

Technical Report

Investigations and
Monitoring Group

**A desktop assessment of
the effects of groundwater
abstraction on surface
water flow in the Hurunui
River catchment**

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Report No. U02/70

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Executive Summary

A desktop investigation provides an estimation of the magnitude of stream depletion in the Hurunui River catchment due to groundwater abstraction.

Various assumptions were necessary and data inaccuracies are acknowledged. However, despite these deficiencies, this assessment provides an indication of:

- consented wells that are potentially hydraulically connected to a river or stream;
- the calculated relative magnitude of the stream depletion effect of the wells identified; and
- the possible magnitude of the combined effect of all these hydraulically connected wells on the mainstem Hurunui River and its tributaries.

For this assessment the catchment was divided into four areas according to the main groupings of wells. Stream depletion effects were calculated for each area separately then combined to provide overall summaries relative to existing low flow conditions and management policies (NRRP 2001).

Given the uncertainties in making this assessment, the calculated stream depletion factor and stream depletion effect values should be used as a ranking tool to determine the possible magnitude of the effect of groundwater abstractions on surface flows. The results of this assessment indicate that stream depletion has the greatest impact on the tributaries rather than the mainstem Hurunui River itself. Of the main tributaries, the Waitohi River and the Pahau River are the most effected by groundwater abstraction. The results also show that 91% of the total estimated stream depletion effect can be managed under the draft NRRP by targeting abstractions with a stream depletion factor of less than 100 days and a stream depletion effect of greater than 5 l/s after 30 days pumping. Under this management regime, 44% (14) of the consents considered in this assessment fall into this category.

Table of Contents

Executive Summary	1
1 Introduction	5
2 Background	5
3 Assessment of stream depletion effects due to groundwater abstractions	5
3.1 Aquifer Parameters and Pumping Details	7
3.1.1 Pumping Rate.....	7
3.1.2 Duration of Pumping.....	7
3.1.3 Distance between Well and Stream/River.....	7
3.1.4 Aquifer Parameters.....	7
3.2 Stream Depletion Assessment.....	12
4 Results/Discussion	12
5 Conclusions	15
6 References	16
Appendix A Well/consent data, calculated stream depletion effect and stream depletion factor for each well considered to be in hydraulic connection with a stream/river	17

List of Figures

Figure 2.1	Hurunui catchment wells and groundwater taken consents	6
Figure 3.1	MAP 1: Culverden well/consent locations.....	8
Figure 3.2	MAP 2: Hawarden – Hurunui well/consent locations.....	9
Figure 3.3	MAP 3: Waikari Valley well/consent locations	10
Figure 3.4	MAP 4: Lower Hurunui River well/consent locaitons	11
Figure 4.1	Hurunui Catchment low flow restrictions.....	13

List of Tables

Table 4.1	The effect of stream depletion relative to low flow restrictions on the Hurunui River and tributaries.....	14
Table 4.2	Combined stream depletion effect due to groundwater abstractions.	15

1 Introduction

The purpose of this report is to provide a desktop assessment of the approximate magnitude of stream depletion in the Hurunui River catchment due to groundwater abstractions. Specifically, this assessment provides an indication of:

- consented wells that are potentially hydraulically connected to a river or stream;
- the calculated relative magnitude of the stream depletion effect of the wells identified;
- the possible magnitude of the combined effect of all these hydraulically connected wells on the mainstem Hurunui River and its tributaries.

For this assessment the catchment was divided into four areas according to the main groupings of wells. Stream depletion effects were calculated for each area separately then combined to provide overall summaries relative to existing low flow conditions and management policies (NRRP 2001).

2 Background

All wells considered in this assessment abstract groundwater from alluvial gravels (gravel, sand & silt) that were deposited by the Hurunui River and its tributaries during successive glacial/interglacial periods. A more detailed description of the geology and groundwater, especially relating to the Culverden basin, may be found in Brown (2001) and Weeber & Talbot (1984). The majority of wells in the Hurunui catchment are located in the Culverden basin that extends from Waikari to Waiau. The wells are concentrated around Culverden and Hawarden. Culverden basin north of the Hurunui River is serviced by the Waiau Irrigation Scheme and the effects of this scheme on groundwater recharge are described by Close (1985) and Tonkin & Taylor (1985). Other wells are located along the Waikari Valley and the lower Hurunui River. As a result of the well distribution, four separate areas were recognised (Figure 2.1). The relevant details obtained from the Wells Database and Consents database for each well used in this assessment are listed for each area in Appendix A.

3 Assessment of stream depletion effects due to groundwater abstractions

This assessment follows a similar format to that described in Aitchison-Earl (2001). Some wells were excluded from this assessment, including wells greater than 1500m from the nearest stream, proposed wells with no pumping information, and deeper wells considered not to be hydraulically connected to surface flow because of the presence of confining layers indicated by the driller's lithological log. Two wells (N33/0256 & N33/0302) were excluded from the Culverden map because the nearest stream flows northwards to the Waiau catchment.

Figure 2.1 Hurunui catchment wells and groundwater taken consents

3.1 Aquifer Parameters and Pumping Details

The calculated stream depletion resulting from the pumping of a well depends on:

- the pumping rate;
- the pumping duration;
- the distance between the well and stream; and
- the hydraulic properties of the aquifer (ie transmissivity, storativity) and the stream bed conductance.

The above parameters, apart from storativity and stream bed conductance, were determined using ECan's Consents and Wells databases. Data inaccuracies are acknowledged, especially with regard to well location, pumping rates and driller's specific capacity tests leading to some uncertainty in the calculated stream depletion effects.

3.1.1 Pumping Rate

The pumping rate was converted to an average daily rate (l/s) using the consent allocation which specifies a volume and a pumping return period (e.g. 33696m³ per 12 days equates to 32.5 l/s).

3.1.2 Duration of Pumping

A common time period is essential to allow the stream depletion effect of each groundwater take to be ranked relative to each other. To maintain consistency with other assessments (Waimakariri, Opihi, Temuka, Rangitata), ECan's Consent Section and the draft Natural Resources Regional Plan (NRRP 2001), the period of 30 days was used to calculate stream depletion effects on the streams/ivers in the Hurunui catchment. The stream depletion effect is considered to be well developed in most cases after this 30 day period.

3.1.3 Distance between Well and Stream/River

The positions of wells and consents were plotted on 1:50 000 NZMS 260 Infomaps using GIS (Figures 3.1, 3.2, 3.3 & 3.4). Consents considered for this assessment are shown on these figures with their well number labels. The distance to the nearest stream/river shown on the Infomap was then estimated. The Consents and Wells databases both contain grid references and some discrepancies were discovered when the well and its consent plotted in different positions. The nearest stream marked on the Infomap was assumed to be flowing for this preliminary assessment. However, further investigation is required to verify this assumption, as the stream depletion effect on a more distant stream would be less than calculated here.

3.1.4 Aquifer Parameters

For the Culverden (Figure 3.1), Hawarden (Figure 3.2) and Lower Hurunui (Figure 3.4) areas, transmissivity values were estimated using the geometric mean of specific capacities converted to a transmissivity value following the method of Bal (1996). No specific capacity values are held in the Wells Database for the Waikari Valley (Figure 3.4) and a conservative transmissivity value was estimated based on Waipara data. The transmissivity values for the four areas are listed in Appendix A. A standard unconfined storativity value of 0.1 was assumed for the entire catchment. The degree of streambed clogging will have a significant effect on streambed conductance but because there is no readily available data to assess its impact, this parameter was not considered.

Figure 3.1 MAP 1: Culverden well/consent locations

Figure 3.2 MAP 2: Hawarden – Hurunui well/consent locations

Figure 3.3 **MAP 3: Waikari Valley well/consent locations**

Figure 3.4 MAP 4: Lower Hurunui River well/consent locaitons

3.2 Stream Depletion Assessment

An estimation of the effects of stream depletion using the values determined for the above parameters in equations derived by Jenkins (1977) was undertaken. The calculations provide an estimate of the degree of connection between groundwater and the stream/river (Stream Depletion Factor) and an estimate of the stream depletion rate after 30 days pumping. The calculations for each well are listed in Appendix A. The stream depletion factor (sdf) has units of days and a well with a low value indicates that pumping from the well will rapidly induce depletion from a stream. Conversely, once pumping ceases, recovery of the stream will also be rapid. A well with a high stream depletion factor will deplete a stream gradually. The maximum depletion effect may occur some time after pumping has ceased followed by a very slow recovery of stream flow.

In many situations the Jenkins method is known to overestimate the stream depletion rate due to assumptions relating to the physical properties of the aquifer and well construction not being met. The Hunt (1999) equation addresses some of these deficiencies, but for the purposes of this assessment has not been used due to an absence of streambed conductance data in this catchment.

4 Results/Discussion

Low flow restrictions exist for the Hurunui River, main tributaries and some streams/drains to protect instream values (Figure 4.1). To provide a context for the estimated stream depletion rate, the stream depletion rate for each river/stream is expressed as a percentage of the low flow related to that river/stream (Table 4.1). Of the main tributaries, the Waitohi River (35%) and the Pahau River (28%) are the most affected by groundwater abstraction. Only one groundwater consent is above the Pahau River low flow site and stream depletion effects lower down the river may be offset by gains to the river from the Waiau Irrigation Scheme. It is uncertain whether St Leonards Drain or any other nearby surface flows are affected by well N33/0252 on account of its depth (36m) and water level (8.2m bgl when drilled).

In the context of low flow restriction on the Hurunui River, the total estimated stream depletion of 338 l/s is 3.5% of the low flow of 10m³/s at Mandamus. All groundwater abstractions occur below this site. Direct stream depletion of the mainstem Hurunui River is small, being 0.7% of the low flow at Mandamus (Table 4.1). The results of this assessment indicate that the stream depletion has the greatest impact on tributaries rather than the mainstem Hurunui River itself.

The Draft Canterbury Natural Resources Regional Plan (NRRP 2001) has a policy (WQN19) designed to manage the effects of stream depletion. Section (a),(ii) of this policy states that:

“a bore or borefield with a stream depletion factor of no more than 100 days and a stream depletion effect of 5 litres per second or greater resulting from a 30 day pumping period, will be managed as having a moderate effect. For allocation purposes, the stream depletion effect shall be determined as the effect after 150 days of pumping. This amount shall be counted as part of any applicable allocation regime. The take shall be subject to any minimum flow regime.”

Table 4.2 summarises the total stream depletion effect due to groundwater takes greater than 5 l/s and having a stream depletion factor of less than 100 days. Under this management regime, 44% (14) of the consents considered in this assessment would be subject to controls and this would manage 91% of the stream depletion effect.

Figure 4.1 Hurunui Catchment low flow restrictions

LOCALITY	Number of Consents	Abstraction rate after 30 days pumping (l/s)	Calculated stream depletion (l/s)	Low flow restriction (l/s)	Stream depletion as % of low flow	Low flow site	Comment
MAP 1: Culverden							Groundwater/surface water affected by Waiau Irrigation Scheme
Unnamed stream/St Leonard Drain	1	55	28	70	40	St Leonard Drain at Ra Kanohi property	1 well - may not be hydraulically connected to surface flow
Pahau River	10	149.8	112.7	400	28.2	Pahau River at Top Pahau Road	Only 1 well above low flow site
Subtotal	11	204.8	140.7				
MAP 2: Hawarden - Hurunui River							
Washpen Stream	2	14	2.2	50	4.4	Washpen Stream at Bentleys Road	
Waitohi River	9	137.9	122.8	350	35.1	Waitohi River at Hurunui confluence	
Unnamed tributary to Waitohi River	1	2	2	15	13.3	Unnamed tributary	
Subtotal	12	153.9	127.0				
MAP 3: Waikari Valley							
Waikari Valley	2	7.3	7.1	50	14.2	Waikari River at Scargill	
MAP 4: Lower Hurunui River							
Lower Hurunui River	5	46.3	41.5	10 000 - 17 000	0.4	Hurunui at Mandamus	All groundwater abstractions below low flow site
Hurunui River (from Map 2)	2	40.5	32.5	10 000 - 17 000	0.3	Hurunui at Mandamus	All groundwater abstractions below low flow site
Subtotal	7	86.8	74.0		0.7		
All groundwater abstractions	32	452.8	348.8	10 000 - 17 000	3.5	Hurunui at Mandamus	All groundwater abstractions below low flow site

Table 4.1 The effect of stream depletion relative to low flow restrictions on the Hurunui River and tributaries.

LOCALITY	Estimated stream depletion effect (l/s)	Total effect due to takes > 5 l/s and <100 days SDF (l/s)	% of effect captured if controls only on > 5 l/s and <100 days SDF	% consents in category
Map 1 (Figure 3.1): Culverden	140.7	135.1	96	55
Map 2 (Figure 3.2): Hawarden - Hurunui River	127.0	117.0	92	42
Map 3 (Figure 3.3): Waikari Valley	7.1	6.2	87	50
Map 4 (Figure 3.4): Lower Hurunui River + 2 consents related to the Hurunui River from Map 2 (CRC021195)	74.0	60.7	82	28
TOTAL	348.8	319.0	91	44

Table 4.2 Combined stream depletion effect due to groundwater abstractions.

5 Conclusions

A preliminary desktop assessment of the estimated stream depletion effects resulting from groundwater abstractions on the Hurunui River and tributaries has been undertaken. Given the uncertainties in making this assessment, the calculated stream depletion factor and stream depletion effect values should be used as a ranking tool to determine the possible magnitude of the effect of groundwater abstractions on surface flows. The results show that 91% of the total estimated stream depletion effect of 349 l/s can be managed by targeting abstractions with a stream depletion factor of less than 100 days and a stream depletion effect of greater than 5 l/s after 30 days pumping, as provided for under the draft NRRP.

6 References

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Appendix A Well/consent data, calculated stream depletion effect and stream depletion factor for each well considered to be in hydraulic connection with a stream/river

MAP 1 (Figure 3.1): CULVERDEN		GRID_REFERENCE (Consents)	GRID_REFERENCE (WELLS DATABASE)	LOCALITY	WELL DEPTH (m)	Strata Data	DISTANCE to nearest river/stream (m)	NEAREST RIVER/STREAM	COMMENT	Specific Capacity (l/s/m)	Estimated Transmissivity (m ² /day)	MAX_RATE (l/s)	MAX_QUANTITY (cubic metres)	USAGE_DAYS	Average Pumping Rate (l/s)	Stream Depletion after 30 days pumping (l/s)	Stream Depletion (l/s) (Consents Database)	Stream Depletion Factor (Days)
CRC930187	M33/0208	M33:874-276	M33:874-276	Balmoral	36	Y	1220	Pahau River		0.349		3	108	1	1.3			
CRC940461	M33/0209	M33:8667-2454	M33:687-245	Balmoral	47	Y	700	Nth branch Dry Stream	Stream dry most of time???	1.583		2	1210	7	2.0			
CRC920408	M33/0267	M33:854-280	M33:854-280	Culverden		N	120	Pahau River	Gallery		614	11	950	1	11.0	9.3		2.3
CRC900325	N33/0099	N33:982-230	N33:9832-2295	Culverden	5.3	N	500	Pahau River	Consent Grid ref??		614	2	43	1	0.5	0.2		40.7
CRC002020	N33/0103	N33:9654-2410	N33:96544-24107	Culverden	11.9	Y	250	Cold Stream (to Pahau River)		15.921	614	28	900	1	10.4	7.1	8.4	10.2
CRC012854	N33/0115	N33:960-240	N33:960-240	Culverden	17	N	600	Pahau River	660m to Cold Stream (SD=4.2, SDF=70.9)		614	15	11664	9	15.0	4.8	7	58.6
CRC900191	N33/0189	N33:948-258	N33:9425-2595	Culverden	8	N	50	"stream" to Pahau River	Consent Grid ref?? Well + pond + drainage. Stream dry??. 300m to Pahau River (SD=29.2, SDF=14.7)		614	67	86292	19	52.6	49.1		0.4
CRC900459	N33/0192	N33:951-224	N33:9512-2238	Culverden	15.2	N	840	Dry Steam (to Hurunui River)	1075m to Pahau River		614	15	15	1	0.2	0		114.9
CRC900772	N33/0193	N33:993-282	N33:9954-2803	Culverden	46.5	Y	NA					0	28	1	0.3			
CRC930388	N33/0199	N33:037-285	N33:037-285	Culverden	30	N	NA					5	72	1	0.8			
CRC940317	N33/0202	N33:9647-2641	N33:9647-2641	Culverden	9.2	N	400	"stream" headwater to Pahau River			614	1	442	7	0.7	0.4		26.1
CRC940758B	N33/0203	N33:9410-2600	N33:9410-2600	Culverden	63.1	Y	See CRC940758A			0.997		19	10500	14	8.7			
CRC940758A	N33/0203	N33:9410-2600	N33:9410-2600	Culverden	63.1	Y	340 10	Pahau River "stream" to Pahau R.	Consent only when irrig. restrictions on Amuri Irrig. Co from Waiau River. Stream dry??.	0.997		22	12100	7	20.0			
CRC950644	N33/0210	N33:999-300	N33:999-300	Culverden	35	Y	NA	No nearby natural stream		1.152		2	48	1	0.6			
CRC951170*	N33/0215	N33:929-270	N33:9290-2700	Culverden	12	Y	250	Pahau River		32.345	614	50	3960	1	45.8	31.2		10.2
CRC970103	N33/0244	N33:9545-2578	N33:9545-2587	Culverden	17.8	Y	160	"stream" headwater	280m to Coldstream headwater (SD=0.2, SDF=12.8), 1300m to Pahau R. (SD=0, SDF=275). Streams dry or receive drainage from irrig. Scheme??	0.326	614	2	30	1	0.3	0.2		4.2
CRC971731*	N33/0252	N33:0443-2360	N33:0443-2360	Culverden	36.1	N	400	Unnamed stream draining Lowry Peaks. (consider St Leonard Drain?)	Stream dry most of time???. Well may be excluded if water level significantly different from stream/drain.	0.296	614	60	4752	1	55.0	28		26.1
CRC971872*	N33/0258	N33:0498-2690	N33:0500-2690	Culverden	4	N	NA	Stream/drain flow to Waiau catchment				40	3456	1	40.0			
CRC011132	N33/0301	N33:9228-2678	N33:9228-2678	Culverden	3.74	Y	170	Pahau River	10m to water race(?) from Pahau River (SD=13.1, SDF=0)	5.227	614	16	11520	10	13.3	10.4	9.74	4.7
CRC010969	N33/0302	N33:0450-2680	N33:0465-2621	Culverden	6.2	N	NA	Stream/drain flow to Waiau Catchment				25	21600	10	25.0		3.89	
Subtotal															204.8	140.7		

A desktop assessment of the effects of groundwater abstraction on surface water flow in the Hurunui River catchment

MAP 2 (Figure 3.2): HAWARDEN - HURUNUI RIVER																		
CONSENT_NO	WELL_NO	GRID_REFERENCE (Consents)	GRID_REFERENCE (WELLS DATABASE)	LOCALITY	WELL DEPTH (m)	Strata Data	DISTANCE to nearest river/stream (m)	NEAREST RIVER/STREAM	COMMENT	Specific Capacity (l/s/m)	Estimated Transmissivity (m ² /day)	MAX_RATE (l/s)	MAX_QUANTITY (cubic metres)	USAGE_DAYS	Average Pumping Rate (l/s)	Stream Depletion after 30 days pumping (l/s)	Stream Depletion (l/s) (Consents Database)	Stream Depletion Factor (Days)
CRC900476	M33/0175	M33:824-145	M33:824-145	Medbury	7	N	250	Waitohi River			1365	30	54978	28	22.7	17.8		4.6
CRC916780A	M33/0192	M33:775-142	M33:775-142	Horsley Down	4.5	N	1500	Washpen Stream	Excavated pit. 1750m to Waitohi River (SD=0.5, SDF=224)		1365	30	864	1	10.0	1		164.8
CRC916780B	M33/0193	M33:783-158	M33:783-158	Horsley Down	0	N	10	Waitohi River	Excavated pit		1365	30	1728	1	20.0	19.8		0
CRC916104	M33/0194	M33:800-148	M33:7998-1475	Horsley Down	7	N	500	Waitohi River			1365	3	260	8	0.4	0.2		18.3
CRC951257	M33/0203	M33:8368-1458	M33:8368-1458	Medbury	15	N	1050	Waitohi River			1365	4	2592	18	1.7	0.4		80.8
CRC900414	M33/0206	M33:878-141	M33:878-141	Hurunui	0		300	"stream" to Waitohi River	Excavated pit. No details re depth etc. Stream dry most of time???. 900m to Waitohi R. & 1000m to Hurunui R. Waitohi and Hurunui river beds downcut		1365	23	6624	18	4.3	3.2		6.6
CRC951610*1	M33/0213	M33:8009-1480	M33:8110-1450	Horsley Down	9.2	Y	100	Waitohi River		0.736	1365	36	2980	1	34.5	31.5		0.7
CRC971081	M33/0215	M33:8009-1480	M33:8009-1480	Hawarden	72	Y	440	Waitohi River	Unlikely to be connected to river	1.048		30	2376	1	27.5			
CRC951610*1	M33/0231	M33:8009-1480	M33:8104-1452	Horsley Down	4	N	100	Waitohi River			1365	45	3726	1	43.1	39.3		0.7
CRC011505	M33/0232	M33:8468-1383	M33:8468-1383	Medbury	10.5	Y	230	"stream" to Waitohi River	Stream dry most of time??? 500m to Waitohi River (SD=1.5, SDF=18.3)	10	1365	3	648	3	2.5	2		3.9
CRC002017	M33/0233	M33:746-223	M33:746-223	The Peaks Hawarden	6	N	125	Hurunui River	Proposed - Wells Database		1365	3	150	1	1.7	1.5		1.1
CRC002025	M33/0234	M33:8661-1269	M33:8661-1269	Hawarden	10	N	10	Washpen Stream/Waitohi River confluence	Proposed - Wells Database		1365	9	750	1	8.7	8.6	8.6	0
CRC020575	M33/0235	M33:8415-1752	M33:8389-1776	Medbury	10	N	150	Hurunui River	Proposed gallery - Wells Database. Consent/well grid reference?									
CRC020575	M33/0236	M33:8415-1752	M33:8379-1735	Medbury	10	N	500 (150)	Hurunui River	Proposed gallery - Wells database Well/consent grid reference???									
CRC020653	M33/0241	M33:7469-2230	M33:7469-2230	The Peaks Hawarden	6	N	50	Hurunui River	Proposed - Wells Database									
CRC012343	M33/0246	M33:8311-0955	M33:8311-0955	Hawarden	12	N	950	Washpen Stream	Proposed - Wells Database		1365	4	345	1	4.0	1.2		66.1
CRC021195	M33/0260	M33:7550-2145	M33:7550-2145	The Peaks Hawarden	4	N	230	Hurunui River	Proposed - Wells database. A higher T value may be more appropriate		1365	39	3352	1	38.8	31	29.4	3.9
CRC980332	N33/0255	N33:9033-1414	N33:9033-1414	Hurunui	3	N	25	Stream to Waitohi River	Stream dry most of time???. 380m to Waitohi River(SD=1.3, SDF=10.6)		1365	2	175	1	2.0	2		0
CRC011748	N33/0323	N33:9013-1419	N33:9013-1419	Hurunui	38	Y	200 230	Stream to Waitohi River Waitohi River	Stream dry most of time???	0.198		4	250	1	2.9			
Subtotal															194.4	159.5		

A desktop assessment of the effects of groundwater abstraction on surface water flow in the Hurunui River catchment

MAP 3 (Figure 3.3):
WAIKARI VALLEY

CONSENT_NO	WELL_NO	GRID_REFERENCE (Consents)	GRID_REFERENCE (WELLS DATABASE)	LOCALITY	WELL DEPTH (m)	Strata Data	DISTANCE to nearest river/stream (m)	NEAREST RIVER/STREAM	COMMENT	Specific Capacity (l/s/m)	Estimated Transmissivity (m ² /day)	MAX_RATE (l/s)	MAX_QUANTITY (cubic metres)	USAGE_DAYS	Average Pumping Rate (l/s)	Stream Depletion after 30 days pumping (l/s)	Stream Depletion (l/s) (Consents Database)	Stream Depletion Factor (Days)
CRC971904	M33/0220	M33:8272-0379	M33:8274-0398	Waikari	3	N	NA	No nearby natural stream	Springs on side of hill			1	95	1	1.1			
CRC971904	M33/0221	M33:8272-0379	M33:8278-0398	Waikari	3	N	NA	No nearby natural stream	Springs on side of hill			1	95	1	1.1			
CRC971904	M33/0222	M33:8272-0379	M33:8279-0395	Waikari	3	N	NA	No nearby natural stream	On side of hill			1	95	1	1.1			
CRC971904	M33/0223	M33:8272-0379	M33:8279-0391	Waikari	3	N	NA	No nearby natural stream	On side of hill			1	95	1	1.1			
CRC001130	N33/0263	N33:0589-0814	N33:0589-0814	Scargill	4.5	Y	20	Waikari River/Greta River confluence			100	1	90	1	1.0	0.9		0.4
CRC020782	N33/0322	N33:9655-0662	N33:9655-0662	Waikari	19.8	N	5 60	"Stream" to Waikari River Waikari River	Proposed - Wells Database. Stream dry most of time???. 60m to Waikari River (SD=5.1, SDF=3.6)		100	10	8640	16	6.3	6.2		0
Subtotal															7.3	7.1		

MAP 4 (Figure 3.4): LOWER
HURUNUI RIVER

CONSENT_NO	WELL_NO	GRID_REFERENCE (Consents)	GRID_REFERENCE (WELLS DATABASE)	LOCALITY	WELL DEPTH (m)	Strata Data	DISTANCE to nearest river/stream (m)	NEAREST RIVER/STREAM	COMMENT	Specific Capacity (l/s/m)	Estimated Transmissivity (m ² /day)	MAX_RATE (l/s)	MAX_QUANTITY (cubic metres)	USAGE_DAYS	Average Pumping Rate (l/s)	Stream Depletion after 30 days pumping (l/s)	Stream Depletion (l/s) (Consents Database)	Stream Depletion Factor (Days)
CRC002016	N33/0095	N33:149-139	N33:14873-14226	Ethelton	6	Y	500	Hurunui River	Consent grid reference???. Consent combined with N33/0096	59.6	5500	10	500	1	5.8	4.5	5.4	4.5
CRC921215	N33/0195	N33:285-152	N33:2885-1490	Domett	20	N	80	"stream" to Hurunui River	Stream probably dry most of time? Well on terrace above Hurunui River.. Well/consent grid reference?? 750m to Honeymoon Ck (SD=0, SDF=562)		100	1	86	1	1.0	0.7		6.4
CRC981328	N33/0261	N33:2235-1306	N33:2270-1309	Domett	5	N	150	Hurunui River	Well/consent grid reference???		5500	9	5201	12	5.0	4.7		0.4
CRC000480	N33/0279	N33:2772-1363	N33:2772-1363	Domett	4	Y	200	Hurunui River		62.5	5500	65	33696	12	32.5	29.7		0.7
CRC920407	O33/0030	O33:319-128	O33:31642-12683	Hurunui Mouth/Domett	4.6	N	90	"stream" to Hurunui River	Stream dry most of time???. Consent grid reference???. 280m to Hurunui R. (SD=1.8, SDF=1.4)		5500	2	173	1	2.0	1.9		0.1
Subtotal															46.3	41.5		
Total															452.8	348.8		

Wells excluded on basis of depth/presence of confining layer/s
Wells excluded on basis of no nearby stream/river
Wells excluded on basis that nearest stream flows to Waiau catchment



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