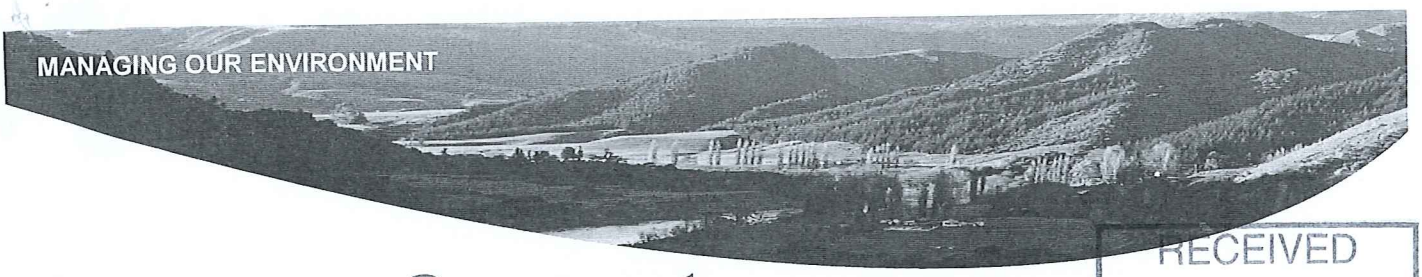


Resource Consent
application form cover sheet

This form needs to be completed with all consent applications submitted to Horizons Regional Council. If sending multiple applications this cover form only needs to be completed once.

Consent holder name: Highgate Farms (C/o Phil Hantdge)
(Please note: Resource Consents can be issued to a person(s), company. If you choose to have your consent in the name of a Trust, Estate or Partnership please ensure the full names of all trustees/partners are stated above)

Contact person: *(if different from above)*

Phone no: 06 374 7882 **Fax no:** ←

Mobile no: 0274 872 642 **Best contact time:** dayTime.

Email address: pjhantadge@gmail.com.

Postal address: 77848 State Highway 2, Dannevirke 4972.

Post code: 4972.

Please tick each of the following consents you are applying for and attach the respective application forms to the back of this form:

- ○ **Drilling of Well**
  Lodgement fee $320 incl GST
- ✓ **Surface Water Take**
  Stock Water: lodgement fee $1,050 incl GST
  Irrigation: lodgement fee $1,300 incl GST
  Other: lodgement fee $920 incl GST
- ○ **Dairyshed Discharge**
  Lodgement fee $1,200 incl GST
- ○ **Change in Land Use Activity to Dairy Farm**
  Lodgement fee $920 incl GST
- ○ **Existing land use and discharge activities for intensive farming**
  Lodgement fee $1,500 incl GST
- ○ **Gravel Take**
  Lodgement fee within allocation $1,800 incl GST
- ○ **Change of Consent Conditions**
  Lodgement fee $920 incl GST
- ○ **Land Disturbance / Vegetation Clearance**
  Lodgement fee $920 incl GST
- ○ **Ground Water Take**
  Stock Water: lodgement fee $1,380 incl GST
  Irrigation: lodgement fee $2,000 incl GST
  Other: lodgement fee $920 incl GST
- ○ **Dairyshed Change of Consent Conditions**
  Lodgement fee $870 incl GST
- ○ **Existing land use for intensive farming**
  Lodgement fee $920 incl GST
- ○ **Addition of Land Parcels**
  no charge
- ○ **Works in a Waterbody**
  Lodgement fee $920 incl GST
- ○ **Other**
  Lodgement fee $920 incl GST

Continued Overleaf

Ring Horizons Regional Council's Consents Team on freephone 0508 800 800 if you require any assistance

Location/ property address of the proposed activity: SH2. Dannevirke

Legal description of all land titles (this can be found on your rates demand): LOT 1 DP 4606 Takoraki 2A2B 2A3O A DIS 2A29 2A3O B 2A3O C Sec 23 BLK II Takoraki SD.

Valuation numbers for all land titles (this can be found on your rates demand): 11140/060.00.

Map reference (if known): Take 1 E2771068 N6103486 Take 2 E2770819 N6101914.

○ **Map attached showing location**

Ring Horizons Regional Council's Consents Team on freephone 0508 800 800 if you require a map

Do you own the property where this activity will take place? Yes ✓ No ○

If no, please state owner of property?

Contact details of property owner: as above.

Please note that written approval is required from this landowner and should accompany this application

Contact person at Horizons Regional Council

If you have already dealt with a member of the consents team please advise their name? Jasmine Mitchell

Signature of applicant: _____ **Date:** 1/9/15

(or person authorised to sign on behalf of the Applicant)

Address for service of applicant if different from above:

Phone no: 06 376 7882 **Fax no:**

Mobile no: 0276 872 642 **Best contact time:**

Contact person:

Have you attached the following:

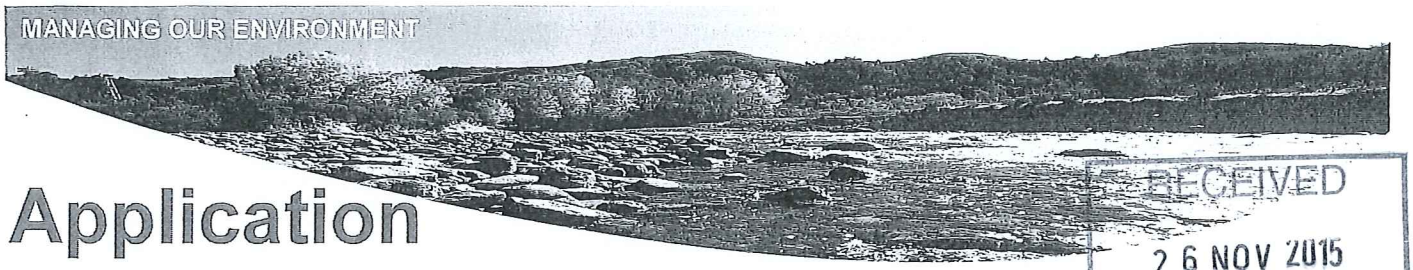
- ○ **Activity application forms as ticked above**
- ○ **Map showing location and all required points of reference as requested on the activity application form**
- ○ **Lodgement fee**

Please note: if you do not provide enough information your application may not be accepted

The information provided on this form will be used to process the consent application and, if granted, to monitor the exercise of the consent. The information requested is required by the Resource Management Act 1991. Horizons Regional Council may disclose the information if a request is made by another party, under provisions of the Local Government Official Information and Meetings Act. Horizons Regional Council may also publicly disclose some of this information in circumstances where consent conditions have been breached. Under the Privacy Act 1993, you have the right of access to personal information about you held by Horizons Regional Council and you are also entitled to request information about you to be corrected.

horizons regional council
11-15 Victoria Avenue
Private Bag 11 025
Manawatu Mail Centre
Palmerston North 4442
T 0508 800 800
F 06 952 2929
help@horizons.govt.nz
www.horizons.govt.nz

MANAGING OUR ENVIRONMENT



Application
to take surface water

RECEIVED
26 NOV 2015
Horizons Regional Council

Is this application replacing a current consent? Yes ☑ No ☐

If yes, do you agree to surrender your current consent should this application be granted? Yes ☑ No ☐

Current consent number *if applicable*: 102750

Dairy supply no: *if applicable*: 47140

Consent holder: Phelip James Hartridge

Contact person: as above

Water source: *(eg river / stream / lake name)* Tamaki River

Maximum daily quantity to be taken 2020 m^3/day (cubic metres per day)

☐ **Estimate quantity** ☑ **Metered quantity**

Maximum instantaneous rate: *this can be found on the pump* ~~23.4~~ m^3/hour **or** 23.4 L/s

Existing Infrastructure
Are there any of the following currently installed?

Flow metre: Yes ☑ No ☐ **If yes, please state type:** Mechanical Varified

Backflow Preventer Yes ☑ No ☐ **Telemetry** Yes ☑ No ☐

Location of abstraction *(map reference)*: E 2770819 N 6101914.

Method of abstraction *(i.e. suction hose, infiltration gallery etc)*: Suction hose

Fish Screen? Yes ☑ No ☐

Aperture size: 4 mm **Velocity through screen:** Unknown. metres/second

Use of water abstracted:

☑ **Irrigation** *(please complete Table 1 overleaf)* ☐ **Water supply** *(please complete Table 2 overleaf)*

☐ **Stockwater / Dairyshed Washdown** *(please complete Table 3 overleaf)* ☐ **Municipal Supply**

☐ **Industrial** *(please describe)* _____

☐ **Other** *(please describe)* _____

Continued Overleaf

Table 1: Irrigation

☑ **Pasture:** *area* 50 ha ☐ **Crop:** *type* _____ *area* _____ ha

Irrigation Depth: 200 mm **Irrigator Type:** Drag hose

Table 2: Water Supply

Type of facility:

☐ **Private Dwelling/s:** Number of dwellings _____ Maximum occupancy _____

☐ **Commercial / Rural:** *(eg: dairyshed, woolshed etc.)* Description _____ Occupancy _____

☐ **School:** Maximum occupancy _____ ☐ **Camping Ground:** Maximum occupancy incl. staff _____

☐ **Marae** Maximum number of: *day visitors* _____ *overnight visitors* _____

☐ **Other:** *Please describe and include maximum occupancy* _____

_____

Table 3: Stockwater Usage (please indicate number of animals):

☐ **Dairy Cows** _____ ☐ **Dry Cows** _____ ☐ **Calves** _____

☐ **Beef Cattle** _____ ☐ **Sheep** _____ ☐ **Horses (working)** _____

☐ **Horses (grazing)** _____ ☐ **Other** *(species and number)* _____

For dairy operations, is water required for shed or yard use/washdown? **Yes** ☐ **No** ☐

Period of time consent is required for? *(max 35 years)* 35 years

Please provide a site plan / map to scale showing where you are taking water from and where the water is to be used
If you have an irrigation plan / schedule please provide a copy
Please note: if you do not provide enough information your application may not be accepted

Fees and charges

A lodgement fee is required with your application. Failure to send the fee may result in rejection of your application.

Stock Water: lodgement fee $1,050 incl GST **Irrigation:** lodgement fee $1,300 incl GST

Other: lodgement fee $920 incl GST

If you would like to pay your lodgement fee via internet banking please make payment to **02-0630-0024883-003**, please insert CONSENT HOLDER NAME in **reference** and CONSENTS in **code**.

Signature of applicant: _____ **Date:** 25/11/15.

(or person authorised to sign on behalf of the Applicant)

Ring Horizons Regional Council's consents team on freephone 0508 800 800 if you require assistance.

The information provided on this form will be used to process the consent application and, if granted, to monitor the exercise of the consent. The information requested is required by the Resource Management Act 1991. Horizons Regional Council may disclose the information if a request is made by another party, under provisions of the Local Government Official Information and Meetings Act. Horizons Regional Council may also publicly disclose some of this information in circumstances where consent conditions have been breached. Under the Privacy Act 1993, you have the right of access to personal information about you held by Horizons Regional Council and you are also entitled to request information about you to be corrected.

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Resource consent Renewal for consent No 102750

To whom it may concern.

Highgate farms
Dannevirke

Additional information.

History.

The block at Hamoa road that this consent applies was originally farmed as a sheep farm by Mr Eric lynch until the early seventies.
It was then purchased by Mr John Gould and converted to a dairy unit encompassing the farm now owned by Mr Eric Yates.
Mr Gould obtained the consent to irrigate in 1975 and installed the present infrastructure which has remained largely the same ever since.
Mr Peter Krough purchased the farm in the early nineties and it was divided up to become Mr Tony Webers farm since sold again. , The lower half to Weber and our portion ,the rear half with the irrigation.
Since that time the lower half, then unirrigated portion, has had irrigation installed by the present owners for the same reasons outlined here.

Topography and Description.

The farm lies in a dry belt east of State highway 2 on free draining soil type and flat terrain necessitating irrigation through the summer months to maintain a satisfactory level of production to meet its overheads.
Because the farm is only 5Km from Dannevirke it attracts high territorial authority rates because of the near lifestyle blocks.

Environmental Effect.

Over time the consented volumes abstracted from the Tamaki river have reduced hugely.
The District council municipal take has been reduced by 2000 cubic meters per day which has been largely been made possible by the construction of the new reservoir.
The consented volume of Mr Stuart Jones has been surrendered. 2500 cu m /day I think.
The consented volume of Mr Peter Smith has been surrendered.
All other takes are operating at peak efficiency.
The river is in a tremendous ecological state being of one of the best positions in the catchment. These figures are available through regional council stats for the river.
I enclose a report commissioned by me prepared by the environmental consultants Kingett Mitchell showing good levels of sustainability with the present draw off levels at low flow. (enclosed)

Farming Practice.

The block is farmed in conjunction with the rest of the Dairy farming operation.
The accompanying irrigated block makes up the dairy platform which is the main financial earner for the whole operation.
All the farm is operated biologically as a low input grass based unit.
The farm supports 26 people at present most income of which is spent in the local economy.
The farm injects between 1.2 and 2.8 million into the local economy depending on the Dairy Payout and rainfall of any particular year.
Our operation utilises the best environmental practices available and changes to meet those obligations as techniques become available.
All rivers are fenced off and kept to a high standard.
We have recently spent over $300.000 on effluent management to spread these valuable nutrients over the entire milking platform which we consider to be the best practice possible in NZ.
Our irrigation management is of a highest standard possible and these records can be obtained from the regional council compliance office.
While we have not yet commissioned our farm assessment for One plan consent, Our Fonterra N assessment puts the value at a 35 KG loss.

Financial Position.

The production required to generate this income requires top management and production.
Under irrigation and good management regime at present the farm does meet its overheads and bank loan obligations.
Should the block lose its consent to irrigate the block becomes uneconomic.
Dairy is the only land use available at this time to meet those obligations.
Over time considerable investment has been put into the block by consecutive owners to lock in its value and resultant accompanying bank loan to suit.
Our financial consultant has been engaged to cost the loss to us of not being able to renew the consent (enclosed).
The resultant loss to our business is $136.080 . This means we would not be able to meet our financial commitments and would have to restructure our operation massively to survive.
The present financial return position is finely balanced as it is and I am at present too old to start again elsewhere.

Summary.

The present boil;ogical farming regime needs in excess of 100 years up to 200 years from now to deepen the soil carbon humic profile. This in turn will lessen the need for irrigation as the soil will have a much greater water holding capacity.
The consent renewal applied for here is critical to the survival of our business.
Failure to obtain a renewal would have major financial and social repercussions to the land and operation.

I trust you will renew the existing consent as applied for.

Yours Faithfully

Philip Hartridge

Consent applicant.

Lewis Shailer
27 River View Lane
R D 10
Palmerston North
Cell: 027 4479 203

16 October 2015

Hartridge Family Trust
C/- P & P Hartridge
R D 2
Dannevirke

RE: Loss of 53ha Irrigation

Dear Phil, Pauline and Dan,

Further to our recent discussion I have prepared feed budgets and some financial analysis to assess the financial implications of a loss of irrigation to the fifty three hectare block. Partial budget and feed budgets attached.

For the purpose of feed budgeting I have left all feeds other than pasture remaining about the same for both options, the main difference will be pasture production. The lack of irrigation required a reduction of 70 cows which reduced production by 31,000 kgMS. I have taken in to account other reductions to income from cattle sales and also the expected reductions in costs given the lower milker numbers and lack of irrigation to power. I have assumed no difference in labour requirement.

Total income is reduced by $209,400. Total costs are reduced by $73,320 leaving a net reduction in surplus from farming of $136,080 due to the lack of irrigation.

Should you require any further information, please do not hesitate to contact me.

Yours sincerely

Lewis Shailer *B.Agr MNZIPIM*
Director / Consultant
DairyTeam Limited

Partial Budget

Without irrigation to the 54ha block I would expect a reduction of income resulting from 31,000 kgMS less production, 60 less bobby calves and 15 less cull cows. At the same time costs will be reduced by milking 70 less cows and less irrigation electricity.

Operating Costs per cow;

AH	92
Breeding	49
Electricity	40
Crops	10
Fertiliser	200
Regrassing	10
Part Winter	100

Total	$501 x 70 cows =	$35,070
Reduced Irrigation Cost		$20,000
Less replacements reared 18 x $800		$14,400
Interest (sell 70 budget cows x $1,100 = $77,000 @ 5%		$ 3,850
Total reduction in Costs		**$73,320**

Reduced Income

31,000 kgMS @ $6.30	$195,300	
Bobby calves 60 x $60	$ 3,600	
Cull Cows 50 x $700	$ 10,500	
Total Reduced Income	**$209,400**	
Net Reduction in Surplus		**$136,080**

Per cow costs have been weighted to reflect the marginal effect a reduction in cow numbers would have. The average milk price over the last ten years inflation adjusted is $6.30.

DairyTeam

Heritage #2 SQ — FEED BUDGET

EFFECTIVE AREA:	143	143	143	143	143	137	137	137	137	137	137	137
INITIAL COVER:	2100											
MONTH:	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY
Growth rate/Day:	19	16	25	42	71	76	61	53	42	32	32	35
UtilisableGrowth rate/Day:	16	13	21	35	59	63	51	44	35	27	27	29
Intake/Day:	17.1	17.1	33.2	47.5	56.0	57.8	53.7	51.3	47.5	47.5	37.4	30.6
Difference/Day:	-1	-4	-12	-12	3	5	-3	-7	-12	-21	-11	-1
Hay	9180	12400	0	0	0	0	0	0	0	0	0	0
Hay/cow/day	1.5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baleage / Hay	9180	12400	16864	20100	0	-20808	-12648	0	0	6045	19200	12400
Baleage/cow/day	1.5	2.0	2.0	2.0	0.0	-1.7	-1.0	0.0	0.0	0.5	2.0	2.0
Palm Kernel/Barley	0	0	16864	22920	24924	0	0	25110	21840	24180	19200	19840
PKE/barley/cow/day	0.0	0.0	2.0	2.0	2.0	0.0	0.0	2.0	2.0	2.0	2.0	2.0
Other Feed/Turnips	0	0	0	0	0	0	0	0	32760	36270	0	0
Other/cow/day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0
FINAL COVER:	2191	2234	2089	2017	2295	2301	2109	2074	2125	1967	1928	2122
ANIMAL INTAKE;												
Dries	204	180	47	47	8	0	0	0	0	0	0	120
Intake/Head/Day	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	9.0
Milkers	0	20	225	335	394	408	408	405	390	390	320	200
Intake/Head/Day	14.9	14.5	18.6	18.6	20.1	19.4	18.0	17.4	16.7	16.7	16.0	15.5
R1 Heifers	0	0	0	0	0	0	0	0	0	0	0	0
Intake/Head/Day	5.5	6.0	6.0	6.0	6.5	6.5	7.0	7.0	8.0	8.0	9.0	9.0
TOTAL DEMAND/DAY	17	17	33	47	56	58	54	51	47	47	37	31
DAYS/PERIOD:	30	31	31	30	31	30	31	31	28	31	30	31

Util %	Gross
0.8	26975
0.8	78416
1	174878
0.8	86288

DAY	%
10	27
20	48
30	63
40	77
50	85
60	92
70	96

	Total		Per Ha	Per Cow
Normal Growth	2125490		15283	
Grass Harvested	1774784		12761	4350
Hay Consumed	21580			53
Baleage/Hay Consumed	62733		439	154
Palm Kernel Consumed	174878		1223	429
Other/Turnips Consumed	69030		483	169
Winter Grazing	132000		923	324
Less R1 Cosumption	0		0	0
Total	2235005		15629.41	5478

Silage Fed (80% Utilis) tDM		75	
Conversion Ratio		11.9	
Breed of Cow - F=1, FxJ=2, J=3.		2	
Walking Flat(**1**) Med(**2**) Hill(**3**) / **Km**	1	3	6
Mean cow liveweight		480	57.4
Pregnancy			3405
Milk production			75
Avarage Feed Quality			11

Target Production

Month	Days	Cows	Cow-Days	MS/cow	MS/Day	Total MS	%
June	30	0	0	1.2	0	0	0.0
July	31	20	620	1.4	28	868	0.5
August	31	225	6975	2	450	13950	7.4
Sept	30	335	10050	2	670	20100	10.7
Oct	31	394	12214	2.1	827	25649	13.6
Nov	30	408	12240	2	816	24480	13.0
Dec	31	408	12648	1.8	734	22766	12.1
Jan	31	405	12555	1.7	689	21344	11.3
Feb	28	390	10920	1.6	624	17472	9.3
March	31	390	12090	1.6	624	19344	10.3
April	30	320	9600	1.6	480	14400	7.6
May	31	200	6200	1.3	260	8060	4.3
Total						**188433**	
Peak Cows Milked		408			MS/Cow	462	

DairyTeam

Hartridge #2 50ha Irigated — FEED BUDGET

EFFECTIVE AREA:	143	143	143	143	143	137	137	137	137	137	137	137
INITIAL COVER:	2100											
MONTH:	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY
Growth rate/Day:	17	14	25	38	65	62	47	36	30	20	20	27
UtilisableGrowth rate/Day:	14	12	21	32	54	52	39	30	25	17	17	23
Intake/Day:	10.9	12.9	28.6	40.3	45.6	47.4	44.1	42.4	38.9	38.9	32.7	27.0
Difference/Day:	3	-1	-8	-9	9	4	-5	-12	-14	-22	-16	-4
Hay	5850	9300	0	0	0	0	0	0	0	0	0	0
Hay/cow/day	1.5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baleage / Hay	5850	9300	0	0	0	-27135	-10385	0	0	29760	33600	22320
Baleage/cow/day	1.5	2.0	0.0	0.0	0.0	-2.7	-1.0	0.0	0.0	3.0	4.0	4.0
Palm Kernel/Barley	0	0	14694	19620	20336	0	0	20770	26880	29760	25200	26040
PKE/barley/cow/day	0.0	0.0	2.0	2.0	2.0	0.0	0.0	2.0	3.0	3.0	3.0	3.0
Other Feed/Turnips	0	0	0	0	0	0	0	0	26880	29760	0	0
Other/cow/day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0
FINAL COVER:	2280	2372	2234	2113	2525	2457	2231	1998	2002	1964	1913	2128
ANIMAL INTAKE;												
Dries	130	130	47	47	8	0	0	0	0	0	0	100
Intake/Head/Day	12.0	12.0	12.0	12.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	9.0
Milkers	0	20	190	280	320	335	335	335	320	320	280	180
Intake/Head/Day	14.9	14.5	18.6	18.6	20.1	19.4	18.0	17.4	16.7	16.7	16.0	15.5
R1 Heifers	0	0	0	0	0	0	0	0	0	0	0	0
Intake/Head/Day	5.5	6.0	6.0	6.0	6.5	6.5	7.0	7.0	8.0	8.0	9.0	9.0
TOTAL DEMAND/DAY	11	13	29	40	46	47	44	42	39	39	33	27
DAYS/PERIOD:	30	31	31	30	31	30	31	31	28	31	30	31

Util %	Gross
0.8	18938
0.8	79138
1	183300
0.8	70800

DAY	%
10	27
20	48
30	63
40	77
50	85
60	92
70	96

	Total		Per Ha	Per Cow
Normal Growth	1701192		12204	
Grass Harvested	1420495		10190	4240
Hay Consumed	15150			45
Baleage/Hay Consumed	63310		443	189
Palm Kernel Consumed	183300		1282	547
Other/Turnips Consumed	56640		396	169
Winter Grazing	132000		923	394
Less R1 Cosumption	0		0	0
Total	1870895		13083.18	5585

Silage Fed (80% Utilis) tDM		76	
Conversion Ratio		11.9	
Breed of Cow - F=1, FxJ=2, J=3.		2	
Walking Flat(**1**) Med(**2**) Hill(**3**) / **Km**	1	3	6
Mean cow liveweight		480	57.4
Pregnancy			3405
Milk production			75
Avarage Feed Quality			11

Target Production							%
Month	Days	Cows	Cow-Days	MS/cow	MS/Day	Total MS	
June	30	0	0	1.2	0	0	0.0
July	31	20	620	1.4	28	868	0.6
August	31	190	5890	2	380	11780	7.5
Sept	30	280	8400	2	560	16800	10.7
Oct	31	320	9920	2.1	672	20832	13.3
Nov	30	335	10050	2	670	20100	12.8
Dec	31	335	10385	1.8	603	18693	11.9
Jan	31	335	10385	1.7	570	17655	11.3
Feb	28	320	8960	1.6	512	14336	9.1
March	31	320	9920	1.6	512	15872	10.1
April	30	280	8400	1.5	420	12600	8.0
May	31	180	5580	1.3	234	7254	4.6
Total						**156790**	
Peak Cows Milked		335			MS/Cow	468	

Kingett Mitchell Ltd
RESOURCE & ENVIRONMENTAL CONSULTANTS

AEE FOR HIGHGATE FARM'S PROPOSED WATER ABSTRACTION FROM THE TAMAKI RIVER

FEBRUARY 2006

on behalf of

Highgate Farm

prepared by

Kingett Mitchell Limited

Kingett Mitchell Limited

PO Box 1762 Christchurch
Level 2
122 Riccarton Road
CHRISTCHURCH

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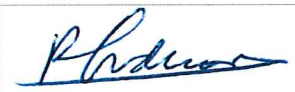
Document Quality Assurance

This report has been prepared in accordance with Kingett Mitchell quality assurance procedures. All relevant quality control information in relation to biological and/or environmental data is identified within the document. The report has been reviewed and is approved for release as set out below.

	Name	Signature
Project Manager	**Richard Montgomerie**	
Project Reviewer	**Richard Montgomerie**	
Director approval for release	**Roger Cudmore**	

Project Job Number	**502150**	

1. Introduction

1.1 Background

P. J. Hartridge of Highgate Farm, Dannevirke (the applicant), lodged two resource consent applications with Horizons.mw (Horizons) on 30 June 2003 to renew existing consents 100899 (Application 102749) and 100012 (Application 102750) to abstract surface water from the Tamaki River for irrigation purposes. The applications were notified and submissions were received from several parties in opposition including Tararua District Council, Fish and Game and the Department of Conservation (DoC). Horizons subsequently issued a request for further information under Section 92 of the Resource Management Act 1991 on 22 August 2003.

Kingett Mitchell Limited (Kingett Mitchell) has been engaged by the applicant in response to Horizons' request for further information. It is understood that Resource Consent applications 102749 and 102750 will remain on hold until this information is received (letter 20 January 2005, Fiona Morton, Horizons). In the interim the applicant continues to operate under the now expired consents 100899 and 100012.

This report provides an assessment of environmental effects (AEE) to support the applicant's resource consent applications.

1.2 Report Scope

The purpose of this report is to fulfil the requirements of Horizons' request for further information and address the concerns raised in the submissions. Specific issues raised by Horizons in a letter to the applicant (20 January 2005) were:

- Justification for increased water requirements.
- A detailed analysis of the takes and surrounding environment (eg. the abstraction site, soil type etc).

This report uses existing reports and data to describe the Tamaki River environment and to assess the existing and potential environmental effects of the applicant's proposed abstractions from the Tamaki River.

Section 2 describes the activity. Section 3 describes the Tamaki River environment, including its catchment, flow, water quality and biological resources. Section 4 assesses effects of the proposed abstraction on the Tamaki River environment and other downstream water users. Section 5 discusses the irrigation efficiency. Section 6 considers alternatives and Section 7 addresses the concerns raised in the submissions and the consultation processes that have been undertaken to date. Section 8 provides an overall conclusion on the effects of the proposed abstraction and Section 9 suggests consent conditions. Section 10 lists the references cited in this report.

2. Description of the Activity

2.1 Proposed Abstraction

The applicant has applied for two resource consents to take surface water from the Tamaki River. Application 102749 is to take 4,040 m^3/day at a rate of 46 L/s to irrigate 107.5 ha of pasture. Application 102750 is to take 2,020 m^3/day at a rate of 23 L/s to irrigate 46 ha of pasture. The two intakes are located downstream of the State Highway 2 Bridge, southwest of Dannevirke (see Fig. 2.1 for location). Table 2.1 provides a summary of the proposed abstraction.

Table 2.1: Summary of proposed abstraction from Tamaki River.

	Application 102749	Application 102750
Volume	4,040 m^3/day	2,020 m^3/day
Abstraction rate	46 L/s	23 L/s
Land area to be irrigated	107.5 ha	46 ha
Location of abstraction point	NZMS 260 U23: 710036	NZMS 260 U23: 708019

Application 102749 is to replace Consent 100899 which has now expired. Consent 100899 permitted abstraction of 2,182 m^3/day to irrigate approximately 60 ha of pasture. The justification for the increase in volume sought through the current application (4,040 m^3/day) is the increase in land area to be irrigated from 60 ha to 107.5 ha.

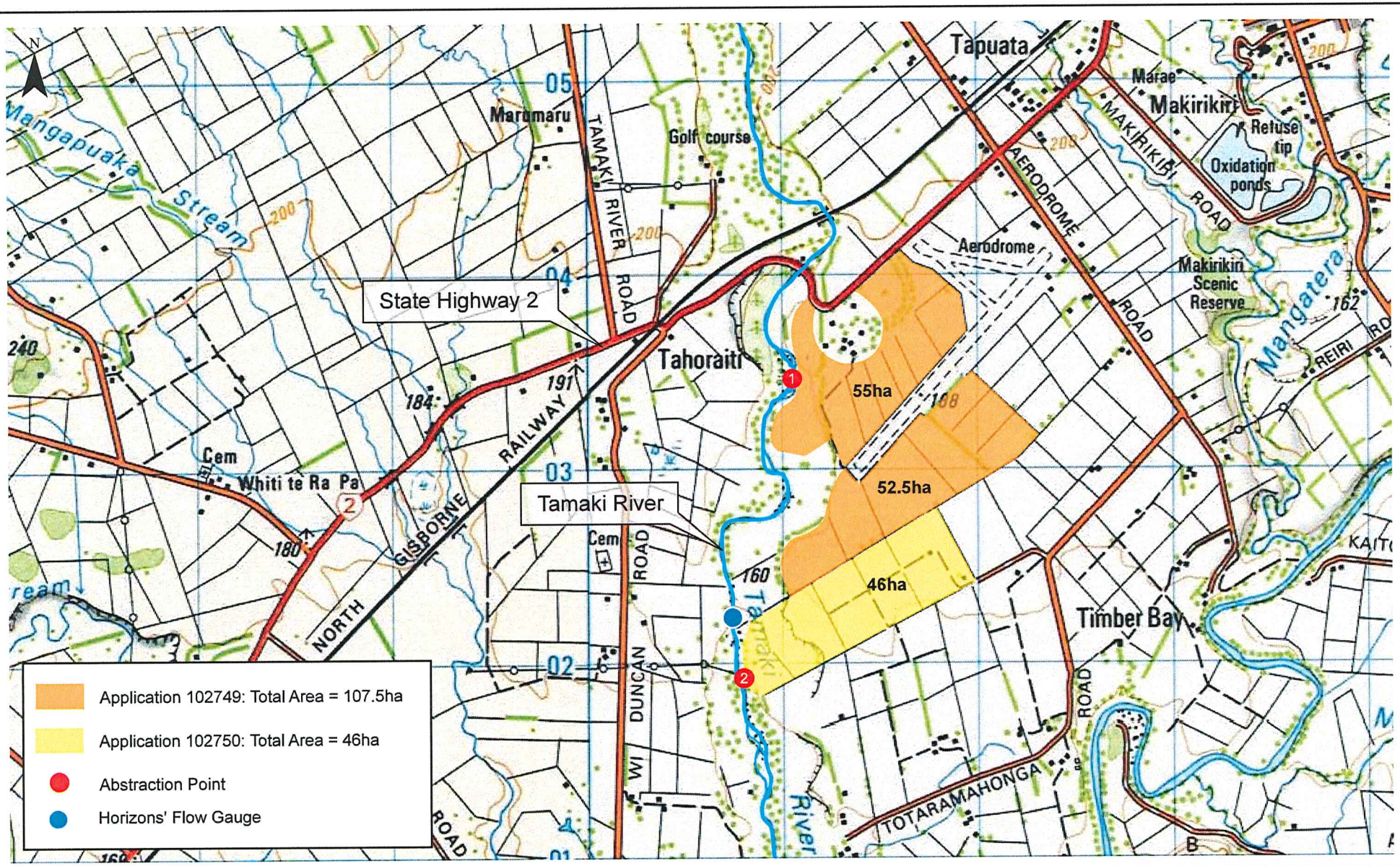
Application 102750 is to replace Consent 100012 which has now expired. Consent 100012 permitted abstraction of 2,635 m^3/day to irrigate 46 ha of pasture. Due to pump limitations the applicant did not exercise the limit of this permit. In an effort to reduce the volume of the combined take the applicant has reduced the volume sought through Application 102750 to 2,020 m^3/day. This is in keeping with the applicant's pumping capabilities.

The combined take sought by the applicant is 6,060 m^3/day to irrigate a total land area of 153.5 ha. This is a significant reduction on the applicant's original application for 8,635 m^3/day.

2.2 Description of the Irrigation System

The irrigation season typically runs from November to May. During this time the pumps operate 24 hours per day when irrigation is required. A soil moisture meter is used to measure soil moisture content and monitor the need for irrigation.

The intake at Abstraction Point 1 (see Fig. 2.1 for location) consists of a six inch pipe with a 5 mm screen in the main channel of the river. Minor, infrequent in-river works are required to maintain screen efficiency. The applicant undertakes these works at the beginning of the irrigation season and endeavours to minimise riverbed disturbance. Abstraction Point 1 serves two pumps each capable of pumping 2,020 m^3/day.



Kingett Mitchell Ltd
RESOURCE & ENVIRONMENTAL CONSULTANTS

TITLE: HIGHGATE FARM IRRIGATION ABSTRACTION SITES & IRRIGATED LAND AREAS

CLIENT: P. J. Hartridge

DATE: FEBRUARY 2006

PROJECT NO: 502150

FIGURE NO: 2.1

j:\graphics\502150\may05\fig2-1.ai

The intake at Abstraction Point 2 (see Fig. 2.1 for location) consists of a 10 m gallery with a six inch pipe and a 7 mm screen. The screen will be upgraded to 5 mm on granting of the new consent. Maintenance is carried out in the gallery at the beginning of the irrigation season to facilitate water flow. Abstraction Point 2 serves one pump with a capacity of 1,650 m^3/day. This pump will be upgraded to a capacity of 2,020 m^3/day on granting of the new consent.

During the season both screens are cleaned daily to maintain flow to the pumps. Water is pumped to drag hose guns which are used to irrigate the pasture. Flow meters were installed in late 2003 and data supplied to Horizons via telemetry. Photographs of the two intakes are shown in Fig. 2.2 and Fig. 2.3.

Fig. 2.2: Abstraction point for Application 102749 on the Tamaki River.

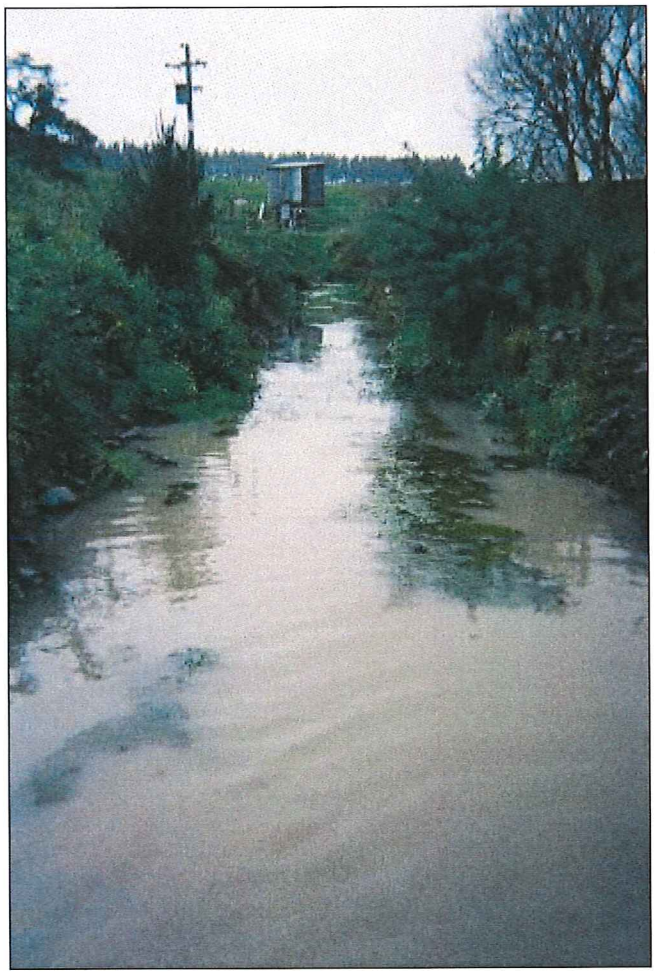


Fig. 2.3: **Abstraction point for Application 102750 on the Tamaki River.**

3. Description of the Environment

3.1 Introduction

The information presented in this section has been acquired from Horizons (in the form of raw data and existing reports) and previous work undertaken by Kingett Mitchell for the Ruahine River Care Group. This section describes the environment to which the applicant's resource consent applications relate.

3.1.1 Upper Manawatu River Catchment

The Upper Manawatu River catchment covers 3,231 km^2 and drains an area bounded by the south eastern Ruahine Range to the north-west and the Puketoi and Waewaepa Ranges to the south-east. The Upper Manawatu River catchment is highly modified with current landuse being a mixture of dairying and dry stock farming. Willow lined banks clearly mark the river's presence.

Except for a portion of the river in the Dannevirke area the low flow channel is dominated by gravel and the river is by nature a run/riffle type. In the Dannevirke area papa bedrock dominates the substrate and pools the habitat type. Below Dannevirke the valley broadens and the river channel is much wider (Horizons 1999).

3.1.2 Tamaki River

The Tamaki River is the largest of the south eastern Ruahine streams. The source of its headwaters is on the highest peak in the southern Ruahine Range. The West Branch drains south west along the base of the ranges while the East Branch flows parallel draining lower foothills. The combined branches forming the Tamaki River then flow south east to the Manawatu River approximately 25 km from the source.

3.2 Hydrology of the Tamaki River

3.2.1 Flow Record

The nearest flow gauge to the applicant's property is the Stephenson gauge (NZMS 260 U23:707022) which was installed by Horizons in December 2003. This gauge is located between the applicant's intakes but closer to Abstraction Point 2 (see Fig 2.1). Despite the short flow record the Stephenson gauge allows the best assessment of effects of the applicant's water takes on river flows to be made due to its proximity to the abstraction points. Fig. 3.1 shows the flow record for the Tamaki River at the Stephenson gauge (data provided by Horizons) and Table 3.1 shows the flow statistics (calculated from data provided by Horizons).

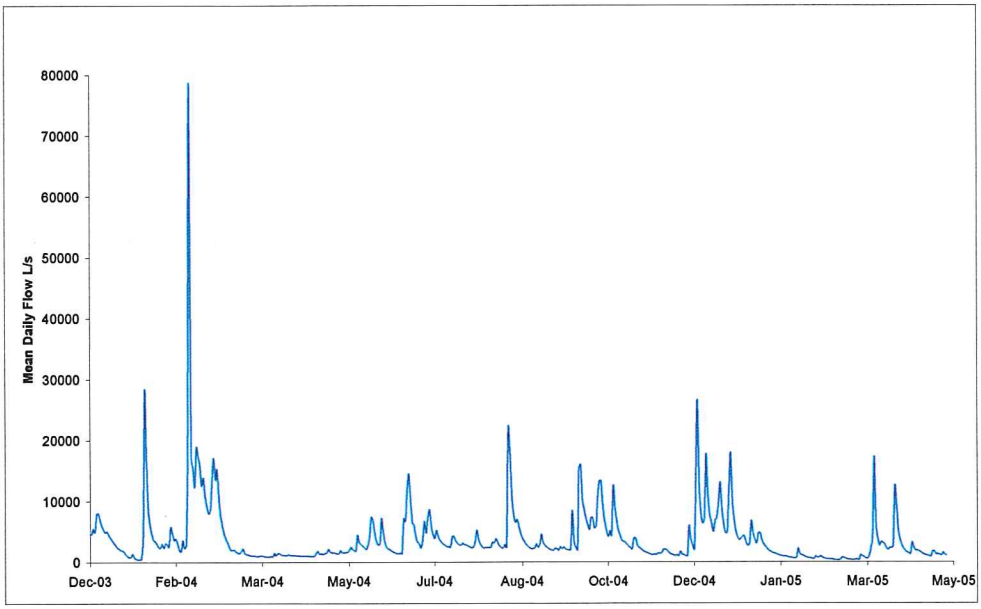


Fig. 3.1: Flow record for the Tamaki River at Stephensons gauge (December 2003 – May 2005).

Table 3.1: Flow statistics for the Tamaki River at Stephensons December 2003 – May 2005.

	Flow (L/s)
Mean	4,030
Minimum	305
Maximum	158,471
Median	2,481

The flow record and statistics indicate that the Tamaki River is subject to seasonal fluctutations and throughout the record has been subject to low (minimum daily flow 305 L/s recorded in February 2005) and high flows (maximum daily flow 158,471 L/s recorded in February 2004). The annual median flow over the period was 2,481 L/s).

Extended periods of low river flows can significantly affect water quality and instream biota. For example, low flows can cause water and temperatures to increase which may affect certain classes of temperature-sensitive aquatic organisms such as brown trout. Low flows also have the ability to cause increases in concentrations of contaminants through reduced dilution. Proliferation of periphyton may result from low river flows, decreased flow disturbance frequency, increased temperatures and increased concentrations of nutrients. Under these conditions there is the potential for periphyton to cause detrimental effects on the aquatic habitat as well as the aesthetic value of a river.

The lowest mean daily river flows (less than 1000 L/s) recorded at the Stephenson gauge have occurred during the irrigation season (January 2004 and January – March 2005). As a result the irrigation season period (1 November – 1May) has been used for the assessment of effects since

this is the critical period in which aquatic habitats can become most compromised as a result of low flows caused by dry weather and abstractions for irrigation.

3.2.2 Consented Allocation

Dannevirke township receives its water from the Tamaki River about 12.5 km upstream from the Manawatu River confluence (8,460 m^3/day). Table 3.2 shows the consented water allocation from the Tamaki River beginning with the most upstream take.

Table 3.2: Consented water allocation from the Tamaki River.

Consent Holder	Existing Consented Volume (m^3/day)	Proposed Consented Volume (m^3/day)
Tararua District Council (Dannevirke town supply)	8,460	8,460
Jones Family Trust	3,000	3,000
Dannevirke Golf Club	116	116
Hartridge Family Partnership	2,182	4,040
Hartridge Family Trust	2,635	2,020
Total Allocation	16,393	17,636

3.3 Water Quality

The Tamaki River is managed for contact recreation under the Manawatu Catchment Water Quality Regional Plan (MCWQRP). Table 3.3 shows a summary of water quality data collected from the State Highway 2 (SH2) bridge, which is just upstream of the applicant's property.

Water quality is generally good and complies with regional guidelines for ammoniacal nitrogen (NH_4-N), carbonaceous biochemical oxygen demand (cBOD) and dissolved reactive phosphorus (DRP). Elevated levels of *E. coli* were recorded on three occasions during the monitoring period. High maximum values for turbidity and concentrations of suspended solids are indicative of flow disturbance events when runoff containing high levels of suspended sediments enters the river.

Dissolved oxygen (DO) concentrations are typically high which suggests the river has a good life supporting capacity for aquatic organisms. The minimum DO concentration of 9.0 mg/L is well above the minimum concentration of 5.0 mg/L required for the adequate protection of native fish species (Dean & Richardson 1999).

Water temperatures are comparatively low when compared to other upper Manawatu tributaries (Horizons 2001). Maximum water temperature recorded in the Tamaki River at SH2 is 17.6°C and further upstream at the water supply weir the maximum temperature recorded is 21.1°C. These low maximum water temperatures suggest that temperature sensitive fish

such as brown trout are unlikely to be adversely affected by warm water temperatures.

Median black disc measurements are well above the MCWQ guideline of 1.6 m for waters managed for contact recreation. This indicates that water in the Tamaki River has high visual clarity and is suitable for contact recreation activities such as swimming.

Table 3.3: Summary of water quality in Tamaki River at State Highway 2 bridge (data supplied by Horizons).

	n	Median	Minimum	Maximum	MCWQ Guideline
Temperature (°C)	22	12.3	6.9	17.6	
pH	24	7.4	7.0	7.7	
DO (mg/L)	22	10.5	9.0	14.3	
Conductivity (mS/m)	24	8.0	6.7	10.1	
Suspended solids (g/m^3)	22	2	< 1	160	
Turbidity (NTU)	24	1.2	0.4	100	
Black disc (m)	24	2.6	0.1	7.4	> 1.6[b]
$cBOD_5$ (g/m^3)	3	< 0.5	< 0.5	0.5	< 2[a]
Nitrate (g/m^3)	24	0.51	0.04	1.8	
NH_4-N (g/m^3)	24	0.025	0.007	0.070	0.8 – 1.1[a]
DRP (g/m^3)	24	0.008	< 0.001	0.028	< 0.015[b]
E. coli (MPN/100mL)	11	115	30	380	

Note: [a] MCWQ Rule 1 General standards for water quality. NH_4-N guideline temperature dependant; [b] MCWQ Rule 2 Contact recreation water quality standards. Data record December 1999 – June 2003. n = number of records.

3.4 Biological Resources

3.4.1 River Habitat

The Tamaki River stream bed sediments in the reaches near SH2 are dominated by cobble and gravel with runs and riffles forming the channel. Some of the wider channels are exposed however the river has some shading consisting of willow trees (*Salix* spp) and exotic grasses (Fowler & Henderson 2000). In the lower reaches the river is well entrenched with cliffs and significant riparian growth. The river generally provides good habitat for aquatic organisms (Horizons 2000).

3.4.2 Benthic Invertebrates

More than ten taxa have been recorded at the SH2 site on the Tamaki River and the mean Macroinvertebrate Community Index (MCI) score was greater than 100 (Fowler & Henderson 2000), indicating that the river was moderately enriched at this location.

Koura have been recorded in the upper reaches of the Tamaki River and in the Rokaiwhana Stream, a tributary of the lower Tamaki River (Table 3.4). Koura are highly mobile and it is likely that they are suited to

the habitat in the Tamaki River near SH2 although there are no records to confirm this.

3.4.3 Fish

The lower Tamaki River offers good juvenile brown trout habitat and habitat for trout food production (Horizons 2000). The Tamaki River at SH2 has been found to have a high total density of native fish with average species diversity when compared with other tributaries of the Upper Manawatu River and the New Zealand Freshwater Fish Database (NZFDB) (Death & Joy 2000).

A search of the NZFDB found that four species of freshwater fish have been recorded in the Tamaki River catchment, three of which are native (Table 3.4). Dwarf galaxias and longfin eels were the most frequently recorded species followed by upland bullies and brown trout. The native species recorded are well suited to the habitat provided by the lower Tamaki River (Horizons 2000).

Table 3.4: Species of freshwater fish recorded in the Tamaki River Catchment[a] (source: NZFDB, May 2005).

Species	Common Name	No. of records	Native
Anguilla dieffenbachii	Longfin eel	7	Y
Galaxias divergens	Dwarf galaxias	7	Y
Gobiomorphus breviceps	Upland bully	5	Y
Paranephrops spp.	Koura	5	Y
Salmo trutta	Brown trout	3	N

Note: [a] Species were recorded in the upper Tamaki River (East Branch and West Branch) and the Rokaiwhana Stream (tributary of the lower Tamaki River).

The Upper Manawatu River catchment is valued as a trout fishery and the tributaries provide valuable trout spawning habitat. The Tamaki River has been reported to provide fair to very good trout spawning habitat despite the near impassability of the weir at the water supply intake (Kingett Mitchell 2003).

3.5 Recreational Values

Although the Tamaki River is managed for contact recreation purposes the river is not highly used for these activities and has limited recreational value. The Tamaki River has limited value as a trout fishery as the habitat is not particularly well suited to adult brown trout and is too small for fishing.

3.6 Soil Types

The applicant's property lies on several river terraces adjacent to the Tamaki River south west of Dannevirke. Two soil types have been mapped on the stony high river terrace – Takapau moderately deep silt loam and Takapau shallow silt loam (Wilde et al. 1999). Takapau soil has formed within loamy alluvium and contains variable amounts of stones overlying thick sandy gravels. Sandy gravels were generally between 30 cm and 50cm. The soil has been identified as well drained with no evidence of impermeable subsoil layers.

The lower river terraces adjacent to the Tamaki River have a range of soils from recent soils (Manawatu and Kairanga soils) to older Takapau soils. Manawatu fine sandy loam is a well drained soil which occurs in small areas with Kairanga silt loam, a poorly drained soil (Wilde et al. 1999).

4. Assessment of Effects

4.1 Introduction

Abstracting water from rivers has the potential to adversely affect water quality, ecological and recreational values of the river. This section describes the actual and potential effects of the applicant's proposed abstractions on flow, water quality, biological and recreational values.

The effect of the two proposed abstractions has been discussed in context of the cumulative effect since the two abstraction points are in close proximity to one another and will be operating concurrently.

4.2 Flow

The assessment of effects of the applicant's proposed water takes on river flows has been made using minimum daily river flows during the irrigation season (1 November – 1 May) and is shown in Fig. 4.1. Since the Stephenson gauge is located between the applicant's two intakes, the flow record at this gauge has been used to estimate the upstream and downstream flows (see Fig. 2.1). Therefore the flow upstream of the applicant's intakes has been estimated by adding the proposed abstraction from Abstraction Point 1 (46 L/s) to the flow at the Stephenson gauge. The effect of the total abstraction has been estimated by subtracting the proposed abstraction from Abstraction Point 2 (23 L/s) from the flow at the Stephenson gauge.

The effect of the proposed abstraction can be seen during low flow periods (March – May 2004 and January – March 2005) when the two flow lines appear distinct. The 2004-05 low flow period has been examined in finer detail in Fig. 4.2 since this period contained the lowest flows in the record. The 2004-05 summer could be described as a fairly typical summer in that it was neither exceptionally wet nor dry.

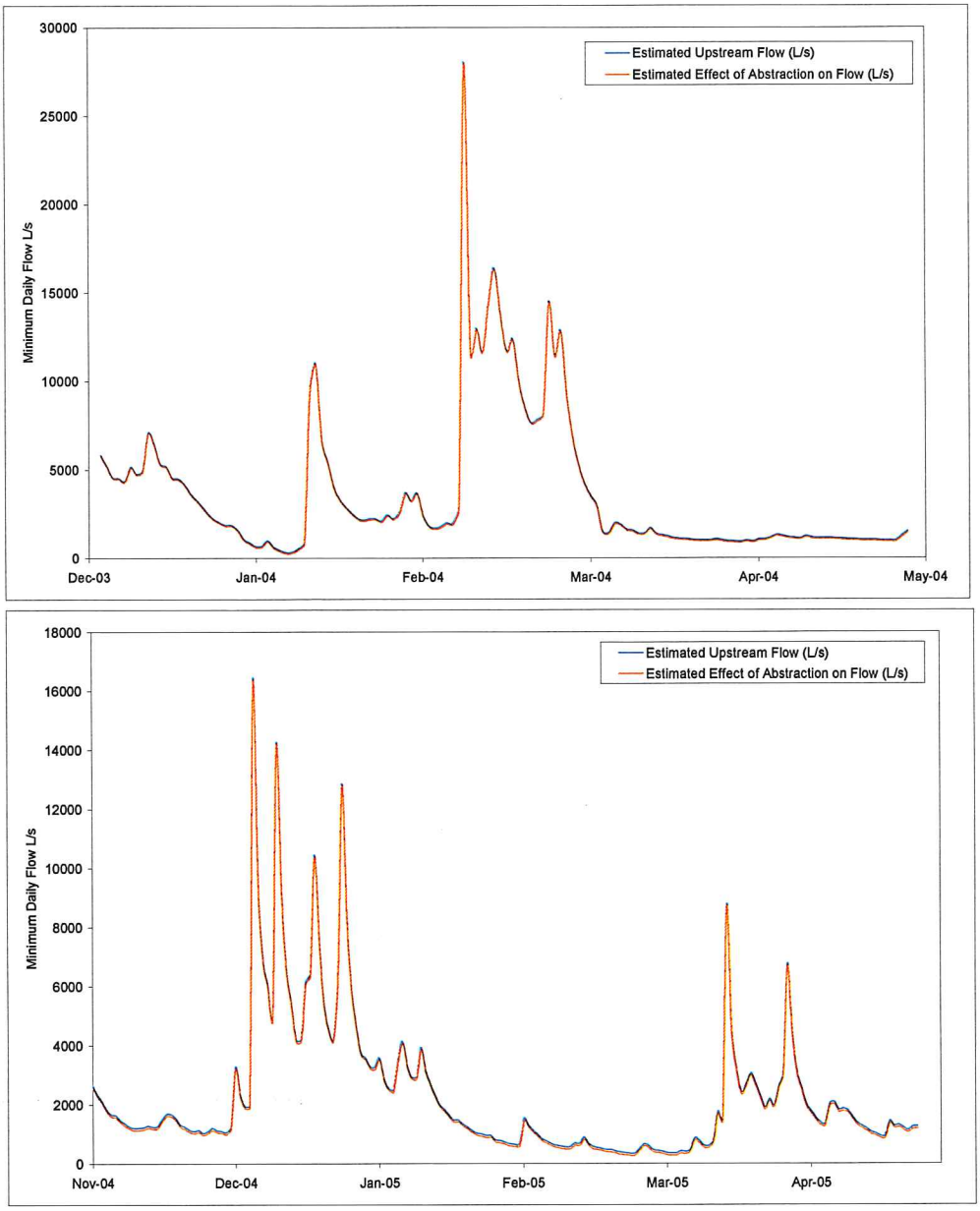


Fig. 4.1: Effect of proposed abstraction on river flows during 2003-04 and 2004-05 irrigation seasons.

Fig. 4.2 shows that as river flows decrease the effect of the proposed abstraction increases. This can be seen where the two flow lines are further apart eg. 9 February and 23 February. Given that there are currently no low-flow minima for the Tamaki River it is difficult to comment on the significance of the applicant's proposed take on river flows. The reduction in flow due to the applicant's proposed abstraction ranged from 0.2 – 18% during the two preceding irrigation seasons.

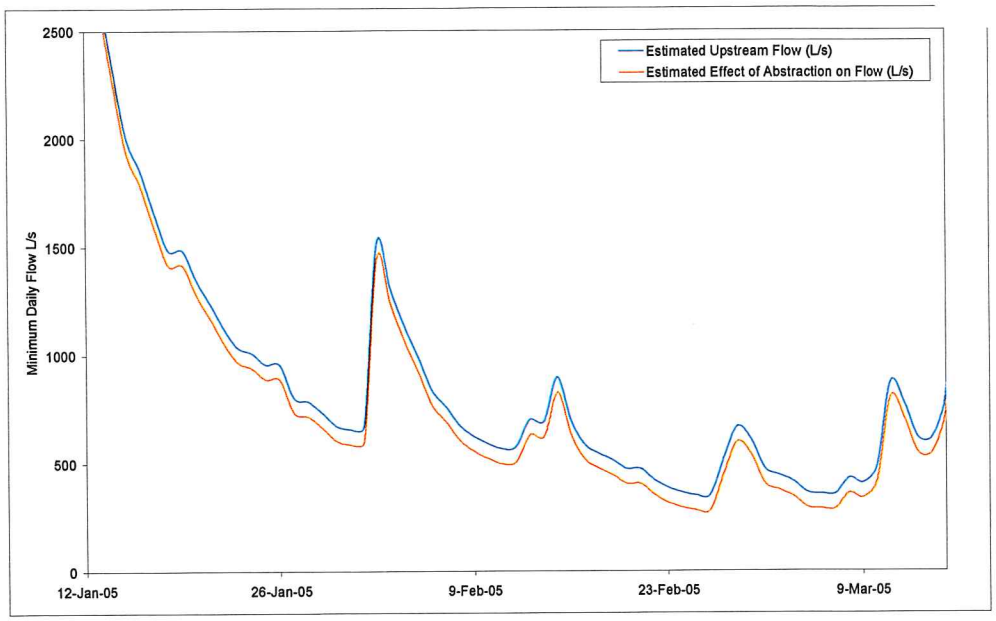


Fig 4.2: Effect of proposed abstraction during low flow period January – March 2005.

4.2.1 Effects of Water Take on Other Users

In recent years there has been an increased use of surface waters to irrigate pastoral lands in an attempt to increase productivity. There is concern that the cumulative effect of an increasing number of water abstractions from the Upper Manawatu River and its tributaries is threatening its value as a high quality trout fishery. Horizons are working towards establishing low flow minima for the Upper Manawatu River and its significant tributaries (including the Tamaki River).

There are currently no abstractions on the Tamaki River downstream of the applicant's property however concerns have been raised over the effect of the proposed abstraction on downstream users in the Manawatu River. The nearest gauge on the Manawatu River downstream of the Tamaki River confluence is the Hopelands gauge. Without detailed hydrological analysis it is difficult to assess the effect of the applicant's propose abstraction on downstream users in the Manawatu River.

4.3 Water Quality

Abstraction from rivers can have the following general effects on water quality:

- Higher water temperatures and larger fluctuations in water temperature as the thermal buffering of a stream is reduced at lower flows, potentially leading to increases in water temperature (Young et al 2004).
- Reduced dissolved oxygen as remaining stream water is increasingly concentrated in pool sections with lower re-aeration.

Lower DO concentrations at night resulting from periphyton respiration of lower overall amount of dissolved oxygen and from degradation of organic inputs. Higher daytime dissolved oxygen concentrations from periphyton photosynthesis, which must now be dissolved in a smaller volume of water. Potentially reduced dissolved oxygen concentrations due to reduced ability of oxygen to dissolve in warmer waters.

- Reduced dilution of contaminants (especially nutrients and bacteria) and capacity of streams to assimilate these contaminants entering downstream of the proposed abstraction.

Irrigation of intensively farmed land, particularly dairy farmed land can result in increased concentrations of contaminants, particularly nitrate-nitrogen and faecal coliform bacteria entering waterways in runoff. Careful irrigation management should prevent any increases in contaminant concentrations in the Tamaki River.

The Tamaki River has been shown to have some of the lowest summer water temperatures in the upper Manawatu (Horizons 2000). Temperatures were predicted to increase to 19°C (mean daily temperature) at annual minimum flows. This translates to daily maxima in the low twenties which have been observed in late January (Horizons 2000). These temperatures are not likely to threaten the survival of aquatic organisms.

Brown trout have limited tolerance of temperature fluctuations and temperatures above 23°C have the potential to limit trout populations (Jobling 1981). The comparatively low water temperatures in the Tamaki River are in the optimal range for brown trout growth.

The potential effect of the proposed abstraction on water quality is likely to be less than minor.

4.4 Biological Resources

4.4.1 River Habitat

Low flows can increase nuisance algal growths and thus make habitat unsuitable for aquatic organisms. Nuisance algal growths can be stimulated by increased water temperature and slow velocity water. Diminished channel width in low flow conditions also reduces the amount of habitat available by reducing the area of food-producing habitat.

Effects on river habitat at varying flows has been assessed in the Tamaki River using the Instream Flow Incremental Method (IFIM) (Horizons 2000) and are briefly discussed in the following sections.

4.4.2 Benthic Invertebrates

Analysis of the habitat suitability graphs in Horizons 2000 (Appendix A) provides an indication of the amount of habitat reduction due to the proposed abstraction. The graphs show that at the estimated annual low flow (374 L/s) in the Tamaki River upstream of the applicant's proposed abstraction the reduction in habitat caused by the proposed abstraction is approximately 4% of weighted useable area for *Deleatidium* and *Pycnocentrodes* and 2% for *Aoteapsyche*. This amount of habitat reduction is not considered significant.

4.4.3 Fish

The IFIM study (Horizons 2000) showed that the Tamaki River at SH2 was not particularly well suited to adult brown trout at flows less than 1000 L/s (see Appendix A). Therefore the effect on adult brown trout habitat caused by the proposed abstraction is minimal since the river is not suitable adult brown trout habitat during low flow periods. The effect on juvenile brown trout habitat is likely to be in the order of 1% at annual low flows. The proposed abstraction is not expected to effect the quality of the spawning habitat as spawning generally occurs outside of the irrigation season.

Native fish species habitat has the potential to be most affected by proposed abstraction of water at low flows. Reduction of flow from 374 L/s (estimated low flow upstream of proposed abstraction) to 305 L/s (low flow at Stephenson gauge) has the potential to cause a 5% reduction in the amount of suitable habitat for Dwarf galaxias. Longfin eel and Upland bully habitat is predicted to decrease by 3% and 2% respectively.

The screens that are fitted to the takes prevent entrainment of juvenile or species with poor swimming abilities and will minimise effects on juvenile trout and native species.

4.4.4 Recreational Values

The Tamaki River has limited use as a recreational area. The small level of effect on river flows and limited recreational values of the Tamaki River mean that it is not expected to be adversely affected by the proposed abstraction.

5. Irrigation Efficiency

Due to pressures on surface water resources in the upper Manawatu it is important to consider irrigation efficiency to ensure that the water abstracted is used in an efficient and sustainable manner. Efficient irrigation assists in protecting the value of the resource by minimising the volume of water abstracted. This in turn helps ensure that the needs of downstream users are not compromised.

Table 5.1 shows the efficiency of the irrigation system which has been assessed by factoring in the area of land irrigated, soil type, soil water holding capacity and water application rate. Details of the calculations are presented in Appendix B. Instantaneous application rates are typically close to, but below, the soil water holding capacity. Given that application rates do not exceed the water holding capacity and the applicant assesses the need for irrigation using soil moisture monitoring the use of water is considered to be efficient.

Table 5.1: Irrigation efficiency on Highgate Farm.

	App. 102749	App. 102750
Design return period (DRP)	14 days	14 days
Maximum volume per DRP	56,560 m^3	28,280 m^3
Water holding capacity [a]	50 mm	50 mm
Net[b] average application rate	3.0 mm/day	3.5 mm/day
Net[b] instantaneous application rate	41.4 mm/DRP	48.4 mm/DRP

Note: [a] From Wilde et al. 1999. [b] Given irrigation efficiency of 80%.

6. Consideration of Alternatives

Abstraction of groundwater could be considered as an alternative to surface water abstraction. However, east of the Ruahine ranges aquifers are restricted to within 30 m of the surface and almost all bores tap unconsolidated gravel and sand resting on mudstone. This mudstone transmits little water and is therefore of little value as a groundwater resource. Little is known about groundwater recharge in the area but it is likely that groundwater is recharged via rainfall infiltration. Efforts to obtain deep groundwater in the Tararua district have been unsuccessful (Bekesi 2001). Abstraction of groundwater is therefore not considered to be a viable alternative.

Construction of a reservoir to store water during wet winter months to be irrigated during summer months could be considered as an alternative. Water could potentially be abstracted from the Tamaki River outside of the irrigation season when the resource is under less pressure. However the main opposition to this alternative is land availability and cost of construction. Further investigation into the feasibility and viability of this alternative would need to be explored.

The most viable and economically sustainable source of water for the applicant is the Tamaki River.

7. Consultation

7.1 Horizons

As a result of discussions with Horizons (Jeff Watson and Jon Roygard) the applicant was advised to engage a consultant to assist in the preparation of this report. The key inclusions for the report suggested at this meeting were:

- Justification for the increased water requirements.
- A detailed analysis of the takes and the surrounding environment eg. The abstraction site, soil type etc.

The main purpose of this report has been to fulfil this request.

7.2 Previous Submissions

Submissions in opposition have been lodged by Fish and Game, Tararua District Council and Jones Family Trust. Richmond Oringi provided conditional support for the applications subject to an assessment of effects and circulation of draft consent conditions. The primary concerns of the submitters were in relation to the increased volume of water compared with the applicant's previous consents and the subsequent potential effects on downstream users. Concern was also raised at the lack of information relating to the potential effects on instream habitat and biota. This report has addressed the concerns raised in previous submissions.

8. Conclusion

It is considered that the potential cumulative adverse effects of the combined take of 69 L/s from the Tamaki River on water quality, habitat quality and quantity and biological resources will be minor. Irrigation management practices and assessment of predominant soil types on the applicant's property indicate that water is used in an efficient manner. Recommended consent conditions are provided in Section 9 of this report.

9. Recommended Consent Conditions

The term of the consent is 15 years from the date of granting of the consent.

1. The maximum daily abstraction of surface water from the Tamaki River on the property legally described as XXX at map reference NZMS 260 U23: 710036 (Application 102749) shall not exceed 4,040 m^3/day and at map reference NZMS 260 U23: 708019 (Application 102750) shall not exceed 2,020 m^3/day.
2. Subject to Condition 1 the maximum rate of abstraction shall not exceed 46 L/s (Application 102749) and 23 L/s (Application 102750).
3. Notwithstanding Conditions 1 and 2 the maximum total rate of abstraction shall not exceed the following rates:
    i. 6,060 m^3/day at 69 L/s when flow in the Manawatu River measured at the Regional Council's flow gauging station at Hopelands exceeds or is equal to 3.4 cubic metres per second (3.4 m^3/s).
    ii. 3,030 m3/day at 34.5 L/s when flow in the Manawatu River measured at the Regional Council's flow gauging station at Hopelands is below 3.4 cubic metres per second (3.4 m^3/s).
    iii. Abstraction shall cease completely when flow in the Manawatu River measured at the Regional Council's flow gauging station at Hopelands is below 2.5 cubic metres per second (2.5 m^3/s).
4. The Permit Holder shall maintain, in fully operational condition, flow meters and a GPRS data logger/telemetry unit on each intake compatible with the Manawatu-Wanganui Regional Council's Telemetry System on the water abstraction line traceably calibrated to +/- 10% or better, that is capable of providing daily water use as well as a pulse counter output. The pulse counter output may be monitored by the Manawatu-Wanganui Regional Council at regular intervals to ensure compliance with Water Permit conditions and as part of a programme to enable monitoring of total catchment water use.
5. The Permit Holder shall keep hourly records of the rates and volumes of water abstracted from the Tamaki River under the authorisation of this Permit using the flow meters and GPRS data logger/telemetry unit as required by Condition 4. The records shall be supplied automatically through the telemetric system linked to the Manawatu-Wanganui Regional Council.
6. The Permit Holder shall provide the Manawatu-Wanganui Regional Council's staff or its agents with reasonable access to enable monitoring of water use.
7. The Permit Holder shall ensure that the intake pipe is screened prior to pumping with a minimum screen size of 5 mm to prevent damage to trout and native fish as a result of the proposed abstraction.

10. References

Bekesi, G. 2001: Manawatu-Wanganui. In: Rosen, M. R. & White, P. A. eds. Groundwaters of New Zealand, pp387-396. New Zealand Hydrological Society, Wellington.

Dean, T. L.; Richardson, J. 1999: Responses of seven species of native freshwater fish and a shrimp to low levels of dissolved oxygen. New Zealand Journal of Marine and Freshwater Research, 1999 33: 99-106.

Death, R.; Joy, M. 2000: Freshwater fish in tributaries of the south eastern upper Manawatu River. Report prepared for Horizons.mw by Massey University. May 2000.

Fowler, R. T.; Henderson, I. M. 2000: Survey of benthic invertebrate communities in six tributaries of the Manawatu River: a baseline monitoring survey of biotic integrity. Massey University. May 2000.

Horizons 1999: An instream flow assessment for the Upper Manawatu River. Horizons.mw. Report No. 99/EXT/378. July 1999.

Horizons 2000: An instream flow assessment for the Upper Manawatu River tributaries. Horizons.mw. Report No. 20/EXT/423. June 2000.

Horizons 2001: Water temperatures in your region's rivers and streams. Horizons.mw. Report No. 2001/INT/302. July 2001.

Jobling, M. 1981: Temperature tolerance and the final preferendum - rapid methods for the assessment of optimum growth temperatures. Journal of Fish Biology 19: 439-455.

Kingett Mitchell 2003: Review of Horizon.mw's in-stream flow assessment studies in the Upper Manawatu River catchment. Report prepared on behalf of Ruahine River Care Group. November 2003.

Manawatu-Wanganui Regional Council 1998: Manawatu catchment water quality plan. Manawatu-Wanganui Regional Council. Report No. 98/EXT/331. September 1998.

Wilde, H. et al. 1999: Dannevirke land-based sewage effluent disposal; Report on the proposed disposal scheme. Report prepared by Manaaki Whenua Landcare Research for Good Earth Matters, Palmerston North. Report No. LC9899/113. June 1999.

Young, R.; Smart, G.; Harding, J. 2004: Impacts of hydro-dams, irrigation schemes and river control works. *In*: Freshwaters of New Zealand. *eds*. Harding, J.; Mosley, P.; Pearson, C.; Sorrell, B. New Zealand Hydrological Society Inc. and New Zealand Limnological Society Inc., Christchurch, New Zealand.

Appendices

Appendix A

Habitat suitability in the Tamaki River at State Highway 2. (Horizons 2000)

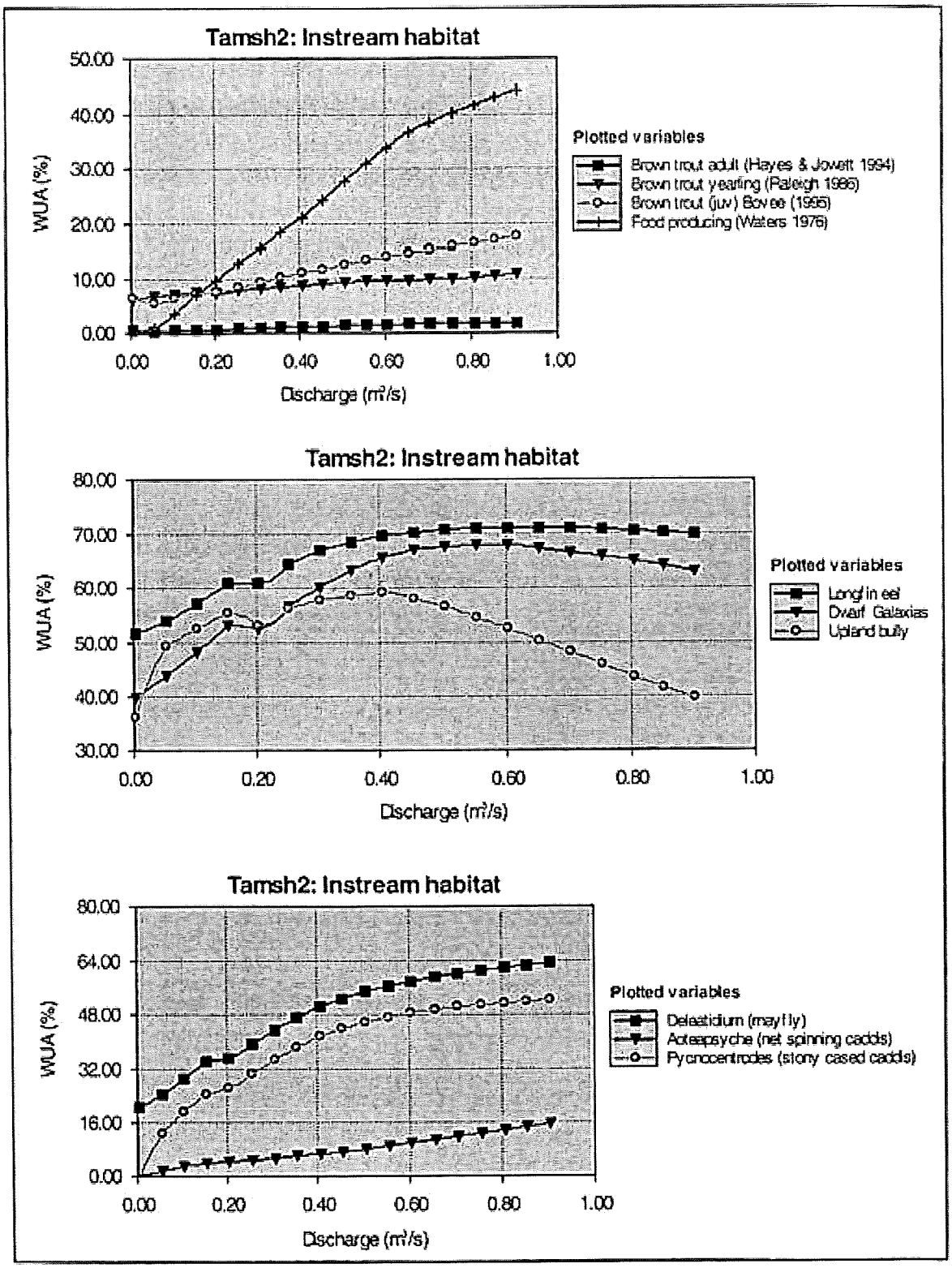


Figure 37: **Habitat suitability in the Tamaki River at SH2 for various species at varying flows.**

Appendix B

Irrigation Efficiency Calculations

Efficiency Calculation for Irrigation of the Hartridge property
Application 102750

Irrigation Details:

Proposed Take(s) (l/s): (includes any combined takes)	23
Irrigation area (ha):	46
Hours/day irrigating:	24
Return period (RP) (days):	14
Days Irrigating in RP:	14

Working:

Conversions:

m3/hr:	82.8	(= 3.6 x l/s)
m3/day:	1987.2	(= m3/hr x hrs taking)
m3/RP:	27820.8	(= m3/day x days taking)
Mean pump rate:	23	(= Max l/s * no. hrs/24 * days irr./DRP)

	Gross:	Net*:
Average application rate (mm/day): (= l/s/ha x hrs/24hrs x days irrigating/DRP x 8.64)	4.3	3.5
Instantaneous application rate (mm/DRP): (= Av. Daily app Rate x DRP)	60.5	48.4

*Given Irrigation efficiency of 80%

Predominant Soil Type: **Takapau moderately deep silt loam and shallow silt loam with stones**

Average Water Holding Capacity (AWHC) of soil (mm): 50

Efficiency Calculation for Irrigation of the Hartridge property
Application 102749

Irrigation Details:

Proposed Take(s) (l/s): (includes any combined takes)	46
Irrigation area (ha):	107.5
Hours/day irrigating:	24
Return period (RP) (days):	14
Days Irrigating in RP:	14

Working:

Conversions:		
m3/hr:	165.6	(= 3.6 x l/s)
m3/day:	3974.4	(= m3/hr x hrs taking)
m3/RP:	55641.6	(= m3/day x days taking)
Mean pump rate:	46	(= Max l/s * no. hrs/24 * days irr./DRP)

	Gross:	Net*:
Average application rate (mm/day): (= l/s/ha x hrs/24hrs x days irrigating/DRP x 8.64)	3.7	3.0
Instantaneous application rate (mm/DRP): (= Av. Daily app Rate x DRP)	51.8	41.4

*Given Irrigation efficiency of 80%

Predominant Soil Type: **Takapau moderately deep silt loam and shallow silt loam with stones**

Average Water Holding Capacity (AWHC) of soil (mm): 50