inhibiting soil erosion. While coastal streams that become blocked by sand movement could benefit from flushing immediately prior to summer, the main source of *E. Coli* in these swimming sites has been identified as avian, i.e. gulls and ducks; therefore, *E. Coli* levels are unlikely to be improved by flushing. With respect to sites located on or adjacent to private land, it was suggested that interventions targeting public access would be of greatest value.

Step 11: Apply indicators and indicator thresholds for potential value

Taking each of the two swimming sites in turn, the Expert Panel considered which interventions were relevant (Appendix 3). The RiVAS+ method calls for the Panel to select the two most important interventions for each river, and for these to be practical and feasible rather than ideal.

Following the RiVAS+ method, the Panel assumed 'best case' or optimum scenarios from application of these interventions. Then the Panel considered the net effect of these interventions upon the value of the two sites for swimming and new scores were recorded for each attribute on this basis (Appendix 3).

Step 12: Weight the primary attributes for potential value

Because equal weighting was used for the current state assessment (RiVAS), equal weighting was also applied to this potential state assessment (RiVAS+).

Step 13: Determine river potential value

The scores were summed for each river. For the two sites, small increases in value for swimming were recorded (Appendix 3). The Whāngārei Falls (Hātea River) increased from local significance to be of regional swimming value; however, the swimming site at the Waipu River bridge (by the Waipu Boat and Fishing Club) remained of local significance for swimming.

Chapter 4
Review

Step 14: Review assessment process and identify future information requirements

Few data were available to inform this case study. Desired data are noted in Appendix 7.

Future information requirements: national database (GIS-based) of the information so that government agencies (e.g. DOC, MfE, MPI) can use it for planning including cross-boundary regional planning.

References

Biggs, B.J.F. (2000). *New Zealand periphyton guidelines: Detecting, monitoring and managing enrichment of streams.* A report prepared for the Ministry for the Environment, Wellington, New Zealand.

Booth, K., Baker, M-A., James, T. and Smith, R. (2010). Part B: River Swimming in the Tasman District: Application of the River Values Assessment System (RiVAS), in Hughey, K.F.D., Baker, M-A. (eds). (2010). The River Values Assessment System: Volume 1: Overview of the Method, Guidelines for Use and Application to Recreational Values. LEaP Report No.24A, Lincoln University, New Zealand. Chapter 7: p23-41.

Booth, K., Callis, J., Panton, T. and Sutherland, D-A. (2012). River Swimming in the Gisborne District: Application of the River Values Assessment System (RiVAS). LEaP Research Paper No.7, Lincoln University, New Zealand.

Hughey, K.F.D., Baker, M-A. (eds). (2010). The River Values Assessment System: Volume 1: Overview of the Method, Guidelines for Use and Application to Recreational Values. LEaP Report No.24A, Lincoln University, New Zealand.

Ministry for the Environment and Ministry of Health (2003). *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas.* Ministry for the Environment, Wellington. Available on the Ministry for the Environment's website at: http://www.mfe.govt.nz/publications/water/microbiological-quality-jun03/

Ministry for the Environment and Ministry of Health. (2009). *Draft New Zealand guidelines for managing cyanobacteria in recreational waters.* A draft prepared for the Ministry for the Environment and the Ministry of Health by S.A. Wood, D.P. Hamilton, W.J. Paul, K.A. Safi and W.M. Williamson.

Appendix 1
Credentials of the River Expert Panel members and advisor

The River Expert Panel comprised seven members. Their credentials are:

1. **John Ballinger** is the Programme Manager, Environmental Monitoring with the Northland Regional Council. He manages the joint agency recreational bathing water quality programme.

2. **Natalie Glover** is the Policy Specialist – Water with the Northland Regional Council. She is project managing Waiora Northland Water, Northland Regional Council's implementation of the National Policy Statement for Freshwater Management.

3. **Lynnell Greer** is the Technical Advisor (Recreation Planning) with the Department of Conservation for Northland. Lynnell has been with the Department for over 10 years as an advisor and previously held positions managing tracks, camps and huts. Lynnell is interested in providing for a wide range of recreational use of the public estate including freshwater swimming.

4. **Darryl Jones** is the Economist at the Northland Regional Council. He is coordinating the application of RiVAS for Northland Regional Council.

5. **George Lewis** is the Monitoring and Compliance Officer with the Kaipara District Council. He is a member of the joint agency recreational bathing water quality programme.

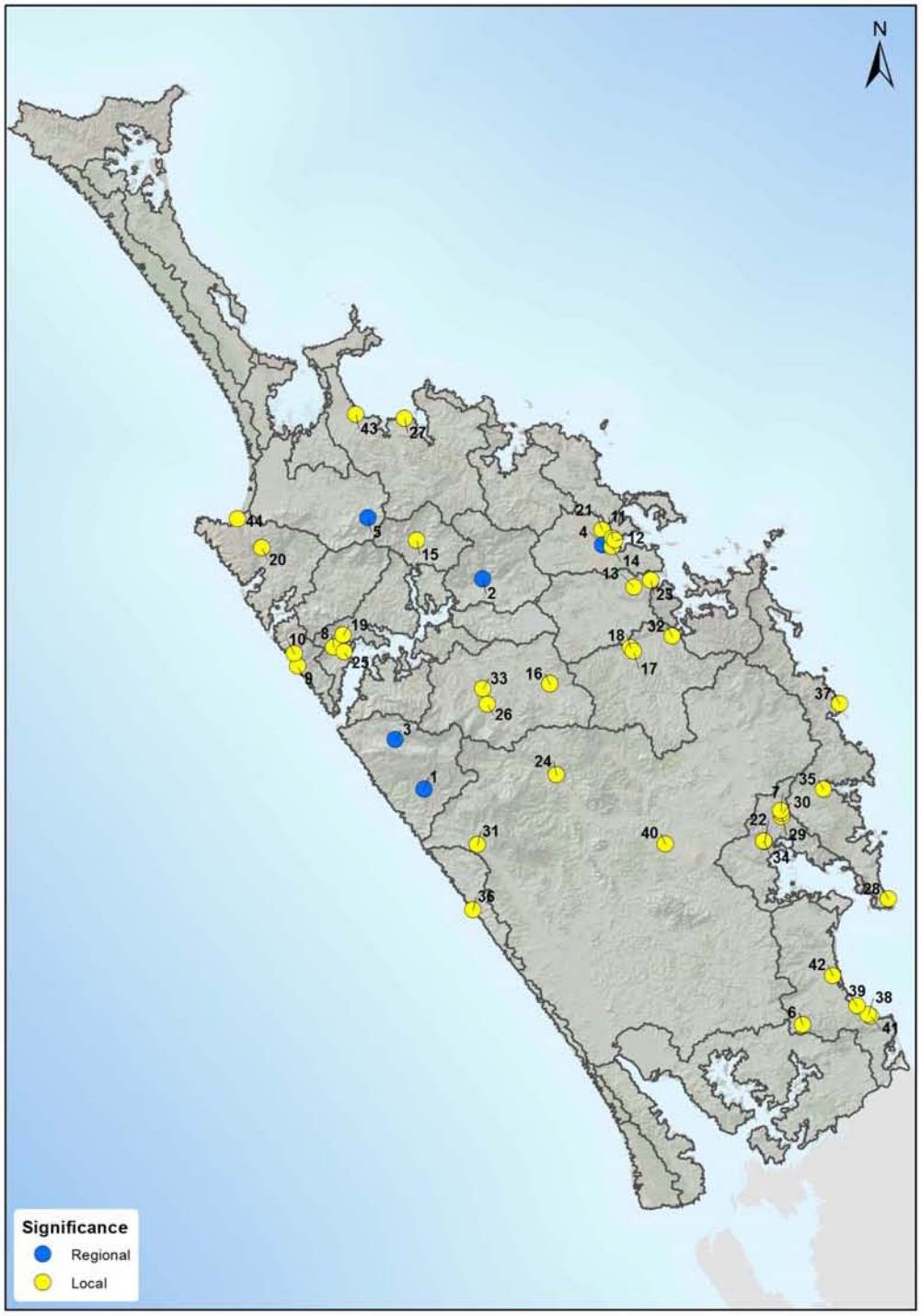
6. **Reiner Mussle** is the Team Leader, Environmental Health/Liquor Licensing with the Whāngārei District Council (WDC). He manages environmental and public health functions for WDC and is a member of the joint agency recreational bathing water quality programme.

7. **Tamati Paraone** is the Monitoring Officer with the Environmental Management Department of the Far North District Council. He is a member of the joint agency recreational bathing water quality programme.

Advisor and facilitator:

8. **Kay Booth** of Lindis Consulting was the facilitator. Kay has been involved in developing the RiVAS tool since its inception in 2007. She has applied RiVAS to various river values for several regional councils, including four previous applications for river swimming.

Appendix 2
Map of ranked swimming sites



Appendix 3
Significance assessment calculations for swimming
(Steps 1, 5-8 and 10-13)

Rank	River/ Stream	Swimming site or reach (if numerous sites within one reach)	Added Post Workshop	Threshold scores _ RiVAS (current conditions)											Comment	Intervention	Threshold scores _ RiVAS+ (potential conditions)									Sum	Current value	Current significance	Potential value		Potential significance
				Water clarity	Swimming holes	Variable water depth	Algae (nuisance)	Algae (E-coli)	Scenic attractiveness	Origin of users	Level of use	Facilities	**Sum**	Significance		See sheet 3 for key	Water clarity	Swimming holes	Variable water depth	Algae (nuisance)	Algae (E-coli)	Scenic attrvness	Origin of users	Level of use	Facilities		Equal weights scores	ie. Regional or Local	Equal weights scores	Shift: current to potential value (all +ve)	ie. Regional or Local
				Horizontal visibility	Max water depth	Morphological variability		G/lines compliance	Overall rating	Kms from home	No. swmrs/peak day	Presence facilities	8 only (50% Algae and 50% E-coli)				Horizontal visibility	Max water depth	Morphological variability		G/lines compliance	Overall rating	Kms from home	No swmrs/peak day	Presence facilities						
				1<1.6m, 2=1.6-3m, 3>3m	1<2m, 2=2-3m, 3>3m	1=low, 2=med, 3=high		1<75%, 2=75-90%, 3>90%	1=low, 2=mod, 3=high	1<10km, 2=10-20km, 3>20km	1=low,2=med,3=high	1=no, 2=toilet only, 3=camp+ toilet					1<1.6m, 2=1.6-3m, 3>3m	1<2m, 2=2-3m, 3>3m	1=low, 2=med, 3=high		1<75%,2=75-90%,3>90%	1=low,2=mod,3=high	1<10km,2=10-30km,3>30km	1=low,2=med,3=high	1=no,2=toilet only,3=camp+toilet						
				NRC data + EP estimate	EP estimate	EP estimate	EP estimate	NRC data	EP estimate	EP estimate	EP estimate	EP estimate	Equal weighting				Data + EP estimate	EP estimate	EP estimate	EP estimate	Data	EP estimate	EP estimate	EP estimate	EP estimate						
1	Waipoua River	Waipoua Forest Visitor Centre		3	3	3	3	3	3	2	2	3	22	Regional																	
2	Waipapa River	Forest Pools		3	2	3	2	3	3	2	3	3	21.5	Regional																	
3	Waimamaku River	Wekaweka Gorge Road	**	3	3	3	3	3	2	2	2	3	21	Regional																	
4	Kerikeri River	Rainbow Falls		2	3	2	2	2	3	3	2	2	19	Regional																	

5	Victoria River	Raetea Camp Ground (DoC)		3	2	2	2	2	3	2	2	3	19	Regional	DoC could advertise a bit more the swimming site															
6	Ahuroa River	Piroa Falls		1	3	3	2	2	3	2	3	1	18	Local																
7	Hātea River	Whāngārei Falls (above)		1	3	3	2	1	2	1	3	3	17.5	Local		7a, 7d	2	3	3	2.5	2	2	2	3	3	20.25	17.5	Local	20.25	2.75	Regional
8	Upper Waihou River (North Hokianga)	End of Kowhitikaru Rd	**	3	2	3	3	2	3	2	1	1	17.5	Local																
9	Moetangi Stream	West Coast Road bridge, just south of Mitimiti	**	2	1	3	3	2	3	3	2	1	17.5	Local																
10	Taikarawa Stream	End of West Coast Road, just north of Mitimiti	**	3	1	3	3	2	1	3	3	1	17.5	Local																
11	Waipapa Stream	Charlies Rock		2	3	2	2	2	3	1	3	1	17	Local	* These places are all located near each other - and would all benefit from improvements together															
12	Waipapa Stream	Basin Landing		2	2	2	3	2	2	1	3	2	16.5	Local	*															
13	Waitangi River	Lily Pond		2	2	2	3	2	2	1	3	2	16.5	Local	*															
14	Kerikeri River	Stone Store		2	2	2	2	1	3	1	3	2	16.5	Local	*															
15	Mangamuka River	Mangamuka Marae	**	2	2	3	3	2	2	1	2	2	16.5	Local																
16	Punakitere River	Mangakahia Road (just south of Kaikohe airport)	**	2	2	3	3	2	3	1	2	1	16.5	Local																
17	Waiharakeke Stream	Lucas Road bridge		2	2	2	3	1	3	1	3	1	16	Local																
18	Otiria Stream	Otiria Falls		2	2	2	3	2	2	1	3	1	15.5	Local																
19	Whakarapa River	Panguru (opposite the Waipuna marae)	**	3	1	3	3	2	2	1	1	2	15.5	Local																
20	Waitotoki Stream	Kaitāia Awaroa Road bridge	**	3	1	2	3	2	3	2	1	1	15.5	Local																
21	Kapiro Stream	Purerua Rd Bridge		2	2	3	3	1	2	1	2	1	15	Local	*															

22	Raumanga Stream	Raumanga Falls		2	2	2	2	2	2	1	3	1	15	Local																	
23	Waitangi River	Watea (NIWA Wakelines site)		2	2	2	3	2	2	1	2	1	14.5	Local																	
24	Mangakahia River	Twin Bridges		2	2	2	2	1	2	2	2	1	14.5	Local																	
25	Upper Waihou River (North Hokianga)	Near West Coast Road bridge	**	3	1	3	3	2	1	1	2	1	14.5	Local																	
26	Mangatawa Stream	Mangatawa Rd (near Otaua marae)	**	2	1	3	3	2	1	2	2	1	14.5	Local																	
27	Kanekane Stream	Coopers Beach SH10 car park		2	1	1	3	1	2	1	3	2	14	Local																	
28	Ocean Beach Stream	Ocean Beach Stream		1	1	1	3	1	2	3	2	2	14	Local																	
29	Hātea River	AH Reed Park (where river meets track from bottom car park)	**	1	3	2	3	1	2	1	2	1	14	Local																	
30	Hātea River	"Oak tree pool" upstream of Reed Park		1	2	2	2	2	3	1	2	1	14	Local																	
31	Kaihu River	Top 10 Motor Camp (Trounson)		1	1	2	2	2	2	1	2	3	14	Local	Source of problems in ruminants, natural aspect of river also causes problem																
32	Tirohanga Stream	Tirohanga Road (50m downstream from FNDC take)		1	2	2	3	2	1	1	3	1	13.5	Local																	
33	Otaua Stream	Otaua Road bridge (near Punakitere Rd)		2	2	2	3	1	2	1	1	1	13	Local																	
34	Raumanga Stream	Raumanga Valley Reserve		2	1	2	2	2	2	1	2	1	13	Local																	
35	Ngunguru River	Scows Landing		1	2	2	3	2	2	1	1	1	12.5	Local																	
36	Omamari Beach	Omamari Beach		1	1	1	3	2	2	1	2	2	12.5	Local	Source of e-coli is avian and																

	Stream	Stream													ruminant, natural conditions (dune) - tried creating channel lasted a few months)																							
37	Otamure Bay Stream	Otamure Bay Stream		1	1	2	2	1	2	1	1	3	12.5	Local	Source of e-coli is avian and ruminant																							
38	Middle Langs Beach stream (at bridge)	Middle Langs Beach stream (at bridge)		1	1	1	3	1	2	1	2	2	12	Local	Source of e-coli is avian																							
39	Waipu Cove Stream	Waipu Cove Stream		1	1	1	1	1	2	2	2	2	12	Local	Natural conditions will make it hard to improve (dune) - dredged but only lasted a few months																							
40	Wairua River	Wairua Falls		1	3	2	1	1	2	1	1	1	12	Local	Relatively isolated, surrounded by farming area																							
41	Langs Beach Strm (at toilets)	Langs Beach Strm (at toilets)		1	1	1	2	1	2	1	2	2	11.5	Local	Source of e-coli is avian																							
42	Waipu River	Bridge by Waipu Boat and Fishing Club		1	3	2	2	1	1	1	1	1	11.5	Local		6c, 7a	2	3	2	2	2	1	1	2	1	14	11.5	Local	14	2.5	Local						
43	Aurere River	SH10 bridge	**	1	1	3	1	2	1	2	1	1	11.5	Local																							
44	Wairoa Stream	Ahipara Rd Bridge	**	1	2	1	2	2	1	1	2	1	11	Local																							

Colour Code Key

Significance thresholds (highlighted columns)

Green	High = National	N/A
Blue	Moderate = Regional	Sum = 19 and above
Yellow	Low = Local	Sum = 18 and below

Misc (highlighted rivers)

Pink	Rivers overlap with neighbouring council

Data reliability (font colour)

Blue/ Purple	Less reliable data
Red	Data checked by Expert Panel and has been adjusted

RiVAS+ (highlighted rows)

Blue	Also assessed for potential future state (RiVAS+)
Orange	Score changed by proposed interventions
Green	Positive influence on attribute but not enough to shift value - counted as an increase of 0.5

Interventions

1.	**Manage access**	
	a. Enhance access	
		i. Helicopter access
		ii. Vehicle access
		iii. Boat access
		iv. Foot access
	b. Control access	
		i. Helicopter access
		ii. Vehicle access
		iii. Boat access
		iv. Foot access
2.	**Enhance flow**	
	a. Increase minimum	
	b. Stabilise (around targeted specific flow)	
	c. More natural variability	
	d. Restore flood flows	
	e. Transfer water between catchments	
3.	**Improve bed & in-stream habitat**	
	a. Maintain channel works (e.g. groynes, other structures) that enhance worth	
	b. Remove channel works (groynes, stop banks etc) that detract from worth	
	c. Control weeds (in-stream, including active river bed) to enhance worth	
	d. Remove hazards (e.g., wire, trees, old structures, forestry slash)	
	e. Leave woody debris in river that enhance worth	
	f. Improve timing of management within flood control area, including root raking	
	g. Remove woody debris to enhance worth	
4.	**Remove or mitigate fish barriers**	
	a. Culverts (or similar – includes small weirs and pump stations)	
	b. Dams	
	c. Flood gates	
	d. Chemical	
5.	**Set back stopbanks**	
6.	**Improve riparian habitat**	
	a. Weed control	
	b. Pest control	
	c. Native revegetation	
	d. Remove litter	
7.	**Enhance water quality**	
	a. Remove/fence out stock	
	b. Reduce non-point source nutrient pollution (e.g., farm nutrient budgets)	
	c. Reduce point source pollution (e.g., mining waste, storm water in urban environments)	
	d. Reduce sediment input (e.g., forest management practices)	
8.	**Stock with fish**	
9.	**Provide amenities**	
	a. Boat launching facilities	
	b. Car parking	
	c. Toilets	
	d. Storage facilities (for kayaks etc)	
	e. Artificial hydraulic feature (for kayakers, swimmers, anglers)	
		i) Slalom course
		ii) Play wave
		iii) Swimming hole
	f. Interpretive signage	
	g. Riverside track (for access)	
	h. Camping	
	i. Picnic tables	

	j. Location signage	
	k. Swimmers' jetty (get in)	
10. Construct water storage		
	a. In-river	
	b. Out-of-river	
11. Develop a run-of-the-river diversion		
12. Provide telemetered flow monitoring (& communicate readings)		
13. Promote/advertise area to the public for that value (e.g. swimming)		

Blue font = intervention added during Northland swimming workshop

Appendix 4
Assessment criteria for river swimming (Steps 2-4)

Note: Blue font indicates revisions from this application

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
Step 2: Identify attributes Step 3: Select and describe primary attributes		Step 3: Select and describe primary attributes	Step 4: Identify indicators	Step 5: Determine significance thresholds	
ATTRIBUTES ASSOCIATED WITH EXISTING USE					
Social	**Level of use**	High use implies high value. This may not hold true for two reasons: **Remote places**, which offer few encounters with other people, may be highly valued for their wilderness value and the experience of 'having the place to ourselves'. **Crowding** may occur at popular sites, which may turn people away. This may be anticipated and the site not chosen for a swim, or occur on arrival (displaced to another nearby site, if one exists).	Number of swimmers on a peak use day (indicator is number of swimmer visits – i.e. later visits by the same person on the same day counted separately) NOTES: Alternative indicators: 1. Maximum number of swimmers at peak	High (**score: 3**) Medium (**score: 2**) Low (**score: 1**)	Expert Panel estimate (good)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
			time on a peak use day 2. Number of swimmer days p.a.		
	Travel distance	Origin of users is suggested as an indicator of quality of the recreational experience, based on the assumption that the higher the expected quality of the experience, the greater the distance users will be prepared to travel. A site close to a large population (short travel distance) will receive more use for reasons of convenience (close to home) resulting in a higher level of local use rather than necessarily signifying regional importance.	Number of kms travelled by swimmers from previous night's location. More than one third of swimmers must travel the distance to trigger the score. NOTES: Travel time was considered but distance offers a more standard metric as time introduces the factor of travel style (e.g. walk, car, cycle).	High: >20 km (**score: 3**) Med: 10-20 km (**score: 2)** Low: <20 km (**score: 1**)	Expert Panel estimate (poor)
	Perception of safety	Overall evaluation that accounts for a range of perceptions (e.g. flow, water quality,	**Desirable site characteristic**		

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		presence of others). Outcome of swimmers' decision-making can be measured via numbers of swimmers attribute.			
	Other users and uses	This includes other users' demographics, their behaviour and the style of their use (e.g. organised events). The types of people who frequent a site may influence its perceived suitability (e.g. site popular with young males who 'take over the place').			
	Diversity of recreation opportunities	Swimming is often undertaken by groups with a range of activity interests. For example, young children who paddle with their parents, some family members who want to go fishing, others who want to sun bathe and swim to 'cool off'. The diversity of opportunities available to cater for different group members may therefore increase a site's attractiveness.			
Amenity / managerial setting	**Presence of facilities**	When a site is well used, councils provide facilities (such as toilets). However, the provision of facilities may also encourage use (people go to sites where there are toilets, which means they can plan to stay all day, for example).	Presence/absence of toilets maintained by the Territorial Authority Presence/absence of camping facilities	Camp + toilet (**score: 3**) Toilet only or camp only (**score 2**) Absent (**score: 1**)	Council data (excellent) Expert Panel estimate (excellent)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		Since some councils provide in a higher level of facility provision than others, the Expert Panel needs to maintain oversight of these data. Camping indicates significant length of stay and a swimming hole can be well used by local campers. Camping facilities may be provided by different types of provider (public or private). Since some councils have a greater propensity to provide facilities than others, the Expert Panel needs to maintain oversight of these data. NOTES: This attribute does not include freedom camping which can happen almost anywhere, but does cater for sites where vehicles (with toilets on board) that have a permit to freedom camp often park.	(e.g. designated camping sites, ablution block, signage, etc) maintained by public or private provider, or place where vehicles with a permit to 'freedom' camp often park		
	Maintenance activities	Some form of council maintenance (e.g. lawn mowing, rubbish collection, weed control) suggests high usage sites.			
	Public access - unrestricted public access;	Public access to the site and within the site to the water is critical. This attribute is one of the essential elements of swimming	**Desirable site characteristic**		

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
	no access charges; easy practical access	sites – without access, no swimming can occur			
	Jump-off points	A high point (e.g. bridge, rope swing) adds to the swimming site - amenity feature			
Aesthetic / scenic	**Perception of scenic attractiveness**	It is expected that there is a positive correlation between perceived scenic attractiveness and swimming amenity. This attribute refers to the integrated set of aesthetic components, many of which are listed as separate attributes in this cluster (see next rows). Ideally a professional landscape assessment would be used or else the perceptions of swimmers. In the absence of these data, Expert Panel estimates were used.	Perception of scenic attractiveness	High (**score: 3**) Medium (**score: 2**) Low (**score: 1**)	Expert Panel estimate (good)
	Degree of naturalness	Amenity feature			
	Wilderness character	Amenity feature			
	Visual landscape	Amenity feature			

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
	back-drop				
	Flora and fauna	Amenity feature			
	Open space	Amenity feature			
	Natural features that offer jump-off points (big rock, cliff, etc)	Amenity feature			
	Water temperature	Amenity feature			
	Cleanliness and tidiness	Amenity feature			
Physical river features	**Swimming holes**	The opportunity to dive and play around in deeper water was considered to be an attractive feature – people often talk about 'good swimming holes'.	Maximum water depth	High: >3 m (**score: 3**) Medium: 2-3m (**score: 2**) Low: <2 m (**score: 1**)	Expert Panel estimate (good)
	Variable water depth	A flat river bed was considered less attractive for swimming than a variable (shallow + deep) bed profile. A low score is a flat bed with little variability.	Morphological variability	High (**score: 3**) Medium (**score: 2**) Low (**score: 1**)	Expert Panel estimate (good)
	Width of river	A river needs to be wide enough to make it worthwhile for swimming	**Desirable site characteristic**		

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
	Flow	Velocity <1 m/s, as >1 m/s is too fast for an adult to wade (at depth of 1 m after which point person likely to swim rather than walk)	**Desirable site characteristic**		
	Hard/soft river bed bottom	Soft river beds are muddy and may be less popular			
	Natural jump-off features (e.g. large rock)	Amenity feature			
	Beach	Somewhere to sit and easy access to the water	**Desirable site characteristic**		
	Pools	Amenity feature			
	Pool/riffle/run sequences	Amenity feature			
	Rapids	Amenity feature			
Water quality	**Algae**	This attribute encompasses types of algae that relate to a health risk (*E. Coli*) and a nuisance (filamentous algae/diatoms) for swimmers. The Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (MfE and MoH 2003) provides a framework for monitoring the	**50% of indicator:** *E. Coli* levels are below the threshold that would score it Very Low in the Microbiological Water Quality Guidelines for	**50% of indicator - *E. Coli* data:** **High**: Met guidelines >90% of the time in past 5 years (**score: 3**) **Medium**: Met guidelines 75-90% of the time in past 5	Council data (excellent) – *E. Coli* Expert Panel estimate (fair) – nuisance algae

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		suitability of sites for recreational bathing. It uses *E. Coli* as an indicator. Other periphyton (filamentous algae and diatoms) present a nuisance to swimmers and detract from aesthetic appeal (Biggs 2000) rather than present a potential health issue.	Marine and Freshwater Recreational Areas, i.e. that sample 95 percentile <550 E. Coli per 100 mL. and: **50% of indicator:** extent of nuisance algae	years (**score: 2**) **Low**: Met guidelines <75% of the time in past 5 years (**score: 1**) **50% of indicator – extent of nuisance algae:** High (**score: 3**) Medium (**score: 2**) Low (**score: 1**)	
	Blue-green algae	Covered above – initially separately identified owing to its importance for public health			
	Water clarity	Users prefer clear water	Compliance with ANZECC (2000) guidelines, i.e.: Horizontal visibility >1.6 m (black disc visibility)	**High**: >3.0 m horizontal visibility when river is below median flow (**score: 3**) **Medium**: 1.6-3.0 m horizontal visibility when river is below median flow (**score: 2**) **Low**: <1.6 m horizontal visibility when river is below	Expert Panel estimate (fair) Some Council data available (very good)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
				median flow (**score: 1**)	
	Faecal contaminants	This is related to water clarity and flow (data indicate a positive correlation)			
	pH	Acid or alkaline pH may cause skin irritations and make eyes and cuts sting			

CONTEXTUAL ATTRIBUTES					
Collective value	Site clusters	The proximity of sites to each other may influence site selection, as it provides options (e.g. if one site looks crowded, users can go to a nearby site).			
	Scarcity	Where few swimming sites exist within an area, then each site is more significant			

Appendix 5
Assessment of indicators by SMARTA criteria

Note: Blue font indicates revisions from this application

Indicator	Specific	Measurable	Achievable	Relevant	Timely	Already in use
No. swimmers on a peak use day	Yes	No. swimmers	Requires on-site monitoring	Use implies site valued by user	Some data available (but not for Northland swimming sites)	Standard recreation metric
No. kms travelled by swimmers from previous night's location	Yes	No. km	Requires user survey to identify previous night location	Large travel distance implies high value	Data not available (requires user survey)	Question been asked in recreation surveys
Presence of facilities (toilets; camp facilities - designated or commonly used camp sites, ablution block, signage, etc)	Yes	Toilet and camp facilities present/ absent; sites used by 'freedom' camping vehicles with a permit	Data available for Council facilities; non-council facilities known by Panel	Facilities respond to demand/high use	Data not available (but known – factual)	Data used by councils for other purposes
Perception of scenic attractiveness	Yes	Response to user survey rating scale question; professional assessment by landscape planner	Requires site visit (planner) or else user survey	Likely to influence choice of swimming site	Data not available (but could obtain from site visit – user survey or professional assessment)	Assessments undertaken by landscape planners for other purposes; question been asked in recreation surveys
Maximum water depth	Yes	Physical measure	Site visit required	Provides swimming	Data not available	No

Indicator	Specific	Measurable	Achievable	Relevant	Timely	Already in use
				hole	(easy to obtain from site visit)	
Morphological variability	Yes	Physical measure	Site visit required	Provides site conducive to swimming	Data not available (easy to obtain from site visit)	No
(1) Compliance with water quality guidelines used to assess the suitability of sites for recreational bathing; (2) Extent of nuisance algae	(1) Yes; (2) Yes	(1) National water quality measures; (2) Expert assessment	(1) Council monitoring programme; (2) Site visit preferrable	(1) Triggers posting of health risk warning and/or nuisance; (2) Nuisance to swimmers	Data available (*E. Coli* bacteria but not nuisance periphyton)	(1) Data used by councils for public health warnings; (2) No
Compliance with horizontal visibility guidelines	Yes	National water quality measure	Council monitoring programme	Likely to influence choice of swimming site	Data available (but limited for swimming sites in Northland)	Data used by councils for other purposes

Appendix 6
Other factors relevant to the assessment of significance for swimming (Step 9)

Desirable site characteristics for swimming
Public access The public must be able to access the site. Access for vehicles is important for most sites and includes space for parking (which may be informal). It was noted that access to most swimming sites is free of charge in New Zealand and this is expected by New Zealanders.
Flow (velocity) The water should be flowing (not stagnant) and able to be waded (<1 m/s at 1 m depth).
River width A river that is too narrow is unlikely to attract swimmers - a width of approximately >5 m was suggested.
Perception of safety Swimmers are unlikely to use a site they consider too risky.
Beach Ideally, the shore provides somewhere to sit and enables easy access to the water.
Other factors
Degree of scarcity of the experience Where few alternative (substitute) sites exist that suit swimming, then the degree of scarcity is high (and vice versa). This places greater significance upon sites. Conversely, where sites exist in close proximity, this may influence site selection as it provides options (e.g. if one site looks crowded, users can go to a nearby site).

Appendix 7
Future data requirements for swimming (Step 14)

Data need
User monitoring at swimming sites on peak use days – numbers of users
Professional assessment of scenic attractiveness by landscape planner
User surveys at swimming sites (home location; perception of scenic attractiveness; use by different ethnic groups; satisfaction with visit)
Population-based survey (in conjunction with other recreation data collection) - to enable calculation of swimmer/days + evaluation of the overall importance of different sites for swimming
National (GIS) database of RiVAS information