File note

30 November 2007

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Patea Freezing Works – Investigation of existing bores

On 29 November 2007 Andres Jaramillo (Geo-hydro Scientific Officer) and I visited the site to establish the location and current status of the 11 bores/wells identified on the 1973 plan.

- Two were open and require capping to protect against potential contamination
- Two still had pumps in place
- Four had pipework in place which has not been blanked off and may have still have submersible pumps in place
- Three could not be located
- One open gallery was identified

Where possible a probe was used to measure the water level and bottom depth. Andres has made a separate report on his findings (doc# 385225).

No.1 well 2637606E-6159608N
Approx 100 m north of the site, on the eastern side of the paddocks.

No. 1 well pump

No.1 well pumpshed, with factory to south

No. 2 well 2637358E-6159402N

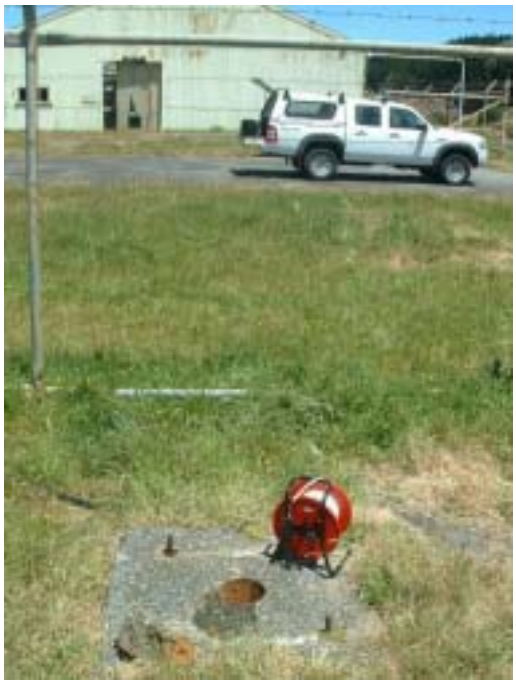
Under the covered loading platform in the south west corner of the site. Pipework present, requires blanking to secure, there was oil in the surface mounting box. What appeared to be a sample pipe was removed allowing the probe to be dropped, the well is over 30m deep and oil was present.

No. 2 well

No. 2 well location

No. 3 artesian well 2637391E-6159499N

Approx 15 m east of the butchers shop, open - requires capping, water level 0.17 m, blockage at 5.6 m deep, suspect this is deeper.

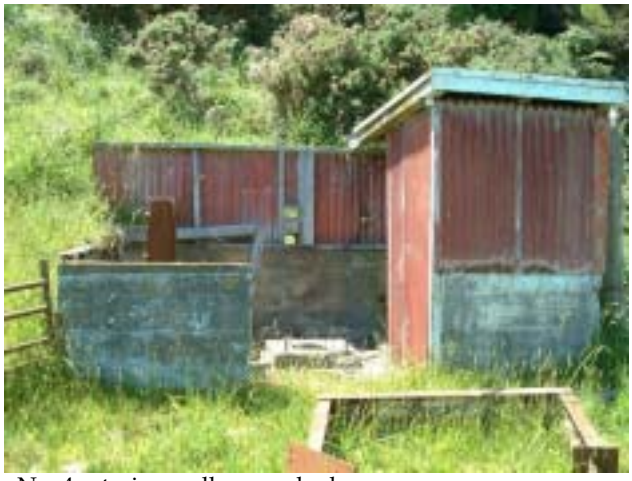


No. 3 artesian well

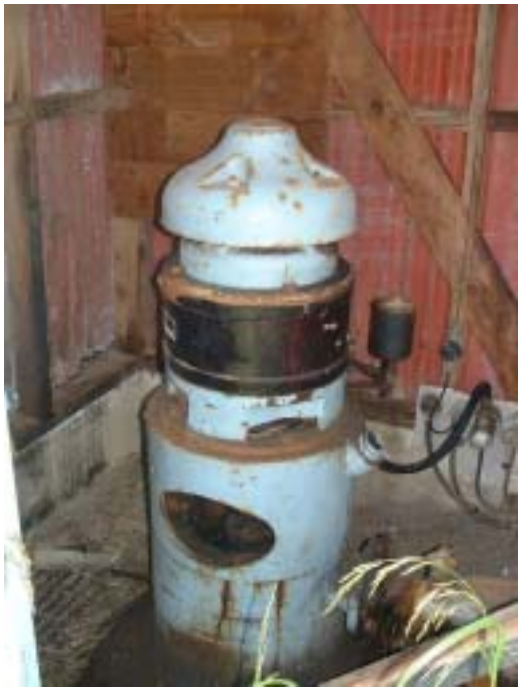
No. 3 artesian well & butchers shop to west

No. 4 artesian well 2637654E-6159417N
East of the stockyards, at the base of the cliffs, open - requires capping, water level 4.2 m, over 30 m deep.


No. 4 artesian well


No. 4 artesian well pumpshed

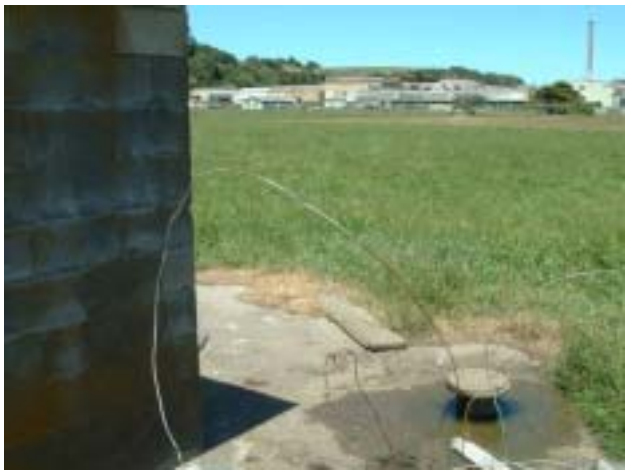
No. 5 artesian well 2637666E-6159371N
East of the fellmongery, at the base of the cliffs. There was a good flow (approx 5 l/s) of water between these wells from the cliffs.


No. 5 artesian well pump


No. 5 artesian well pumpshed

No. 6 well 2637456E-6159699N

On the western side of the paddocks, approx 140 m north of the site, capped - appears to be artesian as water is leaking out from the cap.



No. 6 well and factory to south

No. 6 well and pumpshed

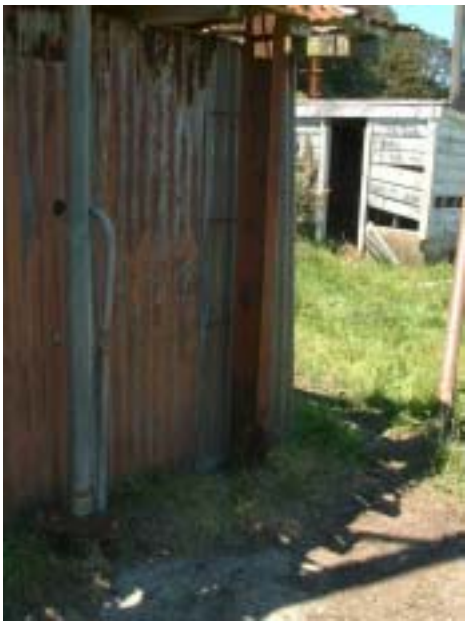
No. 7 well 2637539E-6159917N

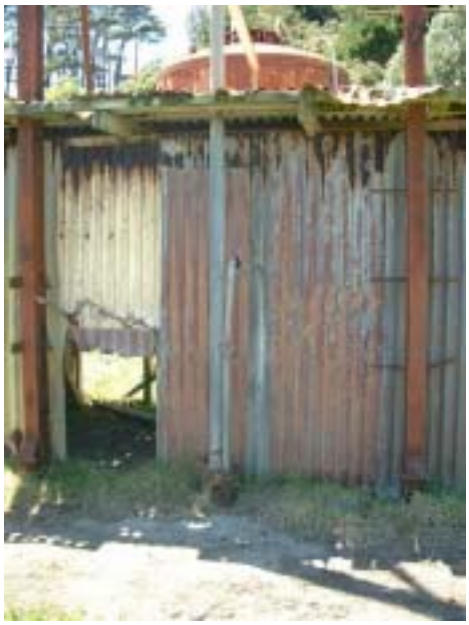
On the western side of the paddocks approx 350 m north of the factory.

No. 7 well

No. 7 well pumpshed and factory to south

No. 8 well 2637604E-6159616
Approx 10 m north of No. 1 well.


No. 8 well with No.1 well in background


No. 8 well pumpshed

Gallery 2637373E-6159531N
Just south of the main gates, appears to be unused as there is no power connected and the pvc pipe on the northern side has a large crack in the joint. Water level 1.45 m, 4.5 m deep.


Gallery


Gallery and factory to south

The following could not be located:
A well - in the freezers (western side) - solid concrete floor.
No. B bore - south west corner of the freezers – building collapsing, too dangerous to enter.
No. C well believed – appears to be under the new factory entrance.

Shane Reynolds
Scientific Officer

Patea Freezing Works Site

Groundwater Investigation

Site Visit

Officer's Report – Andres Jaramillo, Geo-hydro Scientific Officer TRC

On 29th November 2007 a site visit to the Patea Freezing Works site was conducted with the objective to devise a monitoring programme to assess the extent of a potential polluted groundwater underlying the site.

The purpose during the visit was to evaluate the existing conditions of wells/bores, assess locations for observation wells and to ground-truth bore information found in the Council's groundwater database. Data acquired for the wells in and around the site [GND0066- GND0067- GND0068- GND0069-GND0070- GND0071] show some valuable information but is still incomplete to draw preliminary conclusions from it; some lithography is described but little to no information is given regarding casing intervals and depths; some of these wells could tap more than one aquifer which would pose constraints as to the usability of the existing wells for monitoring proposes. Three additional bores were located in the area of interest and one additional well was found nearby the *thought-to-be* major area of pollution source. A gallery showing the water table at approximately 2.2 metres indicates the high water table conditions of the site.

Some of the bores encountered will need to be properly capped and plugged if deemed necessary after an evaluation of their usefulness for monitoring purposes is studied as at the moment they are uncapped and opened to the surface. It is possible that the water samples from the wells encountered may be representative of different water-yielding zones within the same aquifer; however, the data that could be obtained from them could be used as up-gradient baseline conditions.

Unfortunately there is not enough topographical information available to determine groundwater flow-lines and potentiometric groundwater maps which would be very important to determine main groundwater flow.

Installation of groundwater monitoring wells & Vadose-Zone Monitoring

Commonly observation wells are installed at sites such as waste-disposal facilities, underground storage tanks, and areas suspected of groundwater contamination; the exact location and number of units is yet to be determined once the conceptual model has been refined. Their depth is also to be defined once the aquifer(s) to be studied is defined. The Hollow stem auger (HSA) method is typically the preferred drilling method for situations such as this.

If a contaminant is detected in the groundwater the solution to the problem may be very difficult and expensive. The vadose zone (unsaturated zone) in the study area is believed to be no more than 1.5 metre deep which is a thin layer to protect the water table from superficial contamination (also there is a tidal effect below the *thought-to-be* contaminated site); this would also mean that should pollution be encountered, it would be very likely that the water-table has also been polluted at some point. If the vadose zone is to be sampled, it is recommended that a simple mean of sampling be used such as direct sampling of the soil.

If a groundwater monitoring programme is to be implemented, it should include a monitoring well installed upgradient of the site and up to three monitoring wells installed downgradient of the potential source(s) of the groundwater contamination.

Groundwater contamination

The sources of groundwater contamination at this site can be many and the type of contaminants numerous, yet, there is little information readily available and an extra effort should be made to establish the type of pollutants that could have been used/disposed of at the site. The extent of the groundwater contamination will entirely depend on the hydrogeology of the area. Groundwater contamination is not an irreversible process; even certain natural conditions act to remove contaminants through attenuation mechanisms such as dilution, dispersion, mechanical filtration, volatilization, biological activity, ion exchange and adsorption on soil particle surface, chemical reactions and decay.

If the area is in fact contaminated, the two types of contamination likely to be found are those related to landfill pollutants (leacheates) and underground tanks (oil seepage). Leacheates form plumes that move in the direction of groundwater; as the plume moves away from the source, the concentration declines due to dispersion and retardation processes.

Fortunately, the proximity of the source (adjacent to a groundwater discharge zone and to the sea), limits the amount of groundwater that can be (could have been) contaminated. The most likely sources for groundwater contamination include soils saturated with petroleum hydrocarbons and free product floating on the surface of the water table. Nevertheless, in the majority of cases, natural attenuation can adequately mitigate the contaminated groundwater. One of the hydrocarbons that needs to be investigated for potential contamination at this site is diesel. However, despite the mobility of benzene – one of the soluble components of petroleum products such as diesel – it is relatively easily attenuated and biodegraded in a well-oxygenated groundwater.

Recommendations

It is recommended that:

- A survey of the area of study be undertaken to generate contour lines to 1m precision (individual existing bores should be properly surveyed).
- Water samples be taken at the site, upgradient and downgradient of the site.
- Soil samples be collected at the land fill area an analysed for likely pollutants.
- All existing bores be properly capped.
- More data be gathered to support claims of contamination or to demonstrate that contamination has (or has not) occurred.
- Once more data has been collected a simple model such as BIOSCREEN - http://www.epa.gov/ada/csmos/models/bioscrn.html - can be utilised to model the site.

Sources

Fetter, C W. Applied hydrogeology. 4th ed. Prentice Hall Inc, 2001. Fetter, C W. Applied hydrogeology. 3rd ed. Prentice Hall, 1994

Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand

Leveling survey of existing groundwater bores

Sight	B.S.	I.S.	F.S.	H.o.C.	G.L.	Remarks	Well Depth	Water Level	GW-Potentiometric
1	1.498			11.498	*10.000*	No.3 Well	5.75	0.59	9.4
2		1.634			9.864	Gallery		1.44	8.4
3	1.805		1.617	11.686	9.881	CP			
4		1.509			10.177				
5		1.360			10.326	Artesian Well			11.0
6	1.469		1.787	11.368	9.899	CP			
7		1.488			9.880				
8	1.758		0.778	12.348	10.590	CP			
9		1.145			11.203				
10	3.060		0.946	14.462	11.402	CP			
11		0.319			14.143	No.4 Well	~54.5	4.15	10.0
12	1.208		3.541	12.129	10.921	CP			
13		1.535			10.594				
14	1.137		1.558	11.708	10.571	CP			
15		2.013			9.695	No.2 Well	100+	0.70	9.0
16			1.608		10.100	No.3 Well			

Notes:

1. No. 3 Well arbitrary datum of 10.0m.
2. No. 3 Well blocked at 5.75m assumed to tap into deeper aquifer.
3. Gallery potentiometric level not used to calculate potentiometric lines.
4. Artesian Well water level assumed to be 0.0m, cap not removed.

Taranaki Regional Council

ESAM

Groundwater Site Location Query

Report prepared for: Shane Reynolds

Easting: 2637438 **Northing:** 6159485 **Radius:** 800

6 sites found that match the criteria specified above.

GND0066 Patea Freezing Ltd, Patea

Description: GROUNDWATER

Easting: 2637300 Northing: 6159700

Depth: 171.3 Diameter: 101.6 Drill Date: 1 Jan 1940

Elevation: 24.30 Elevation Accuracy: Estimated from NZMZ 1/NZMS 260

Pump Type: Unknown Construction: Drilled - open ended casing

Aquifer: Whenuakura Aquifer Type: Unknown

WQ Data: Bore Use: Industrial (Commercial)

Pump Test Data Location:

Top of Screen: 0.0 Bottom of Screen: 0.0

Casing 1: Casing 2:

High Static Water Level: 3.7 Low Static Water Level: 3.7

Comments: YLOW 36.27L/min
DRILLING DATE 19-09-1917

Depth	Strata Type	Static Water Level	Comments
0.0	No lithological data available		
52.4	Sand		SAND & CLAY
52.5	No lithological data available		ROCK
139.0	Papa		LAYERS PAPA & SAND WITH ROCKS
151.5	Sand		SAND
174.3	Papa		PAPA

GND0067 Patea Freezing Works, Patea Bore #10

Description: GROUNDWATER

Easting: 2637400 Northing: 6159800

Depth: 114.0 Diameter: 203.0 Drill Date: 3 Sep 1976

Elevation: 24.50 Elevation Accuracy: Estimated from NZMZ 1/NZMS 260

Pump Type: Jet pump - deep well Construction: Drilled - open ended casing

Aquifer: Whenuakura Aquifer Type: Unknown

WQ Data: Bore Use: Industrial (Commercial)

Pump Test Data Location:

Top of Screen: 0.0 Bottom of Screen: 0.0

Casing 1: Casing 2:

High Static Water Level: 8.5 Low Static Water Level: 8.5

Comments: AVERAGE YIELD 572.8L/min
PUMP DEPTH 36.57M
CHLORIDE=42PPM
SALT=69PPM

Depth	Strata Type	Static Water Level	Comments
5.0	Silt		BROWN SILT
16.0	Silt		GREY SILT
21.0	Clay		BLUE CLAY
37.0	Clay		GREY CLAY
85.0	Shell		LAYERS GREY SILTY SANDS & SHELL ROCK
95.0	Papa		PAPA (SILTSTONE)
104.5	Papa		SANDSTONE WITH LENSES PAPA AND SHELLROCK

GND0069 Patea Freezing Works, Patea Bore #7

Description: GROUNDWATER

Easting: 2637400 Northing: 6159900

Depth: 78.2 Diameter: 152.4 Drill Date: 13 Dec 1965

Elevation: 24.30 Elevation Accuracy: Estimated from NZMZ 1/NZMS 260

Pump Type: Unknown Construction: Drilled - open ended casing

Aquifer: Whenuakura Aquifer Type: Unknown

WQ Data: Bore Use: Industrial (Commercial)

Pump Test Data Location:

Top of Screen: 0.0 Bottom of Screen: 0.0

Casing 1: Casing 2:

High Static Water Level: 8.2 Low Static Water Level: 15.2

Comments: PUMPING RATE 627.35L/MIN
60.96M AIR PIPE 50.8mm DIAMETER
PUMP DEPTH 36.57M
WATER QUALITY
CHLORIDE= 60ppm
SALT = 99ppm

Depth	Strata Type	Static Water Level	Comments
9.1	Sand		SAND AND CLAY
32.9	No lithological data available		SILTSTONE
39.6	Shell		SHELL BED
53.6	No lithological data available		SANDSTONE
54.9	Sand		SAND & SHELL
79.2	No lithological data available		SHELLROCK

GND0070 Patea Freezing Ltd, Patea

Description: GROUNDWATER

Easting: 2637500 Northing: 6159700

Depth: 126.5 Diameter: 76.2 Drill Date: 1 Jan 1940

Elevation: 24.30 Elevation Accuracy: Estimated from NZMZ 1/NZMS 260

Pump Type: Unknown Construction: Drilled - open ended casing

Aquifer: Whenuakura Aquifer Type: Unknown

WQ Data: Bore Use: Industrial (Commercial)

Pump Test Data Location:

Top of Screen: 0.0 Bottom of Screen: 0.0

Casing 1: 61.0 Casing 2:

High Static Water Level: 0.0 Low Static Water Level: 0.0

Comments: FLOW 136.4L/min
CASING TO 60.96M
DRILLING DATE 16-01-1919

Depth	Strata Type	Static Water Level	Comments
38.9	Sand		SAND PAPA GRIT
49.1	Papa		PAPA
70.1	Sand		SAND
72.5	Papa		PAPA
96.9	Sand		LAYERS SAND AND ROCK
111.2	Papa		PAPA
126.5	Sand		SAND

GND0071 Patea Freezing Ltd, Patea

Description: GROUNDWATER

Easting: 2637400 Northing: 6159600

Depth: 122.7 Diameter: 76.2 Drill Date: 1 Jan 1940

Elevation: 24.30 Elevation Accuracy: Estimated from NZMZ 1/NZMS 260

Pump Type: Unknown Construction: Drilled - open ended casing

Aquifer: Whenuakura Aquifer Type: Unknown

WQ Data: Bore Use: Industrial (Commercial)

Pump Test Data Location:

Top of Screen: 0.0 Bottom of Screen: 0.0

Casing 1: 67.1 Casing 2:

High Static Water Level: 0.0 Low Static Water Level: 0.0

Comments: CASING TO 67.06M DAI
DRILLING DATE 31-07-1914

Depth	Strata Type	Static Water Level	Comments
5.5	Sand		SAND AND CLAY
10.7	Papa		PAPA
51.5	Sand		SAND PAPA HARD SHINGLE
51.7	No lithological data available		ROCK HARD
53.0	Sand		SAND (WATER)
67.1	Sand		SAND SHINGLE(WATER)
110.6	Shell		LAYERS (MANY)HARD SHELL SAND PAPA(WATER)
113.4	Sand		SAND (WATER)
119.5	Sand		SAND AND PAPA
122.7	Sand		SAND

GND0601 Patea Township, Cnr York & Suffolk St. Bore I

Description: GROUNDWATER

Easting: 2637127 Northing: 6159664

Depth: 118.9 Diameter: 101.6 Drill Date: 28 Feb 1956

Elevation: 6.00 Elevation Accuracy: Estimated from NZMZ 1/NZMS 260

Pump Type: No pump on this well Construction: Drilled - open ended casing

Aquifer: Whenuakura Aquifer Type: Unknown

WQ Data: Bore Use: Unused

Pump Test Data Location:

Top of Screen: 81.7 Bottom of Screen:

Casing 1: 81.7 Casing 2:

High Static Water Level: Low Static Water Level:

Comments: Bore not used
Disused public water supply; 90 to 120 gpm

Depth	Strata Type	Static Water Level	Comments
5.5	Sand C		Coarse sand
6.7	Clay		Black soft mud
15.2	Sand C		Coarse sand
33.8	Clay		Soft clay and fine blue sand
34.5	GWS		Sandy gravel
37.2	Gravel		Well graded red river gravel
54.0	Sand		Brackish water sand tested 1956
77.7	Sand		Sandstone
93.0	Clay		Clay and sand
95.4	Clay		Clay
97.6	Shell		Shellrock
103.7	Sand		Sand and soft clay
104.3	Shell		Shellrock
114.3	Sand		Soft sandstone
117.4	Clay		Clay
118.9	Sand		Soft sandstone