

Memo

To: Manager – Planning & Regulations
From: John O'Connor – Utilities Engineer
File: WAS 16/11
Date: 1 May 2008
Subject: Plan Change 13 – Twizel Water Supply Protection Area

Craig

The modern approach to community water supply management is to apply a series of barriers to prevent or minimise contaminants entering the source water rather than being solely reliant on treating the water. By keeping the source water as clean as possible, the risk of contaminants entering the water supply is lowered and the cost of treatment is reduced.

Currently the Twizel Water Supply is untreated and is therefore very vulnerable to contamination of the water source. Recent legislation will most likely require some form of treatment, but the degree and thus the cost of treatment will largely depend on the quality and risks associated with source water.

It is therefore important to ensure that the water supply protection zone for Twizel is correctly located. If intensive land uses become established in the zone of the source water, it would be difficult to apply measures retrospectively to protect or remediate the groundwater quality, and the community may face considerable costs to treat the water to a potable standard or to find and develop an alternative source.

The current Twizel Water Supply Protection Zone is clearly not in the optimum location. Greg Birdling of Opus, in his letter 3CW494.00 of 24 August 2007, has proposed a water supply protection zone based on the method described in the NRRP Chapter 4, and taking into account the local geology and groundwater characteristics. Greg's assumption on the direction of the groundwater flow, is logical. The approximate positions of the wells as shown on his map are correct given the scale of the map.

Attached is a copy of letter CWS_2_TW1001 of 2 May 2008 from Stephen Waller of Community & Public Health which supports amending the water supply protection zone as proposed by Greg Birdling.

I have attached a geological map of the area to illustrate how the geological features were used to help determine the location of the proposed Twizel Water Supply Protection Zone. The map is compiled from information contained in the Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 15, which was published in 2007.

For the sake of clarity, the scale has been enlarged 5 times (from 1:250,000 to 1:50,000). This has slightly distorted the actual boundaries between the map units as can be seen by the location of the Pukaki Canal on the map. It is likely that the boundary between Map Units "Late Last Glacial Outwash" and "Alluvium in Active River Bed" on the North East side of Twizel is actually the terrace above Fraser Stream.

As can be seen from the Geological Map the whole area around Twizel was formed by the Late Last Glacial Outwash. This material comprises of variable mixtures of gravel, sand, silt and clay, and is generally moderately permeable.

In the Map Unit "Alluvium in Active River Bed", rivers have disturbed the top of the glacial outwash, and washed out the clay and much of the silt. Drilling records for the Twizel Wells indicate that the depth of this disturbed alluvium layer in the vicinity of the Wells is 15m. This alluvium comprises variable loose gravel, sand and silt, and is very permeable. The water table is generally close to the surface, and the ground water is partially retained in the underground channel of alluvium formed by the rivers in the parent glacial outwash material. It is like an underground reservoir into which the Twizel Wells have been sunk.

I have attached a plan of the GIS owner layer at a suitable scale on which I have superimposed the proposed protection zones for each well as per the diagram in figure WQL8 in Chapter 4 of the WRRP. The zone diagrams are positioned according to the well locations and in such a way that the terrace adjacent to Fraser Stream is included at the north west corner of each zone.

The proposed water supply protection zones include properties above and below the terrace. The properties above the terrace along Glen Lyon Road have access to the Council Sewerage Scheme. The properties below the terrace within the proposed water supply protection zone do not currently have access to the Council Sewerage Scheme.

The following is a list of the properties below the terrace that are in the proposed water supply protection zone.

Key	Comment
25320 00704	House – Ruataniwha Cottage
25320 00705	House – Ruataniwha Homestead
25320 00706	Shearing Shed – Consent on hold to covert to dwelling
25320 00707	Consent granted for shed
25320 00708	Vacant
25320 00711	New house
25320 00752	Vacant
25320 00758	Vacant
25320 00759	Vacant
25320 00791	Vacant
25320 00792	Consent for house applied for. More information required. Subdivision consent granted
25320 00793	Vacant. Only small corner affected
25320 00928	Vacant

There are 13 properties affected including one property for which consent has been granted to subdivide into 2 sections. Currently only 3 properties have dwellings on them. Building consent has been applied for on one property, and consent to convert a shearing shed to a dwelling on another property is on hold.

The water table in the affected area below the terrace is relatively high (approx 2m below the surface) and the area is prone to flooding. The combination of these two factors increases the risk of septic tanks contaminating the Twizel source water.

Measures to protect the Twizel source water from contamination need to be put in place before further development occurs. This will avoid having to take measures retrospectively on most of the properties. It will also reduce the risk of contamination of individual on-property wells which the properties use for their water supplies.

There are various documents which you may find helpful to support the Amendment to the Twizel Water Supply Protection Zone in the Proposed Plan Change 13 of the Mackenzie District Plan.

1) **Health (Drinking Water) Amendment Act 2007**

This Act was enacted in October 2007 and comes into force on 1 July 2008.

Clause 69U imposes a duty on the drinking water supplier to take reasonable steps to contribute to protection of the source of drinking water.

Clause 69Z imposes a duty on the drinking water supplier to prepare and implement a Public Health Risk Management Plan

2) **Proposed Natural Resources Regional Plan,
Chapter 4 : Water Quality**

The following sections of Chapter 4 of the NRRP deal with community drinking water sources.

Issue WQL3	Community drinking water sources	page 78
Objective WQL3	Water quality outcomes for community drinking water sources	page 78
Policy WQL12	Avoid the potential for contamination of community drinking water sources	page 80
Schedule WQL2	Community Drinking Water Supply Protection Zones	page 272

3) **Ministry of Health Guidelines for Drinking Water Quality Management for New Zealand**

Chapter 3 of these guidelines deals with source waters.

The first paragraph of clause 3.2.3 is as follows:

3.2.3 FACTORS AFFECTING GROUNDWATER QUALITY

3.2.3.1 THE WATER SOURCE

Because contaminants that may have infectious or toxic properties can remain in the aquifer for a considerable time and affect its use, operators of groundwater-sourced drinking-water supplies should take every precaution to prevent contamination of the aquifer. Water managers should assess the potential for contamination arising from possible sources located in the immediate area of the bore (although nitrate plumes can travel kilometres). All possible precautions should be taken to protect the water supply from these. Examples of sources include: stores of hazardous substances, underground storage tanks such as at petrol stations, effluent discharges, septic tanks, waste ponds, offal pits, application of pesticides or animal wastes to nearby land. As part of this assessment, advice should be sought to determine the capture zone of supply bores.

This takes into account groundwater flows, drawdown effects and attenuation characteristics, see Section 3.2.4

4) **Public Health Risk Management Plans (PHRMP)**

For preparing PHRMP's the Ministry of Health have listed the typical risks to source water which need to be considered. The list which is not exhaustive is as follows:

- Contaminated sites
- Domestic or industrial processes
- Mining operations
- Landfill site
- Waste discharge to land
- Storage of hazardous substances
- Septic tanks
- Urban or industrial run-off
- Surface impoundments
- Effluent ponds
- Waste disposal down holes or bores
- Abandoned or decommissioned wells
- Animals and faecal matter
- Agrichemicals
- Irrigation
- Forestry
- Fertiliser
- Geothermal activity
- Mineral deposits
- Saline water
- Algal bloom
- Insufficient water

Clause 3.1.1.k of the current District Plan deals only with sewage from residential units within the Twizel Water Supply Protection Zone. You will need to consider if other causes of contamination are dealt with adequately by the NRRP or other regulations.

I make the following comments in relation to Alistair Shearer's submission.

1) **Protection Zone Dimensions**

Site specific information was considered by Greg Birdling of Opus in determining the location and dimensions of the protection zone. These include:

- The geology of the area as described above.
- The direction of flow of groundwater.
- The depth of the well.
- Pumping rates
- The type of aquifer.
- The type of contaminant (septic tank effluent).

Greg commented that the method set out in the NRRP to calculate the dimensions of a provisional zone "appears to offer a fairly sensible solution in that the permeable areas upgradient are covered".

2) **Rising Groundwater**

The geological information as described above, and drilling records from the Twizel Wells, indicate that the area labelled Map Unit "Alluvium in Active River Bed" is a relatively shallow (approximately 15m deep) un-confined aquifer contained by the parent glacial outwash.

3) **Bacto Tests Source Water**

The source water is tested once per month for the presence of E.Coli. Fortunately E.Coli has been detected very seldomly and we want to keep it that way. 18 cfu / 100 ml were detected on 4 March 2004 following flooding in the area and 2 cfu / 100 ml were detected in a follow up sample on 10 March 2004. 1 cfu / 100 ml was detected on 9 February 2006.

JOHN O'CONNOR
UTILITIES ENGINEER

WAS 16/11

24 August 2007

Mr John O'Connor
Utilities Engineer
Mackenzie District Council
PO Box 52
FAIRLIE



3CW494.00

Dear John

TWIZEL WATER SUPPLY PROTECTION AREA

Thank you for your letter of 23 August regarding the Twizel Water Supply Protection Area. The purpose of this letter is to respond to your points, namely that the water supply protection area shown in your District Plan for Twizel is not in the optimum location given local geology and groundwater characteristics.

We understand that the District Plan is currently under review, and that it is an opportune time to make any changes.

The proposed Canterbury Natural Resources Regional Plan (NRRP) provides methods by which community drinking-water protection areas should be allocated (Chapter 4, Pg 272, Schedule WQL2). This is supported by Tables listing wells and surface water takes used for community water supply purposes such that these areas are protected under the NRRP. Twizel's water supply is contained within WQL21 which is for surface water intakes, however this only gives a single location, and may not best reflect the widely spaced (350m) nature of the wells.

We believe that it would be desirable to apply the NRRP method to the District Plan in order to provide consistency across both planning documents. The NRRP method also appears to offer a fairly sensible solution in that the permeable areas up-gradient are covered.

We have attached a drawing showing the extent of the existing protection area, and proposed areas using the NRRP method to all the wells. We have done this as the spacing of the wells means that there are unprotected areas if the NRRP co-ordinate is used. However, this does mean that the District Plan and NRRP would not be exactly the same. You will note that there is a significant difference between the existing and proposed area, and we believe that this justifies your concerns.

The proposed protection area shown are based on an assumed groundwater flow direction (which we expect would generally follow the river direction), and approximate location of the bores. These assumptions should be verified as correct prior to including in the District Plan if possible with accurate survey and measuring of piezometric heads (if facility for this is available).

We recommend that the District Plan is amended in accordance with this letter and drawing, subject to confirming the assumptions above. Ideally, the NRRP should be amended to provide protection

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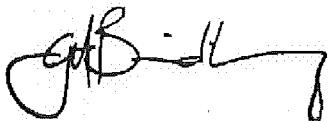
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areas to all wells, but you may wish to consider if this is necessary.

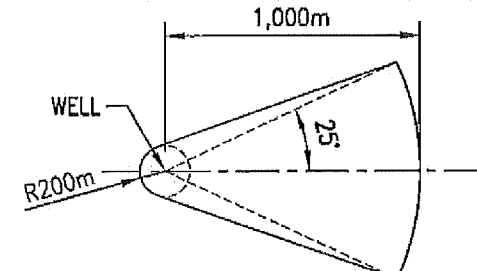
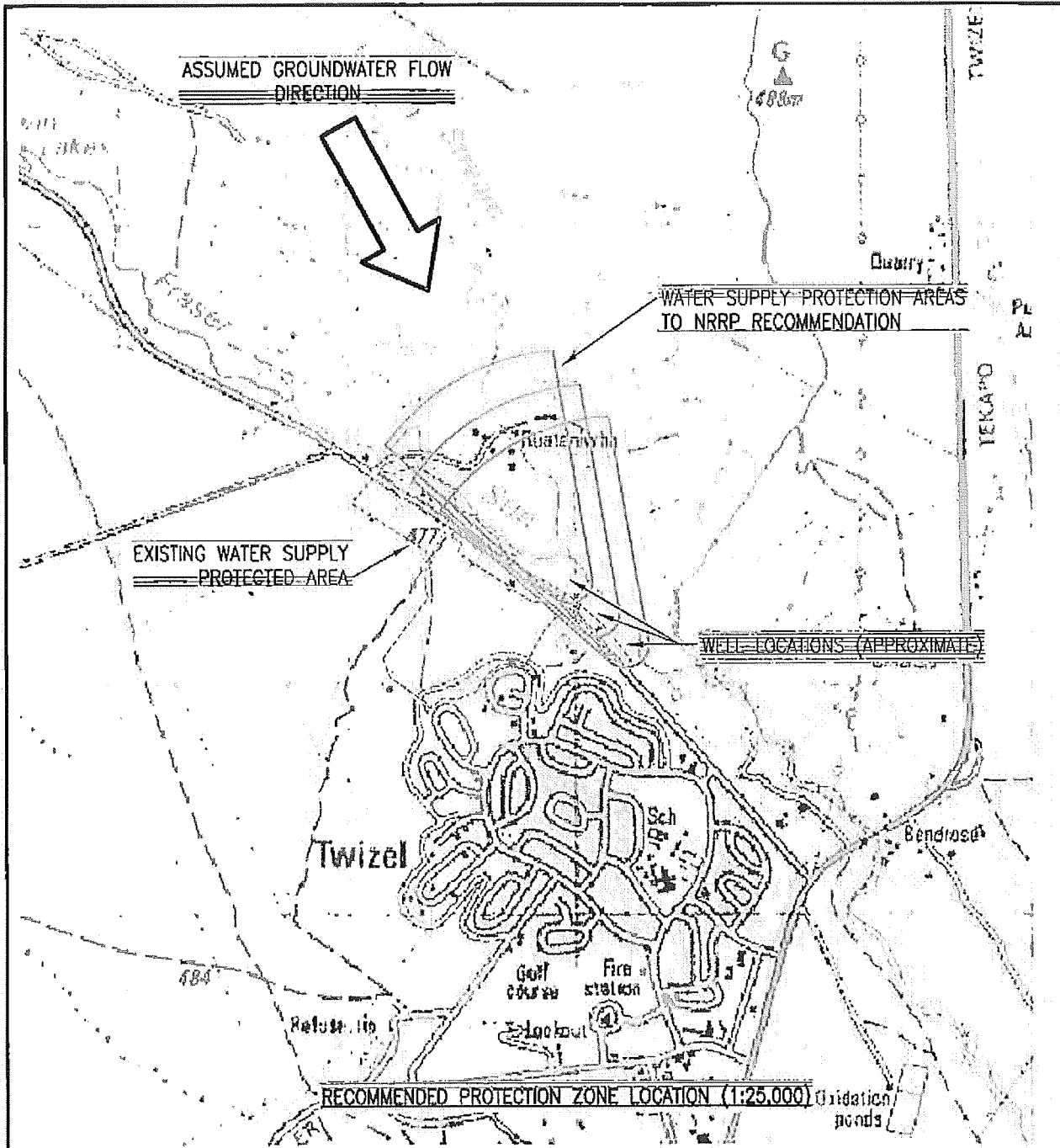
Please contact me if you have any questions relating to this issue.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Greg Birdling', with a long horizontal flourish extending to the right.

Greg Birdling
Senior Environmental Engineer

Encl. Map of recommended protection areas



PROTECTION ZONE DIMENSIONS (NTS)

	BY	CHECKED	DATE
DESIGN	GB		08/07
DRAWN	GB		08/07
APPROVED			

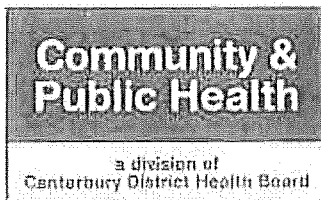
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TITLE					
MACKENZIE DISTRICT COUNCIL TWIZEL WATER SUPPLY					
WATER SUPPLY PROTECTION AREAS PROPOSED REVISIONS					
STATUS		FOR COMMENT		FILE	
				3CW494.00	
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	24/08/07 @ 13:49			WPZ	RO

Our file: CWS_2_TW1001

Your file:

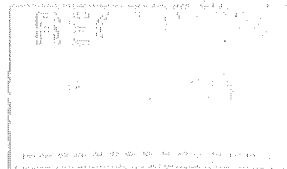


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"Promoting Healthy Choices and Environments in South Canterbury"

2 May 2008

John O'Connor
Mackenzie District Council
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Dear John

TWIZEL WATER SUPPLY PROTECTION AREA

Thank you for the documents relating to the Twizel Water Supply Protection Zone forwarded to this office for comment.

I agree with the comments of Greg Birdling set out in his letter of 24th August 2007. It is generally desirable that the water protection zones set out in the District plan align with those that are set out in the NRRP so that the permeable up gradient areas are covered. To achieve this, the most practical solution would be to amend the district Plan.

We would be willing to submit in support of the change should the Council decide to go ahead with the change.

Yours faithfully

Stephen Waller
Health Protection Officer

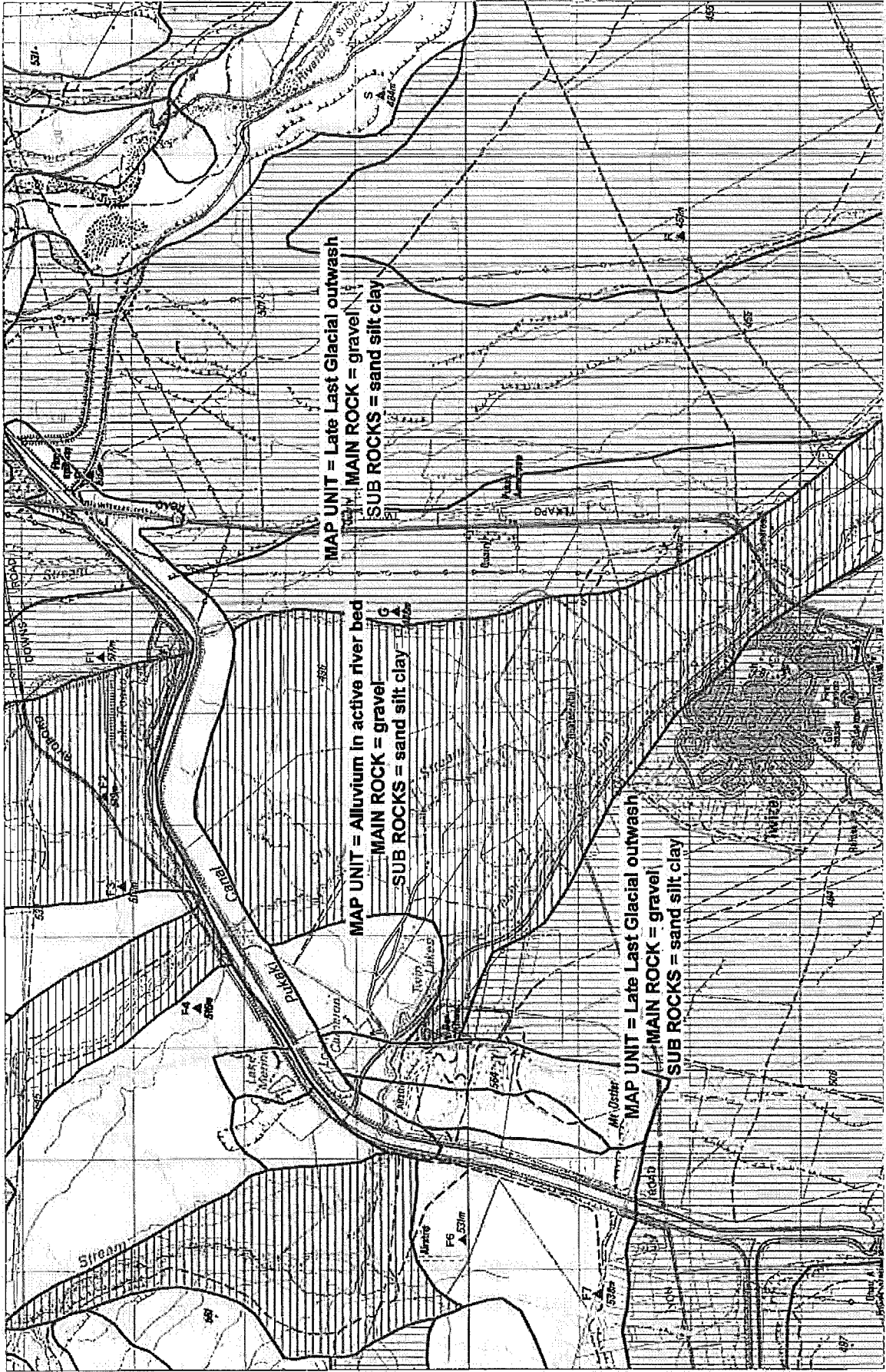
■ Christchurch Office: PO Box 1475, Christchurch. Telephone 03 379 9480. ■ Hauora Mātauraka: PO Box 1475, Christchurch. Telephone 03 374 0490.

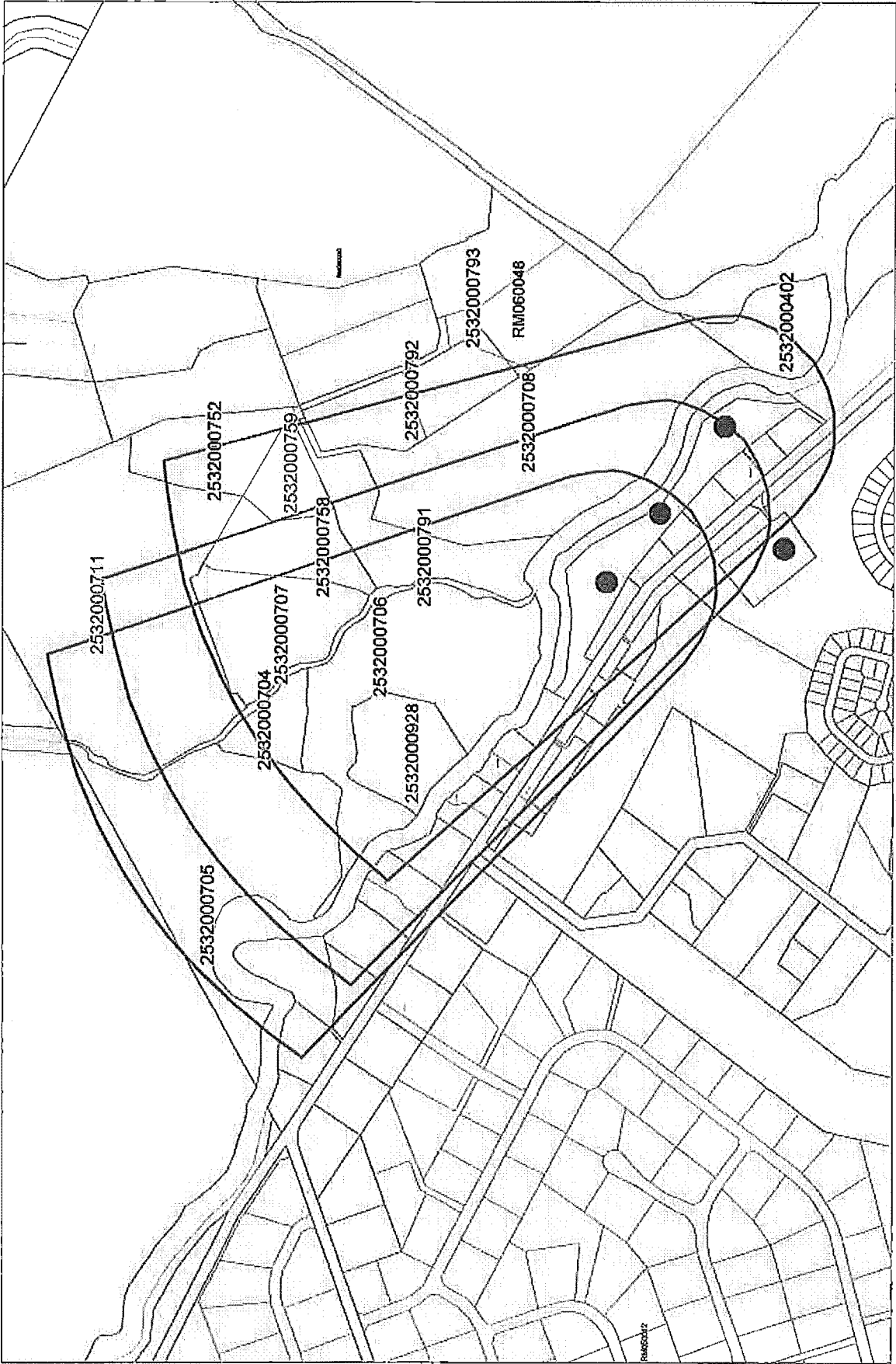
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■ South Canterbury Office: PO Box 510, Timaru. Telephone 03 688 6019.

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Scale 1:10,000