MATATA PUBLIC HEALTH RISK ASSESSMENT

Institute of Environmental Science & Research Limited

Report CSC12009

June 2012

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June 2012

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Executive Summary

This report provides an assessment of the impacts of the existing septic systems on health risks in Matata.

The overall conclusion of this report is that **there is not a compelling case for the introduction of a reticulated sewage disposal system in Matata on the basis of risks to human health.** However some current onsite septic systems are not functioning adequately. Quantifying the proportion of properties with issues and whether these can be adequately rectified will require individual onsite assessments.

Installation of a reticulated sewage system would have benefits including flexibility in land use, enhanced development opportunities and the removal of sewage disposal responsibilities from the local householder. There are however significant costs involved in sewage reticulation which need to be balanced against the benefits, and compared with the costs of continuing onsite treatment.

Our conclusion that there is not a compelling case for the introduction of a reticulated sewage disposal system in Matata on the basis of risks to human health is based on the following observations:

- Reported disease incidence in Matata is not elevated compared to the wider Whakatane District area.
- Microbiological monitoring by both Bay of Plenty Regional Council and ESR/Beca indicate elevated *E. coli* numbers in the downstream part of Waitepuru Stream, Waimea Stream, and the Clark Road Drain. The Waitepuru and Waimea Stream *E. coli* levels are not dissimilar to typical streams in reticulated sewage areas.
- Faecal source tracking analysis indicates that the stream water is not consistent with raw human sewage. Some septic tank seepage may be getting into some of surface waters, but it has undergone a degree of treatment in septic tanks and soil.
- However, the Clark Road drain and a pipe near the Matata Hotel have had high numbers of *E. coli,* and are consistent with inadequately treated sewage. These should be investigated.
- Limited sampling of groundwater in Matata revealed very low levels of *E. coli* (below the detection limit in this study).
- 2004 water quality testing results were hampered by high levels of *E. coli* at upstream sites before the streams enter the township. *E. coli* at upstream sites taken in 2011 and 2012 have been very low, with previous upstream sources no longer a significant factor in the microbial load of the streams.
- Council records and the survey responses indicate that problems with septic tanks and effluent disposal fields have occurred in Matata, and at least some remediation work has been undertaken.

- Assessment of the onsite wastewater disposal systems using Auckland Healthcare Guidelines indicates potential issues with septic tanks, but environmental conditions are not such that septic tanks or some more advanced processes cannot be used for most properties if properly designed, installed and maintained.
- Residents are divided over the need for reticulation of sewage. Some report problems with their septic tanks, which in some cases it would appear they have rectified. Most residents are not aware of problems with their septic tanks.
- Arguably of most importance, contamination of the water is unlikely to result in disease because (i) drinking water is reticulated from elsewhere, (ii) there is no swimming in the streams or lagoon, (iii) other recreational activities in the streams or lagoon would provide limited exposure, and (iv) mahinga kai are not harvested from these waters.

Recommendations

While there is not a compelling case for the introduction of a reticulated sewage disposal system in Matata on the basis of risks to human health, there are problems with a number of septic systems and installation of a reticulated sewage system would have benefits. This is a decision for the local community and council. If reticulation is not pursued, or if there will be a significant delay until sewage reticulation, then the following recommendations should be adopted:

- We recommend that properties are inspected and home owners given advice on improvements required for their septic systems, and advice on how to maintain and operate their onsite system. This advice should be provided by an assessor who is not also an installer/producer of septic systems.
- A number of modifiable actions such as reducing water use, improvements to drainage and stormwater control, as well as improvements to onsite sewage systems could all reduce septic tank problems.
- The areas around Clarke Street drain and along Arawa Street appear to be priority areas for initial action.
- Any increased residential development in Matata would need to consider onsite sewage disposal, and ensure sufficient lot size to accommodate sustainable drainage fields for septic systems.
- Education of the community, particularly children through the local school could ensure that they are aware of the need to avoid contact with streams after rainfall, not to drink stream water, and to wash hands after contact with the local surface water. Signage may be appropriate at the Clark Street/Waimea Stream. These education messages are consistent for most New Zealand communities and reasonable to minimise an individual's exposure to pathogens in the environment.

Introduction

Background

In 2004, the Whakatane District Council applied to the Ministry of Health for funding under the Sanitary Works Subsidy Scheme (SWSS) to install a reticulated treatment and disposal system for Matata. The driver for the application was the unsuitability of the existing septic tank systems for domestic sewage treatment and disposal. Septic tanks were considered unsuitable because "ground conditions were not good for effluent disposal, and effluent on occasion, surfaces and reaches drains. In isolated areas the system does not work, owing to high water table."[1]

A Health Impact Assessment was prepared by Opus International Consultants in 2004 to support of the application, as well as a costing and description of the proposed treatment and disposal plant. This costing stated that "Ground conditions in parts of the settlement are unsuitable for septic tank fields and there is pressure for growth in the community". The proposal was to reticulate wastewater to a treatment plant in Matata and discharge treated effluent to the sand dunes.

In 2005, provisional approval was given by the Ministry of Health for a subsidy of $3.7m based on total capital costs of $4.0m.

The reticulation project was put on hold during the clean-up and recovery after the flood and landslides in May 2005.

In 2008 Opus International updated the proposed implementation to reflect cost increases, changes to the SWSS funding criteria, and necessity to alter the location of the treatment and disposal system due to the impact of the landslides. The updated cost of the scheme was $9.0m. This costing was partly based on an increase in population (to 950). A subsequent report, by Harrison & Grierson, recommended that instead of local treatment, a vacuum collection system could transport Matata sewage to the existing treatment plant at Edgecumbe (11.6 km away) at a cost of $10.1m. Harrison and Grierson also provided an updated Public Health Impact Assessment in 2009.

The Ministry of Health approved a funding subsidy of $6.7m based on this Harrison & Grierson option. In 2011 Harrison & Grierson suggested the additional option of pumping the Matata sewage to the Whakatane treatment plant (20 km away), which provides superior treatment and has capacity to accept Matata's wastewater. The cost of this option was estimated at $10.3m. They also provided revised costings of local treatment at Matata of $10.3m.

[1] Information Pack for Public Meeting to consider options and costing, Whakatane District Council, April 2004.

Iwi have expressed strong opposition and challenges to the Edgecumbe and Whakatane options, and a high degree of interest in a local solution[2]. In addition the significant shortfall between the SWSS subsidy and project costs has prompted Council to review project options including the original drivers and outcomes sought.

Scope

This report provides an assessment of the impacts of the existing septic tanks on health outcomes and health risks in Matata.

This report includes:

- Summary of previous health impact assessments
- Up to date review of notifiable disease data
- Summary of previous water quality investigations
- New data from water sampling conducted by ESR/Beca, including microbiological data, and source tracking analyses
- Summary of results from a survey of residents
- Summary of Whakatane District Council records of septic tank and effluent disposal problems
- Preliminary assessment of Matata on-site wastewater disposal systems using criteria developed by Auckland Healthcare
- Discussion of potential exposure routes and potential for health risk modelling
- Conclusions

This report does not attempt to quantify any of the health risks of alternative reticulated sewage options previously proposed.

Matata community

According to the 2006 census, 642 people normally live in Matata – a decrease of 3.6% since the 2001 census. 15.4% of the population are aged 65 or over, 22.4% under 15 years. 56.4% identified as Māori.

There are 243 occupied dwellings in Matata, with 62% privately owned, just over 25% rented and the remainder held in a family trust. The main street has a hotel, and several small retail businesses.

There are three small streams flowing through the community: Waitepuru, Awatarariki, and the sporadically flowing Waimea (Appendix 4, Figure 2). Although they do not appear to be suitable for swimming, these streams may be the site of play activity by children. The streams (and groundwater) flow into a lagoon between the township and the beach. This lagoon does not appear to be used for swimming, and recreational activities such as boating are apparently infrequent. The lagoon is inhabited by significant numbers of waterfowl.

[2] Matata Wastewater Project Update to Ministry of Health, 8th May 2012

Previous Health Impact Assessments

Matata Wastewater Scheme HIA (Opus) 15 June 2004

The Opus 2004 report declared that continued use of septic tanks was not an option for Matata due to ground conditions being unsuitable for effluent fields, particularly due to high water tables.

Evidence for problems with septic tanks was supported by:

- History of poor performance reported by Whakatane District Council, and described in Council Records.
- Requirement for upgrades of septic tanks based on anecdotal reports by residents across the township (not just where the water table is high), of which some of the upgrades were recorded by the Council.

Five potential exposure pathways were identified:

- Failure of effluent fields leading to surface contamination of sections with potential for exposure of children playing outside and pets carrying contaminants inside dwellings. Support for effluent field failures was derived from District Council Records, where complaints from the public about effluent seepage and odour problems led to investigations by the Council. Extensive work on public toilets to remedy problems has been undertaken.
- Contamination of surface streams with septic effluent leading to exposure of children playing in streams. Bacterial monitoring in 2004 showed elevated levels of *E. coli* after rain (increase from 460 cfu/100ml upstream of the township to 4600 cfu/100ml downstream, in the Waimea stream), as well as increases in nitrate levels.
- Contamination of Matata lagoon with effluent leading to exposure via boating and fishing or (limited) swimming (regarded as much less likely than the two exposure pathways above).
- Contamination of water supply by negative pressures occurring in reticulation pipes drawing in contaminated groundwater. *E. coli* had been found in drinking water samples, leading to a periodic requirement for chlorination of the reticulated drinking-water.
- Contamination of open coast (not considered likely)

The first two exposure routes (poor septic tank performance and required up-grades of some septic systems) were regarded as a particular problem after rainfall due to the high water table.

Notifiable disease data provided by Toi Te Ora Public Health Unit were reviewed by Opus. From 1987 to 2003 reported cases from Matata (population approximately 670) were six of campylobacteriosis and one of salmonellosis. *Note: It was claimed in the Opus 2004 HIA that the incidence of campylobacteriosis was higher in Matata than for the Whakatane District as a whole, apparently based on campylobacteriosis*

being a higher proportion of all notified cases from Matata, compared to Whakatane. However a total of six cases over 16 years from a population of 670 represents a low reported rate by national standards. For Matata the average annual rate of about 56 per 100,000 was at a period when the national notification rate of campylobacteriosis rose from 100 to 300 per 100,000.

The proposed reticulated scheme was considered by Opus to remove all of the main exposure pathways (except in the extreme circumstances of reticulation overflows).

2009 Public Health Impact Assessment update

The Health Impact Assessment was updated in December 2009 by Harrison and Grierson Consultants. Part of this update included updated notifiable disease data from 2004 – 2009. Over this period one additional case of campylobacteriosis, two cases of salmonellosis, one case of giardiasis, and one of leptospirosis were reported. The Harrison and Grierson Consultants' report claimed that the incidence of these three diseases increased from 1987 compared to the 2003 data.

Health of the Matata Community

Notifiable disease data

Cases of notifiable disease are a primary source for evaluating the health status of a community. The notifiable disease and outbreak database EpiSurv was examined to identify cases or outbreaks reported from Matata between 1 May 2002 and 1 May 2012. Case reports were anonymised with only meshblocks (not addresses) obtained. No outbreaks were reported in Matata over that period. A total of seven potentially waterborne notifications were found (Table 1)[3].

Leptospirosis is transmitted from the urine of infected animals, and the urine may contaminate waterways either through direct deposition or through runoff. It is highly improbable that the one leptospirosis case was related to septic tank seepage.

There were two salmonellosis cases in 2005, which were likely to be from the same family (same onset date, same meshblock). Over the other years there were also two campylobacteriosis and two giardiasis cases. There was no temporal or spatial clustering of these cases (Table 1, Figure 1).

When compared with notification rates over 10 years in the rest of the Whakatane District, there was no statistical difference in notification rates for salmonellosis and giardiasis, and a significantly lower rate of campylobacteriosis (Table 2).

All but the two salmonellosis cases were in people older than 15, which makes them less likely to be acquired through playing in streams. According to EpiSurv notes, the 2011 campylobacter case was likely to be related to occupational exposure outside of Matata. While the pathogens reported may be transmitted to people via water, they can also be transmitted via contaminated food, person-to-person contact with another case and, contact with infected animals/faeces. For campylobacteriosis, it is generally considered that contaminated food and animal contact are the two most common vehicles of infection in New Zealand.

[3] Potentially waterborne notifiable diseases are: campylobacteriosis, cholera, cryptosporidiosis, gastroenteritis, giardiasis, hepatitis A infection, leptospirosis, paratyphoid infection, salmonellosis, pathogenic *E. coli* infection, typhoid infection, yersiniosis.

Table 1 Potentially waterborne notifications for Matata 1/05/2002 - 1/05/2012.

Year	*Month*	*Disease*	*Age Group*
2002	no cases reported		
2003	no cases reported		
2004	April	Campylobacteriosis	60 to 69
2005	January	Salmonellosis	5 to 9
2005	January	Salmonellosis	10 to 14
2006	March	Giardiasis	30 to 39
2007	no cases reported		
2008	September	Leptospirosis	50 to 59
2009	no cases reported		
2010	no cases reported		
2011	June	Giardiasis	30 to 39
2011	August	Campylobacteriosis	15 to 19
2012	no cases reported		

Table 2 Calculated average annual disease rates per 100,000 May 2002-May 2012

Disease	*Matata Pop= 642*	*Whakatane Pop= 32,658*
Campylobacteriosis	31	185
Giardiasis	31	35
Salmonellosis	31	31

Figure 1 Meshblock levels locations of notifications. Note the home addresses of cases could be anywhere within the meshblock shown for the cases. Where C = campylobacteriosis, G = giardiasis and S = salmonellosis.

Discussion

Only a proportion of actual cases of disease are notified. Under-reporting is caused by:

- people with (usually milder) symptoms not visiting a GP;
- GPs not taking clinical specimens for laboratory diagnosis;
- the causal pathogen not being detected by the laboratory and;
- failure to notify.

Therefore, the number of actual infections will always be higher than the number of notified cases. Consequently, notification data are affected by a number of influences, particularly access to local health services such as general practitioners. There are also a range of possible exposures for notified diseases, few of which are accurately identified for any notified case. Small numbers of cases also limit the statistical significance that can be assigned.

With these caveats in mind, the available notified disease data does not signal any particular gastrointestinal disease problems in Matata.

Water Quality Investigations

Matata Wastewater Scheme Health Impact Assessment prepared by Opus International Consultants, 2004

The Waitepuru, Waimea and Awatarariki Streams were sampled on four occasions between 16th January and 4th February 2004. Upstream samples were taken from railway culverts (Sites 1, 6 and 11), and downstream samples from Arawa Street (Possibly near sites 5, 10 and 12). Results are presented in Table 11, and sampling sites indicated on the Map in Figure 2 – both in Appendix 4.

Elevated levels of *E. coli* were found in the upstream sites of all three streams – a maximum of 3100, 830 and 1600 *E. coli*/100ml respectively. A source for these *E. coli* in the water before the township was not identified. There was no increase in *E. coli* levels in downstream samples of the Awatarariki Stream (Site 12). There were increases in the downstream *E. coli* levels of samples from the Waitepuru and Waimea streams of between two and nine-fold (Table 11, Appendix 4). The biggest increases were associated with rainfall events.

Investigation of on-site effluent disposal prepared by Paul Scholes, Environment Bay of Plenty. May 2005

This report examined the physical environment of Matata township, noting the high water table (generally within 1 metre of the surface), and the lagoon as a sink for surface water and possibly some groundwaters. Annual rainfall average for 1990 – 2000 was 1365 mm (compared to 1200 – 1400 mm for Whakatane, and 1200 mm for the Bay of Plenty).

Complaints and issues with septic tanks were reviewed. Most relate to heavily used systems, particularly the public toilets and hotel. The Department of Conservation considers the Matata lagoon to be a potential sink for septage from septic tanks, and has objected to further subdivision and development.

Surface water monitoring data from 1992 to 1993 were reviewed. Some data were consistent with septic tank effluent contamination (correlation of nutrient and faecal coliform levels at some sites, higher bacterial loadings after rainfall).

More recent monitoring data from 2004 were also reviewed. There appeared to be no strong correlation between rainfall and faecal coliform concentrations in the Waitepuru stream. However, the levels of oxides of nitrogen increased between upstream and downstream sampling sites of

this stream, which is consistent with septage seepage. Faecal coliform concentrations versus ammonium nitrogen, nitrate nitrogen, and total phosphorus in the Waitepuru stream at site 5 were strongly correlated, but not at the upstream rail bridge site. This suggests contamination by poorly treated septage.

It was noted that measurements from samples taken in Matata lagoon are complicated by the contribution from wildfowl. *E. coli* levels were above the guideline (Action/Red Mode) for freshwater contact recreation (550 cfu/100ml)[4] but this was considered unremarkable given the wildfowl population, and flows.

The report concluded: "Examination of water quality surveys undertaken shows very little direct evidence of contamination from septic tanks. Anecdotal evidence shows some systems are prone to failure. Given the level of bacterial contamination in some surface waters contamination from septage is highly probable".

The strongest evidence supporting septic tank seepage was increased nitrate-nitrogen in the Waitepuru stream from the upper to lower urban reach. Contamination of waterways from septage was considered likely, given the age of some systems, and high water table. The report concludes that bacterial levels were similar to those of some sewered urban waterways.

Bay of Plenty Regional Council monitoring data report 13 October 2011 (Paul Futter)

Stream and drain samples were taken on 13th October 2011 at upstream and downstream sites on Waitepuru Stream, Awatarariki Stream, lower parts of the Waimea Stream and drains in Richmond Street and Arawa Street. *E. coli* levels were very low in all samples except for a drain near the Matata Hotel. Only modest numbers of *E. coli* (with only 1 out of 10 results above 550 cfu/ml) and levels of other contaminants were detected.

Bay of Plenty Regional Council monitoring data report 31 May 2012 (Paul Scholes)

Stream and drain samples taken in April and May 2012 (after rain events) were described as similar to those from 2004, in that surface waters showed some contamination likely to be of septic tank origin. Downstream samples from the Waimea (Site 5) and Waitepuru (Site 10) streams and a drain (Around site 17) showed elevated numbers of *E. coli*.

[4] As described in the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Area, Ministry for the Environment/Ministry of Health, 2003 update.

There was little evidence of contamination of groundwaters, based on sampling of a number of springs located in freshly dug drainage channels, which did not show any faecal contamination. Bacterial levels in the lagoon were unremarkable.

It was recommended that on the basis of the potential health risk posed in two streams the public should be warned against coming into contact with these waters. The Waimea Stream was described as relatively inaccessible to the public (this contrasts with the 2004 Opus report that identified the Waimea Stream as "readily accessible to children due its immediate proximity as it traverses the town"). The Waitepuru Stream was described as accessible in the lower reaches.

ESR/Beca Surface and groundwater sampling May/June 2012

Water samples were collected from 15 sites on 30th May (between 11 am and 1 pm) and 11 sites on 6th June 2012 (between 9 am and 11 am). Sampling locations are shown in Appendix 4. On the 30th May conditions were dry and clear. There had been 36 mm of rain in the previous 72 hours. Ground conditions were soft, but not sodden. On the 6th June it was overcast with light rain during sampling. The previous day there had been heavy rain. The ground was sodden/saturated.

Samples were tested for total coliforms (TC) and *E. coli* using the Colilert test. The previous Bay of Plenty Regional Council sampling had been tested by membrane filtration methodology, which generated faecal coliform and *E. coli* test results. The *E. coli* results between the two methods are equivalent and directly comparable. However, faecal coliforms are a subset of total coliforms and should not be compared with total coliform results. Total coliforms have a large number of environmental sources not all of which are faecally associated. Faecal coliforms, while associated more with faecal sources, also have non-faecal sources. Therefore, *E. coli* is the best indication of faecal contamination.

Testing results are presented alongside the 2011 and 2012 Environment Bay of Plenty testing results in Appendix 4, and described by individual site in the sections below.

Selected samples were also tested using up to three different faecal source tracking tools: faecal sterols, DNA markers, and fluorescent whitening agents.

Faecal sterols

Sterols are lipids that have important biological functions, in plants and animals, including maintenance of cell wall structure. The subgroup of "faecal" sterols is found mainly in human and animal faeces, and the sterol "fingerprint" can be quite distinctive between species. In particular,

human faeces have high levels of the sterol coprostanol and the analysis of ratios of sterols generates a fingerprint that is able to discriminate human faeces from other sources. Biotransformation of sterols occurs in the large intestine, where microbial populations convert digested sterols such as cholesterol to a range of other sterols. Three samples were tested for faecal sterols.

DNA markers

A range of microorganisms are present in faeces, some of which are specific to their animal hosts. Total DNA is extracted from a water sample and the sample is examined using the polymerase chain reaction (PCR) for DNA from source-specific organisms. The presence of certain microorganisms indicates the source of the faecal contamination. Assays were used that are specific for humans, herbivores, dogs and ducks. Five samples were tested for DNA markers.

Fluorescent whitening agent analysis

Fluorescent whitening agents (FWAs) are common constituents of washing powders used to brighten clothing. Most household plumbing systems mix effluent from toilets with 'grey water' from washing machines. Consequently, FWAs are usually associated with human faecal contamination in both septic tanks and community wastewater systems. The presence of FWAs indicates human effluent. Nine samples were tested for FWAs.

Site 1
Waitepuru Stream.
Upstream site before the stream enters the culvert under the railway line.

30th May	
Total coliforms (TC):	840
E. coli:	60
FWA	ND*
6th June	
TC:	810
E. coli:	20

Site 2
Waitepuru Stream, Wilson St
Seaward side of road

30th May	
TC:	1220
E. coli:	160
FWA	ND*
6th June	not sampled

Site 3

Waitepuru Stream, Nesbitt St
Seaward side of road

30th May	
TC:	1850
E. coli:	300
FWA	ND*
6th June	not sampled

* ND – Not detected. The detection limit for FWAs was <0.001µg/L.

<table>
<tr><td rowspan="2">  </td><td colspan="2">Site 4

Waitepuru Stream, Heale St Seaward side of road</td></tr>
<tr><td>30th May
TC:
E. coli:
FWA

6th June
TC:
E. coli:</td><td>
2790
360
ND*

6870
130</td></tr>
<tr><td rowspan="2">  </td><td colspan="2">Site 5

Waitepuru Stream, beside the lagoon over the main road.</td></tr>
<tr><td>30th May
TC:
E. coli:
FWA

6th June
TC:
E. coli:</td><td>
3610
1110
0.002µg/L

11200
240</td></tr>
</table>

Waitepuru Stream, beside the lagoon over the main road (Site 5) had the highest levels in this stream of *E. coli*, and as the most downstream site on the Waitepuru Stream, it could, potentially, be impacted by all the properties adjacent to this stream. The sample from site 5 was also tested for DNA markers and faecal sterols.

Faecal sterol levels were very low at site 5. This low level is not consistent with human faecal pollution. Indicative DNA markers for human faecal sources (*Bacteroidetes* and *B. adolescentis*) were not detected in this sample.

Fluorescent whitening agent (FWA) analysis was performed on all the 30th May 2012 Waitepuru Stream samples. FWAs were below the detection limit (<0.001µg/L in all samples, except for the most downstream site where a very low level of 0.002µg/L was detected. Levels above 0.1µg/L are indicative of human sewage.

There is a small increase in *E. coli* levels as the Waitepuru Stream passes through the township. This increase is comparable with most reticulated urban areas[5] and could be the result of stormwater runoff, wildfowl, and dog inputs, in addition to contributions from septic tanks.

The source tracking analysis indicates that raw sewage is not entering the streams.

[5] Neale, M. W. (2012). State of the Environment Monitoring: River Water Quality Annual Report 2010. Auckland Council Technical Report

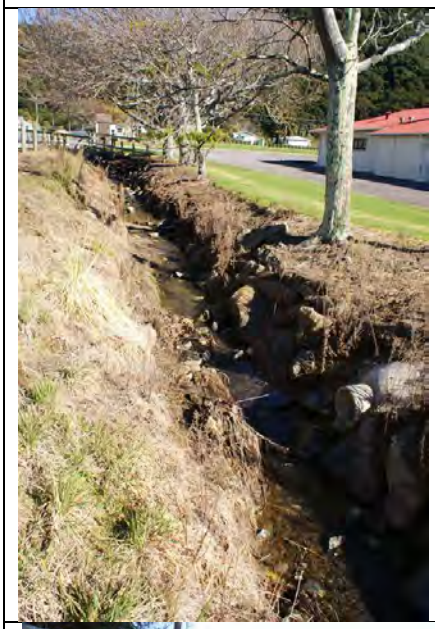
2012 ESR Testing of Waimea Stream and Clarke Street Drain

The Waimea Stream enters the township behind Pakeha Street, close to Mair Street and meanders past the Matata Grounds. The Clarke Street drain joins the Waimea Stream at Grace Street and they discharge to the lagoon via a culvert under Arawa Street.

Site 6

Waimea upstream site. Sampled reserve side of railway line.

30th May	
TC:	720
E. coli:	60
6th June	Not sampled



Site 7

Waimea Stream by Rugby Clubrooms at the corner of Division Street and Wilson St.

30th May	
TC:	1220
E. coli:	150
6th June	
TC:	>24200
E. coli:	345

Site 8
Waimea Stream before the junction with the Clarke Street Stream.

30th May	
TC:	4720
E. coli:	110
6th June	
TC:	>24200
E. coli:	660

<table>
<tr><td rowspan="2">  </td><td colspan="2">Site 9

Clarke Street stream before it joins Waimea Stream</td></tr>
<tr><td>30th May
TC:
E. coli:
FWA

6th June
TC:
E. coli:</td><td>

>24200
2140
<0.001µg/L

17330
1200</td></tr>
<tr><td rowspan="2"> 
  </td><td colspan="2">Site 10

Waimea Stream culvert at point of discharge into the lagoon. Sampled from off the concrete lip.</td></tr>
<tr><td>30th May

TC:
E. coli:

6th June</td><td>

10460
570

not sampled</td></tr>
</table>

The Waimea Stream *E. coli* results are consistent with those from previous sampling by the Bay of Plenty Regional Council, in that *E. coli* counts of up to approximately 1000 cfu/100 ml are found. The exception is a Regional Council sample taken on 27 April 2012, which had >10,000 *E. coli*.

Samples from the Clark Street drain (Site 9) have consistently shown higher levels of *E. coli* in both the ESR/Beca and Regional Council

sampling, and numbers are above the recreational water Red Mode guideline.

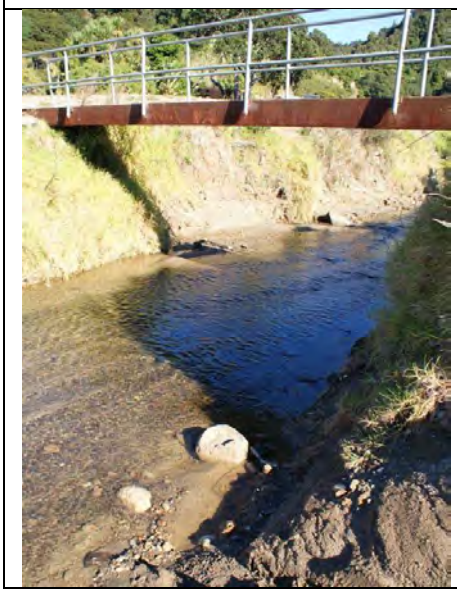
A sample from the Clark Street drain (Site 9) was tested for faecal sterols. The sterol ratios were consistent with a human/animal source, but the sterols ratios were not consistent with those found in solely human sources. This suggests that biotransformation of human sterols has occurred. This sample contained DNA markers indicative of human sources. Together, these results indicate that elevated *E. coli* are present in this drain, which are likely to originate from human sewage. The sewage has however undergone some level of environmental biotransformation – whether in septic tanks or soil. The levels of *E. coli* would be cause for concern if humans were exposed. FWAs were below the level of detection in this sample. FWAs become associated with human sewage via grey water from washing of clothes. The absence of FWAs may mean that grey water is not being mixed with human sewage at the problem sites, that properties involved have not done washing recently, or that they use FWA-free washing powders (for example http://www.ecostore.co.nz).

2012 ESR Testing of Awatarariki Stream and Groundwater

<table>
<tr><td rowspan="2">  </td><td colspan="2">Site 13

Richmond Street Groundwater</td></tr>
<tr><td>30th May

6th June
Total Coliforms (TC):
E. coli:</td><td>not sampled

17330
<1</td></tr>
<tr><td rowspan="2">  </td><td colspan="2">Site 12

Awatarariki Stream. On far side of footbridge.</td></tr>
<tr><td>30th May

TC:
E. coli:

6th June</td><td>

910
60

Not sampled</td></tr>
</table>

Testing of Richmond Street ground water and Awatarariki Stream show low levels of *E. coli*, and so no evidence of contamination from faecal sources, which is consistent with sampling conducted by Bay of Plenty Regional Council in 2011 and 2012.

Previous sampling in 2004 found elevated levels of *E. coli* in the Awatarariki Stream, but these were present in the upstream sampling site, indicating that the source of pollution was upstream of the township. Whatever this unidentified source was, it appears that it no longer contributes to water pollution (see Table 11, Appendix 4).

2012 ESR Testing of Lagoon

Three sites in the lagoon were sampled. Site 21 was adjacent to a stormwater discharge inlet, although with the high level of the lagoon it was not possible to observe if there was a discharge at the time of sampling.

Site 20

Lagoon at Waimea/Clark Culvert.

30th May	
TC:	15530
E. coli:	2380
FWA	0.016µg/L
6th June	
TC:	>24200
E. coli:	490

Site 21

Lagoon at stormwater discharge into lagoon opposite the Matata Pub.

30th May	
TC:	12000
E. coli:	170
6th June	
TC:	3650
E. coli:	520

Site 22

Lagoon beside beach access Road

30th May	
TC:	7700
E. coli:	570
FWA	0.002µg/L
6th June	not sampled

The sample from the lagoon at the Waimea culvert (Site 20) was analysed for sterols and DNA markers. The concentration of these was similar to the sample from the Clarke Street site (Site 9) but the ratios of different sterols were consistent with wildfowl and plant based sources. This sample also contained duck indicative DNA marker.

FWAs were analysed in two of the lagoon samples, with low levels detected. This may indicate grey water sources that are not mixed with human sewage.

These data do not support contamination of the lagoon from septic tanks. Significant numbers of wildfowl on the lagoon (at least 100 were observed on the 30th May) appear to be the major contributors to faecal contamination.

Wildfowl on the lagoon

2012 ESR testing of pipe from beside Matata Hotel

This pipe was flowing steadily and samples were taken directly from the pipe. The ditch it discharged into had little water in it, and disappeared under Arawa Road.

Site 30 Running pipe draining from beside the hotel.	
30th May	
TC: *E. coli*: FWA	>24200 >24200 2.03µg/L
6th June	
TC: *E. coli*:	>24200 9800

The samples from this site contained the highest numbers of *E. coli* of all the ESR/Beca samples. A sample was on the 13 Oct 2011 by Paul Futter, Bay of Plenty Regional Council just downstream of this pipe at the point where it goes under Arawa Road. *E. coli* measured were reported as 14,000 cfu/100ml. Testing of the 30th May sample for DNA markers, identified human indicative markers, indicating minimal biotransformation of faecal inputs. FWAs were also detected at levels consistent with human sewage – hundred fold higher than any other sample.

As noted by Paul Futter, this may be the result of either seepage from the Hotel septic tank disposal field or the properties above. Either way it appears an ongoing issue and needs further investigation and remediation. It is certainly the site most consistent with human faecal material.

Resident survey

Background

A household survey was prepared and administered by the Whakatane District Council. The survey questions are summarised in Table 3. A house-to-house delivery was undertaken on June 3rd 2012 to approximately 260 properties. Another 148 surveys were sent on June 5th 2012 to those on the Whakatane District Council rating database who did not have a Matata street delivery address). Included were a covering letter, process flowchart, the survey and a prepaid envelope.

Responses had been received from 129 households by 3rd July 2012 (Table 3). Forty percent of responses believed a sewage reticulation, treatment and effluent disposal system was needed for Matata, with 46% indicating sewage reticulation wasn't. Only 23% were willing to pay an increase in rates to cover treatment costs. Eleven percent reported problems with operation of septic systems, and 19% bad smells. Most (67%) people were happy to have a septic tank inspection and provided their address details. From the first 11 responses received, the approximate locations of those who answered questions 1 and 3 and provided their address are shown in Appendix 5. The survey also asked for reasons why a reticulated sewage scheme might be needed and other comments which are listed in Appendix 1.

Table 3 Survey responses

Question	*Yes*	*No*	*Don't know**
1. Do you think a sewage reticulation, treatment and effluent disposal system is needed for Matata?	52	59	18
2. If a wastewater treatment system was installed, part of the construction cost and the operating cost would fall upon Matata ratepayers. Would you be prepared to see your rates increase to cover the treatment costs?	30	87	12
3. Are you aware of any problems with the operation of your septic tank?	14	107	8
4. Have you noticed any bad smells in the streams and drains running through Matata? (If Yes, please state where and when this was)	21	85	6
5. If required, can we come and inspect your septic tank and effluent field? (If yes, please provide your address and contact details)	87	33	9
6. How long have you lived in your current house in Matata?	average 16, range 2 months to 68 years		
7. Are you the owner of your house?	107	16	6

*Or no response

Septic tank or effluent disposal complaints for Matata township

Whakatane District Council Health Nuisance Files

In June 2012, Lisa Millican, Environmental Health Officer, Whakatane District Council, reviewed the Health Nuisance Files, 26.9.5, for health nuisance complaints concerning septic tank and effluent disposal problems for Matata. File 26.9.5 ranges over several volumes. Volume A was destroyed in June 2008 so information prior to August 1997 is unobtainable. Volume B ranges August 1997 until June 2001. No septic tank or similar problems on file for Matata were found for this time period. Review of files Volumes C up to current Volume F (current) found a number of relevant records spanning 2001 to 2012 which are summarised in Appendix 2.

The information summarised in Appendix 2 lists types of problems that have been responded to by environmental health staff in Matata Township. There may well be other instances where property owners have instigating necessary drain repairs and/or upgrade or similar maintenance work without involving Whakatane District Council. It is also possible that Council staff working under other legislation may have responded to concerns about effluent disposal system problems e.g. building control staff. Information relating to this work by building officers may have been filed elsewhere, possibly on individual property files.

The Matata Playground and Public Toilets have been subject of concern on and off over the years. Initially the upgraded Matata public toilets were of concern because of on-site effluent disposal problems, then more recently further to Lagoon works, seepage and water ponding about the actual playground fixtures was concerning to the residents as the same could not be used such was the extent of the water ponding. During the ponding, it must be noted that the on-site effluent disposal area was clear of water ponding and the system functioned correctly.

Matata Public Toilets

Application of Auckland Healthcare (A+) Assessment Matrix to Matata on-site wastewater disposal

Background

In 1998 Auckland Healthcare Services developed for the Ministry of Health a set of public health criteria for the assessment of on-site wastewater disposal systems in order to assess the need for the introduction of reticulated sewerage systems[6]. This document has been widely used by local authorities in New Zealand. An assessment protocol and associated set of criteria were designed that would assist in determining whether a community requires reticulated sewerage in order to prevent possible risks to public health from existing on-site wastewater systems. The grading is based on an Environmental Grading and a Site Management Grading (Appendix 3, Tables 9 and 10), which are then combined to give an overall grading (Table 4, below).

These gradings should be performed on 100 sections or 10% of the properties, whichever is less.

To maximise assessment of potential public health risk conditions it is important that this protocol be implemented during winter when rainfall and groundwater levels are highest and failures are most likely to occur.

The authors note that this grading makes no attempt to estimate the cost/benefits of reticulated sewage installation to a community. They also state that the grading tally and recommendation process set out should not be used as the sole method for reaching decisions on the dividing line between remaining with (or adopting) on-site systems, or proceeding to community sewerage reticulation. Such a decision will depend on a wide range of factors including economics, risk perception and community aspirations.

Table 4 A+ Grading Keys. Lower scores are better.

Environmental grading

Environmental	Score	Grade
	<11	A
	11-30	B
	31-55	C
	>55	D

Site management grading

Site management	Score	Grade
	<16	1
	16-45	2
	46-65	3
	66-80	4
	81-110	5
	>110	6

[6] **Auckland Healthcare Services (1998).** Community Reticulation Criteria- Proposed criteria for introducing reticulated sewerage systems to small communities based on risk assessment of individual on-site wastewater disposal systems: A report to the Ministry of Health. Auckland Healthcare Services Auckland.

Undertaking actual inspections of properties in Matata was beyond the scope of this report. However to illustrate the results that may be observed if this were actually done, we have estimated gradings for Matata township based on the A+ gradings. These are not based on individual section inspections, but provide an indication of possible gradings that may be observed. The score in brackets is from Appendix 3 Tables 9 and 10.

Environmental Grading for Matata

Environmental factors (Table 5) need investigating on a site-by-site basis. Auger tests at Arawa Street near Warbrick Terrace indicate a range of medium sands, minor clays, and groundwater levels of about 1 m. If groundwater levels are kept low, good drainage (score 3), and high soakage rates are possible (score 3). Groundcover is grass on most sections (score 2), although some may be planted. The climate has high sunshine, medium rainfall on low lying land (score 3).

Adding the above scores to the terrain type in Matata would mean that flat sections (score 1) would have a total score of 22 (Grade B) (refer table 4), undulating section a score of 26 (Grade B) while steep sections a score of 31 (Grade C). The lower the score, the better suited the setting is for on-site systems. Drainage problems will increase scores, and lower the grading.

Table 5 Possible Environmental Factor scores for Matata

Environmental Factor	Description	Score
Subsoil investigations	good drainage e.g., medium-fine and loamy sand	3
Soakage rates	300-100 mm/hour	3
Slope	flat (slope 0 - 5°)	1
	undulating (slope 6-15°)	5
	steep (slope greater than 15°)	10
Climate	medium rainfall high sunshine levels medium wind low lying land	3
Groundwater level (winter)	300 mm - 1.6 m	10
Groundcover	grass	2

Site Management Grading

Site management gradings could generate a wide range of scores (Table 6). For most properties in Matata a base score of 35 is likely based on reticulated drinking water (score 1), community size of 600 (score 3), housing density >16/km^2 (score 10) and section sites of <1,000m^2 (score 20), and year round occupancy (score 1).

If stormwater is controlled and maintained (score 1), volume of daily waste is minimised (score 1), and a new onsite sewage system is installed, then another 6 points would give a total score of 41, for a Grade of 2. At the other end of the scale, under this scenario, but without an effective onsite treatment system, a score of 107 is possible for a Grade of 6.

In between these extremes, small septic tanks (score 15), older than 20 years (score 15), with maintenance every 5-10 years (score 10), and a single failure (score 3) would generate total score of 80, just inside Grade 4. Larger tanks (score 1), up to 20 years old (score 10), maintained every 5 years (score 5), and with a single failure with remedial action (score 3) would generate a total score of 56, just inside Grade 3.

Table 6 Potential site management factor scores for Matata

Factor	Description	Score
Number of failures	never	1
	once, remedial action taken	3
	one or more, no action taken	20
Age of system	New	1
	6-10 years	5
	11-20 years	10
	>20 years	15
Maintenance	every 3 years or less	1
	every 5 years	5
	every 5-10 years	10
	never	20
Septic tank capacity	>660 L/person	1
	<540L/person	15
Volume of waste (daily)	140-250L/person	1
	250-320L/person	5
Size of site	<1000 m^2	20
Stormwater control	Stormwater control evident and maintained	1
	stormwater control not present	20
Seasonal occupancy	constant year round	1
Community Housing density	>16/km^2	10
Community size	100-500	3
Community source of potable water	reticulated	1

Overall Grading

Environmental gradings of B for flat sections, and C for undulating to steep sections are likely, although some sections may be worse. Site management gradings of 2 for a new system are possible, 3 for older well maintained systems, and 4 or more for inadequate systems. When these gradings are combined, total gradings for Matata are likely to fall within the blue circle on Table 7. However some properties would be expected to be outside this area, with both poorer and superior gradings.

The A+ matrix suggests that reticulation will be required if more than 1% of properties fall in the red region, or 10% or more fall in the orange area. To determine how many properties fall into each category, actual inspections of individual properties will be required. The uncertainty around the size and position of the blue circle would then be reduced.

This preliminary analysis also highlights two other factors. First that Matata is clearly at risk if no action is taken, and second, that improvements to onsite systems such as reducing water use, stormwater management, and regular maintenance could improve the gradings achieved on some properties.

Table 7 Total community tally

	Site management grade					
Environmental grade	1	2	3	4	5	6
A						
B						
C						
D						

Community recommendation step

clear	no public health risk: no action required
	monitoring of community systems and development required if 10% or more fall into this area
	community will require reticulation shortly to avoid public health risk if 10% or more fall into this area
	reticulation required now to mitigate likely public health risk if 1% or more fall into this area

Quantitative Modelling Approaches

Introduction

For the current onsite sewage disposal in Matata, the important potential hazards are microbial pathogens present in wastewater. As there are no industrial inputs to wastewater in Matata, chemical hazards are unlikely to be important.

Potential exposure routes are by ingestion, inhalation or absorption through the skin of effluent-contaminated water and consumption of mahinga kai harvested from these waters. The most important exposure routes would be through drinking water, water contacted during recreational activity, or consumption of food derived from (or in contact with) the water source.

If sufficient data are available, it may be possible to mathematically model human exposures to pathogens. Using exposure estimates and dose-response relationships it is possible to predict the probability of infection (or illness) for an individual, or using population data, to predict risk or number of cases in a community. The probability of infection can be benchmarked against international standards, such as those recommended by the World Health Organisation[7].

Such exposure assessments are best conducted using data on pathogen concentrations in the water. Often such data are not available, and so guidelines based on microbiological indicator data (such as *E. coli*) can be derived, using datasets where both indicator and pathogen measurements have been used, and assuming that the same relationship between indicators and pathogens exists. This approach has been used to develop the *E. coli* guideline values for freshwater recreational waters (Table H2 in the *Microbiological Water Quality Guidelines*[8]), which are based on estimates of the amount of water ingested during recreational swimming.

To assess the value of modelling, we first explore potential exposure pathways.

7 Guidelines for Drinking-water Quality, Third Edition, 2008: For a pathogen causing watery diarrhoea with a low case fatality rate (e.g., 1 in 100 000), this reference level of risk would be equivalent to 1/1000 annual risk of disease to an individual (approximately 1/10 over a lifetime).

8 Ministry for the Environment, 2003. Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas. New Zealand

Exposure pathway assessment

The original Matata Wastewater Scheme HIA (Opus) 15 June 2004 identified five possible exposure pathways:

- Failure of effluent fields leading to surface contamination of sections leading to exposure of children playing outside and pets carrying contaminants inside dwellings.
- Contamination of surface streams with septic effluent leading to exposure of children playing in streams.
- Contamination of Matata lagoon with effluent leading to exposure via boating and fishing or (limited) swimming.
- Contamination of water supply by negative pressures occurring in reticulation pipes drawing in contaminated groundwater.
- Contamination of open coast.

Each of these is discussed below, with an expansion of fishing to include mahinga kai.

Drinking Water

Since 1973, Matata has had a reticulated water supply piped 6 km from a source known as Jennings Spring in the Manawahe Hills west of Awakaponga. A pump station on the road between Edgecumbe and Matata supplies the 275 m^3 reservoir located on the hill behind Matata and water is gravity fed to the town below.

In 1995 the Council installed a permanent drinking-water treatment plant to chlorinate the water supply, which was upgraded to include UV water treatment in 2010. An additional 250 m^3 water reservoir was approved for construction in 2011.

The water supply is compliant for *E. coli* under the Drinking Water Standards, having in the most recent year of assessment complied in full including having a Public Health Risk Management Plan (PHRMP) implemented.

Local septic tanks could only impact on water supply if infiltration to water distribution network occurs. Provided the system maintains positive pressure this is unlikely.

Effluent fields

Evidence of effluent field failures was derived from District Council records, where complaints from the public about effluent seepage and odour problems led to investigations by the Council. Extensive work on public toilets to remedy problems has been undertaken. The absence of reported illnesses in young children does not support a significant risk of exposure from effluent fields during play, or from pets.

Exposure assessments for contamination of surfaces by failed effluent fields would require major assumptions concerning amounts ingested during play activities.

Failed effluent fields may contaminate home-grown fruit and/or vegetables. Controls on the location of effluent fields should prevent this from occurring.

Contamination of surface streams

The aesthetic appearance of and access to streams in Matata suggests that recreational swimming is unlikely. Nevertheless, water may be ingested during other recreational activities, in and around streams. Modelling of exposure from such activities would be feasible if assumptions were made about the amount of water that might be ingested.

However, in the absence of data concerning pathogen concentrations in these streams, the use of recreational water quality guidelines based on *E. coli* counts is more sensible.

Mahinga Kai

Fish, shellfish and watercress can all become contaminated with pathogens originating from untreated sewage. None of these are known to be harvested in the streams or lagoon so this would appear to be an unlikely exposure.

Recreational use of the lagoon and streams

Boating and fishing in the lagoon, with limited swimming, were reported as occurring in the HIA report from Opus in 2004. This report also considered contact with the lagoon water to be of much less importance than contamination of effluent fields or streams. More recent comments from WDC staff suggest actual recreational use of lagoon is minimal.

Water quality monitoring and source tracking analysis indicates that contamination in the lagoon is principally derived from wildfowl rather than human sources.

Contamination of open coast

Swimming in the ocean is a possible exposure route. The large sand bank would filter contaminates that might leach to this point, and dilution in the well-mixed beach area would mean exposures were not a significant health risk. The 2004 Opus report considered contamination of the open coast by septic tank effluent as “not at all likely”. We agree with this assessment.

Discussion

Most modelling approaches to health risk from water have concerned ingestion of drinking water, water from recreational swimming and other "on water" activities such as boating, and ingestion of contaminated seafood. We consider that modelling of the health risk from septic tank contamination of effluent fields and streams in Matata would not add to the health impact assessment. E. coli guideline values for freshwater are more useful as an indicator of risk.

Conclusions

The low rate of campylobacteriosis cases from Matata compared to the rest of Whakatane cannot be taken as evidence of a lower health risk. However, the notified rates (and the absence of reported outbreaks over a ten year period) suggest that the health risk in Matata is not elevated compared to the wider Whakatane District area.

The 2004 Health Impact Assessment reported sampling of the Waitepuru, Waimea and Awatarariki Streams on four occasions early in 2004. These analyses were notable for the very high levels of *E. coli* in upstream samples (up to 3100 *E. coli*/100ml). The increases observed in the downstream samples of the Waitepuru and Waimea streams were attributed to poorly performing septic tanks. However without the application of the more recently developed faecal source tracking tools, and a more extensive sampling programme, the validity of this conclusion is difficult to assess.

More recent microbiological monitoring by both Bay of Plenty Regional Council and that undertaken in this study, indicate that upstream water samples of all three streams have been consistently low in *E. coli*. Limited sampling of groundwater in Matata did not show faecal contamination. However, elevated *E. coli* numbers have been observed in the downstream part of the Waitepuru Stream, Waimea Stream, and the Clark Road Drain. Although the numbers of *E. coli* found often exceed the Action/Red Mode limit for the recreational water guidelines, they are not exceptional. For example, an assessment of stormwater in Clevedon showed *E. coli* concentrations of up to 198,000 MPN/100mL, indicating significant contamination from on-site wastewater systems[9].

Faecal source tracking indicates that some septic tank septage is getting into some of surface waters in Matata, but that it has undergone a degree of treatment. Only the discharge from the drain adjacent to the Matata Hotel was consistent with raw human sewage and should be investigated with some urgency.

Council records and the survey responses indicate that problems with septic tanks and effluent fields have occurred in Matata, and remediation work has been required.

Actual individual assessment of the onsite wastewater disposal systems using Auckland Healthcare Guidelines was not performed. But estimates of possible grades using these criteria, indicates potential issues with septic systems, but that environmental conditions are not such that septic

[9] http://www.manukau.govt.nz/tec/district/planchange/25WastewaterOrmiston.pdf accessed 20 June 2012

systems or some more advanced processes cannot be used for most properties **if properly designed, installed and maintained.**

Residents are split over the need for reticulation of sewage. Some report problems with their septic systems, which in some cases it would appear they have rectified. Most residents are not aware of problems with their septic systems (which would probably be most evident as failing drainage fields), suggesting that individual onsite sewage systems can function effectively.

Any contamination of the water is unlikely to result in disease as drinking water is reticulated from elsewhere, there is no swimming in the streams or lagoon, other recreational activities in the streams or lagoon are limited, and mahinga kai are not harvested from these waters.

Overall, these data do not make a compelling case for the introduction of reticulated sewage disposal system in Matata on the basis of risks to human health. However some current onsite septic systems are not functioning adequately. Quantifying the proportion of properties with issues and whether these can be adequately rectified will require individual onsite assessments. The areas around Clarke Street drain and along Arawa Street appear to be priority areas for further investigation.

Installation of a reticulated sewage system would have benefits including flexibility in land use, enhanced development opportunities and the removal of sewage disposal responsibilities from the local householder. There are however significant costs involved in sewage reticulation which need to be balanced against the benefits, and compared with the costs of continuing onsite treatment.

If reticulation is not pursued, or if there will be a significant delay until sewage reticulation, then the following recommendations should be adopted:

- We recommend that properties are inspected and home owners given advice on improvements required for their septic systems, and advice on how to maintain and operate any onsite system. In particular, a number of modifiable actions such as reducing water use, improvements to drainage, stormwater control, regular solids removal from septic tanks, as well as improvements to onsite sewage systems could all reduce any septic tank problems. Continued efforts to improve drainage should also improve onsite treatment.
- Any further development in Matata would need to carefully consider the practicality of additional onsite sewage disposal.
- As well as reducing health risk through improved onsite sewage systems, exposure risks to the public could be managed through erection of signage close to local streams to discourage children

playing in them. Education of the local community, particularly through the local school could ensure that they are aware of the need to avoid contact with streams after rainfall, not to drink stream water, and to wash hands after contact with the local surface water. These education messages are consistent for most New Zealand communities and reasonable to minimise an individual's exposure to pathogens in the environment.

Appendix 1 – Survey Comments from Residents

Reasons given in survey by respondents who think a sewage reticulation, treatment and effluent disposal system is needed for Matata

To remedy the on-going soakage problems in the town so Matata can grow/subdivide, bring it into population growth.
1. A more healthy environment - streams, play ground & parks etc. 2. More sections for housing re: subdivision and town expansion
As rate payer how system should be better than a septic tank system
Because back in 2004 Opus Consultants had tested the three streams in Matata and found significantly elevated levels of faecal coliforms, particularly after heavy rains.
Because I currently have the neighbours waste seeping up through my backyard and the system will stop this from happening. Also it is very costly to have the tank emptied which means mine may also leak.
Because of problems at Matata with runoff of effluent in several residential properties & lack of maintenance.
Because septic tanks just don't work. Water levels are to high because of the lagoon not flowing out properly and build up of silt.
Cause Matata is a growing township also for health reasons
Cost now to the cost later
Currently effluent 'drains' to the lagoon via septic systems because of the geography of the land.
Effluent needs treating properly. Water quality in the lagoon & streams & chances of cross contamination improved
Environmental tank leakage is endangering our environment
Ground too water logged
Having trouble with effluent field - 3rd time had field tiles put in 17 years
Health reason and water drainage is detraining
Health Reasons
It would be great not to have to empty septic tank. As when it flooded Matata it filled up with sand. It works ok, but need to go onto a sewage systems.
It would be wonderful to have due to problems with waste disposal from septic tanks
Like you - we don't like having to dispose of every drop of waste water &

wonder when our system will start.
Matata's lay of the land with hills in the background sloping towards the lagoon creates a large underground water flow during severe wet periods which raises the water table & spills sewage from septic tanks which past tests have shown.
Modernize the system, and be good to know waste leaves the town to be processed
More efficient; more hygienic; less chance of pollution/disease
Obvious - why should we be kept 3rd World!!!
Of some kind, not necessarily the usual system used 2day. Lets think outside the square for Matata, we are unpaid, just off the pension (2yrs to go) So where do we find the rate increase which will stay on for 50 years.
One point I wish to bring up is you do not mention cost per household.
Only way to keep land and people healthy
Septic Tank & Soak drainage is failing here, many of us are diverting our grey water to storm water run off.
Since the 2005 floods our septic tanks have been crap
So I no longer have to worry about sewage
So I no longer have to worry about sewage
The reason being a lot of septic tanks here in Matata are not working properly.
This year in particular ground water levels have been very high affecting many septic tank systems and possibly affect the wild life lagoons adjacent.
To allow growth & increased living intensity in urban areas rather than larger less efficient life style block development
To prevent ground water contamination.
Wastewater should be disposed of by the local authority in the best way possible.
Would create possible growth (building) surrounding community. A lot of the existing "septic tanks" are over 60 years old.
To allow further subdivision. Installation of individual treatment is even more expensive.
We need a reticulation treatment plant for our effluent disposal system so we don't get the repeat episode of what occurred at the corner of Division & Arawa Streets by public conveniences

Question 8. Is there any other information you would like to provide for our review team to consider?

About to build holiday/tourist residence and have commercial options available on site with reticulation S/S
An upgrade on looking after my septic tank. Have I planted too close to the drainage field?
As pensioners this project would be unaffordable to us as ratepayers.
Built in 2007, this property has a Devan Blue 9000 multi chambered aerated wastewater system - not an old style septic tank.
Cost of rates to high already
Cost per household would have to be considered as our rates in the next financial year will be above $4,000 with a sewerage system it could be up to $5,000 per year.
Ducks inhabit the southern & central streams & the football field has nitrogenous fertiliser applied regularly. These can affect nitrogen sampling giving erroneous readings Re: health risks. - See attached
There are some know areas of Matata which are challenges to conventional on site sewerage systems. These may be due to higher water tables, particularly where houses are built close to the ocean and areas with a clay layer under topsoil. The areas are not large and can be successfully dealt with by modification of the standard soakage system. In December 1996 Environment BOP issued their On Site Effluent Treatment Regional Plan with plan change no.1 6 December 2002. These documents describe systems which can be used in almost any situation to give satisfactory effluent treatment on site. There are system available which clearly deal with the main causes of poor effluent treatment in Matata. To help spread the cost of system upgrades in those areas where a need exists, I would be prepared to pay a one-off share of the costs. This is clearly preferable to paying the significant capital and on-going operating costs of a conventional sewerage treatment system.
Each time it rains there is a problem with water lying along my road frontage making it difficult to go in & out. Really need some drainage as section gets boggy!
Field tiles should be 42 metre and washing machine water put onto the lawn!
For $800 a quarter we get a rubbish collection! Not good enough! Current rates should include sewage reticulation treatment & effluent disposal.
Grey water from septic tanks inspected regularly. Is good nutrient taken up, processed by shrubs, grass, lawns, trees etc. at no cost instead of pumping out to sea or forestry. Why has the Council never inspected Matata septic tanks during my 30 years living here??? I have had it

pumped out periodically as required (3-5 Yearly)
How rich do you think we are? Our rates are dearer than when we were in Hamilton, and we get less e.g.. Lighting, kerb & channel, regular bus service, footpaths etc. Rates = Legalised theft!
I began work here in Matata with my father who was a builder and plumber/drain layer. We worked on many new houses here in Matata and did maintenance and additions on many others. This included adding new soak holes & soak drains to septic tank systems. Over the years and even lately I have seen several places in Matata have their back yards criss crossed with added soak drains and/or sump holes to fix up failing systems, it is getting to the stage where some residence are getting little room left on their sections. Some are reverting to diverting washing machine water, shower or both waste water onto their lawn, the stream or the road gutter. Last month I assisted my neighbour to find his diverted soak drain & new soak hole, this had again failed after 4 years or less, he had only put in a temporary offal hole, with the hope a waste system will go into Matata soon. I myself have had to do similar work.
I have noticed ground becoming soggy more and more since lagoon has been reline - e.g. (Clay sides)
I renewed my effluent field several years ago and installed a filter on the out flow of the tank. If septic tank systems are efficient (as in my case) there should be no need of an expensive sewage reticulation system.
I would assume actual rate cost would be borne by Matata ratepayer only. If so the rate assessment should be provided.
If and when a meeting will be held for the ratepayers of Matata because if we want to purchase a home here what will the rates increase to?
If the total cost is to be shared between the council & the ministry of health that may make a difference but for us there's no need for change. Also if the ratepayers were to have an increase in their rates to cover any of the cost, there would be really big financial worry for many many whanau.
Just another useless cost, not good doing odd septic tanks all or nothing!
Matata has a high water table since the flood and it must be addressed.
Matata is a nice place to live, just ask anyone who lives here. This coastal town needs changes to its infrastructure to attract rate paying people to the town. Provide the right environment and the people will come.
Need unfortunately is compromised by the ability for locals to afford further rate increases which are high for a population comprising of many low to middle earners & retired persons on fixed incomes.
Our rates are already excessive. I am not confident WDC will stay within budget and when reflecting on recent work, have the expertise to do the job!

Our rates are nearly $3,000. Adding capital expense of sewage system would be like having a mortgage to WDC. Can't afford it. Our septic tank is working fine, leave as is & use govt $$ to assist those to do theirs up.
Rates are too much now!
Rates Whakatane 1 property $3,065.00, rates 2 properties Taupo. House in the town or 50 acre block with house etc. $3,781.00 total.
Re: 2 Question - The whole of the Whakatane area & district should share in any rate increases. We have contributed (Matata) to the cost of sewerage in other areas.
Any problems with septic tank operation in Matata generally and in Richmond Street particularly, have been caused by rising groundwater level. The rising groundwater level has been caused by the lagoon works when silt excavated from those lagoons was used to landscape those works. The material hardened off to a concrete like substance which is impermeable to water drainage. In Richmond Street, recent work carried out when deep ditches were excavated on the seaward side of the street enabled the immediate lowering of the water table and consequent lowering of septic tank levels of my neighbours. The efficacy of those works can be seen by the continuous flow of water issuing from the drain exit.
Shocking questionnaire, loaded to you NOT doing anything! All communities deserve modern sewage systems. Matata is the gateway to Whakatane - you meet its needs please. Disgusting review process - of course there is a problem - you come and live here! Septic tanks are third world. This is loaded to you doing nothing - you promised us - you have been given money - USE IT!
Since living here we have had to put in another soakage drain, this has also failed.
Some septic tanks are old but all should be inspected
The ability for retirees to be able to pay a) connection fee b) connection to house costs & c) Inevitable rates increase.
The district council in giving building permits has obviously ignored the limitations for septic tanks and so is fully responsible for the results.
The original tests done by Opus are a joke, council has copies of my comments on it. Can supply again if required. Hope new work not by Opus. Regional Council tests of lagoon water show no problems!!
The team may want to consider how they would feel paying more on top of already huge rates, for something people on far less rates are already getting. Why not put out a questionnaire about how the people of Matata feel about the hugely disproportionate amount of rates we pay?

Especially for such a low socio economic demographic. You may say there have been few submissions for the LTP but that is because when hundreds of submissions were put in at last call they were totally ignored so people just rightly think what on earth is the use? Just talk to the people here about it, some are being forced to sell. Looking forward to receiving that questionnaire. I think the real problem here is we have no clout with representation from a councillor.
There is another (all in one) system, for the loo, not sure what its called or the bugs-eat-it-up system
This has been going on for approx. 30 years, something should be done as price goes up all the time.
We are very concerned of the rate hike that it will cause as we are struggling to make ends meet as it is!!
We have a new bio cycle system on our property, don't need to change it.
We have just installed new field drains as requested by you, cost us a lot of money.
We have noticed problems arriving with water overflowing from the sump only since the lagoon was formed and we have had a significant rise in ground water.
We need something but if is too pricey most of us won't be able to afford sewage.
Where's it going? The last two sites got washed away.
With money from existing rates clean septic tanks every 3-5 years *Problem Solved*
I personally have to meet EBOP resource consent conditions to install filters to both septic tanks on my property at 37 Arawa St Matata to comply by 30th June 2012, with the understanding if a sewage scheme is not up and running in five years I will have to replace these septic tanks with an Advanced System..... as we have seen with the Matata public toilets, they don't work very well at all, in the conditions we have out here. My concern is if we go down the track of upgrading our existing septic tanks EBOP will no doubt insist on this type of system and at $20,000 plus each we would be far better off putting that money into a sewage scheme in Matata. It would be criminal to delay "further" a sewage scheme in Matata..... after all Matata is a gateway into the Eastern Bay, so lets make it smell sweet.
Yes, my biggest concern is that we will have to pick up the shortfall. My second biggest concern is that council won't follow thru with what they say they're going to do, as I have experienced in the past and the flood mitigation works on my property.
Yes, please read the 2004 information pack with covering letter provided

by council in 2004 which I have attached. Please read - Matata debris flow mitigation structure, project review dated 13 March 2012. CPG Project No.705054. Relating to anticipated property development of the fan head area with sewage schemes and infill housing in mind.
Yes, the cost of this project if it goes ahead.
Your ability to waste money talking and duck shoving is incredible. Do some research and make a decision on viability versus cost and then let people know. Don't waste rate payers money being PC!!!!! Turning into another swimming pool saga……
Use some of the 10 million quoted to replace and upgrade the septic tanks of the town
Matata ratepayers can't afford to pay for a sewage system.
I have a new bio septic tank with the three chambers & pump that outputs to the garden
We currently only own a section - no house
The place is tenanted so inspection by appointment only!
Give us something you have!! We are not 3rd world out here. You have the money do it as you said you would. Matata entrance to Whakatane
The reticulation should be paid for by the whole district like swimming pool, Library, Ohope hill etc.. All other districts have got a sewage disposal system paid by all ratepayers.
We are affected by the disaster & cannot currently build on our section so would not be prepared to pay in the short term (but we get a rebate currently anyway). We do however see the benefit of having a community reticulation system.

Appendix 2 Health Nuisance Complaints relating to effluent disposal systems for Matata

Table 8 Summary of Health Nuisance Complaints (File 26.9.5) relating to effluent disposal systems for Matata

Date	Location	Nature of Concern	Findings	Comment
13/7/2001	Heale St, Matata	Toilet and gulley traps overflows	Substantiated. Tank and field tiles full water due to heavy rains	Upgrade of drainage system etc was needed to address problem
1/10/2002	Arawa Street, Matata	Raw sewage overflowing footpath	Unsubstantiated. Residents claimed actually grey water from caravan that had spilled and run down driveway. Cleaned it up	Demonstrates how effluent problem at forefront of community mind.
30/9/2002	Nesbitt Street, Matata	Caravan dwelling and long drop	Substantiated	Included because long drop not meant for use in urban situations and complaint arises as community awareness and its expectation is for environment and public health to be respected and protected.
19/11/2002	Nesbitt Street, Matata	Odour like oxidation ponds esp. bad on warm, still nights from Matata public toilets; have to close windows.	Comment on new public toilets. Work underway in response to concerns effluent.	Community tolerance to effluent odour is low. Lower tolerance of an issue often occurs when problems have been experienced.
13/01/2004	Arawa St, Matata	Matata Tennis Club toilet block vandalism	Unsubstantiated. Potential for problems if not maintained	As above
22/03/2004	Richmond Street,	Living in caravan and no toilet etc	Substantiated. Work done to have activity cease.	
13/05/2004	Memo from EHO to DI	Faecal contaminated stream water found by OPUS consultants work	Erected signage advising against swimming in English and Te Reo	Flowed on from the SWSS scheme work in response to community wanting to know what WDC was going to do about it.
2004/2005	Clark Street, Matata	Two pipes discharging into Waimea Stream	Substantiated. One grey pipe and one white pipe discharge soapy, sudsy grey water. Hadn't rained for a week in notes.	Example of undesirable behaviour. Arises as people attempt to lighten load on disposal systems, which are not coping for any number of reasons.

Date	Location	Nature of Concern	Findings	Comment
01/06/2005	Richmond Street, Matata	Complaint of living in caravan recurred and no sanitary facilities etc	Substantiated. Local returned to empty section.	Undesirable behaviour. Lack of finances, yet desire to be in Matata due to ties to land. Conflicting with legislation as living is substandard.
Matata 2005 Floods	Pollen St & Nesbitt St	Substandard housing found as a result of flooded house inspections	Use of long drops supporting substandard housing conditions.	Tolerated by the community. But was not in the interest of the people to continue to live in such conditions.
09/02/2010	Clem Elliot Drive, Matata	Complaint re family living in caravans etc with long drop	Substantiated	As above
26/08/2010	Arawa Street, Matata.	Complaint that raw sewage is running across pavement	Unsubstantiated. Ground water was seeping out. Blocked storm water pipe was the problem.	As above
26/08/2010	Arawa St - Matata Hotel	Complaint that raw sewage is leaking onto footpath	Unsubstantiated. As above blocked storm water pipe was the problem.	
30/09/2011	Wilson Street, Matata	Discharging liquid via pipe to stream.	Regional Council Pollution Prevention Officer tests liquid. Confirms high faecal coli form loading. Serve abatement notice to cease.	Person ceases illegal discharge and remedial works on on-site effluent disposal system required.
February 2012	Richmond Street, Matata	Liquid discharging from properties to curb.	Investigation work confirms faecal coli form loading indicting effluent contaminated liquid	Classed dangerous and insanitary buildings requiring remedy. Owners of newer house with new on-site system wrote and supportive of reticulated sewage system.
02/04/2012[1]	Heale Street, Matata	Complaint about rats and overflowing septic tank.	Substantiated problem with septic tank, signs of discharge about mushroom.	Property owner advised of need to abate nuisance conditions. Revisit found improved situation.

Appendix 3 – A+ Environmental and Site Management Grading Factors

Table 9 A+ Environmental Factors

Score	1	2	3	5	10	15	20	score
Subsoil investigations	free draining eg coarse to medium sand;		good drainage eg Medium-fine and loamy sand	moderate drainage eg sandy loam, loam and silt loam	1. slow draining eg sandy clay-loam, silty-clay-loam 2. rapid draining eg gravel, coarse sand	poor to non-draining eg bedrock present within 1m of ground surface		
Soakage rates	>300 mm/hour		300-100 mm/hour	100-50 mm/hour	50-25 mm/hour	<25 mm/hour		
Slope	flat (slope 0 - 5°)			undulating (slope 6-15°)	steep (slope greater than 15°)			
Climate	low rain high sunshine levels high wind high land			low rainfall low wind low sunshine low lying land	high rainfall low wind low sunshine low lying land			
Groundwater level (winter)	>3 metres			1.5 - 3 metres	300 mm - 1.6 m		<300 mm	
Groundcover	trees/bushes etc.	grass		barren				

Table 10 A+ Site management factors

Score	1	2	3	5	10	15	20	score
Number of failures[10]	never		once, remedial action taken				one or more, no action taken	
Age of system	new	1-5 years		6-10 years	11-20 years	>20 years		
Maintenance[11] (on systems older than 5 yrs)	every 3 years or less			every 5 years	every 5-10 years		never	
Septic tank capacity/person[12]	>660 L/person					<540L/person		
Volume of waste (daily)	140-250L/person			250-320L/person		>320L/person		
Size of site	> 4000 m^2			2500-4000 m^2	1000-2499 m^2		<1000 m^2	
Stormwater control	Stormwater control evident and maintained			Stormwater control evident and not maintained			stormwater control not present	
Seasonal occupancy	constant year round		seasonal occupancy increase of less than 5 people	seasonal occupancy increase of 5 to 10 people		seasonal occupancy increase of more than 10 people		
Community Housing density[13]	<4/km^2	4-16/ km^2			>16/km^2			
Community size[14]	less than 100		100-500	501-5 000		5 001-20 000	>20 000	
Community source of potable water	reticulated/ rainwater						adjacent spring/stream/ borewater	

[10] as defined in TP 58
[11] Maintenance includes service contracts, regular desludging and filter cleaning
[12] as per NZS 4610:1982
[13] Based on the US EPA guidelines of 1977, from Yates, M. Septic tank density and groundwater contamination. Groundwater. 1995; 23: 586-591
[14] As defined in the Water Supplies Protection Regulations 1961

Appendix 4 – Water Sampling Sites and Combined Table of Results

Figure 2 Sampling locations for water quality testing. Shown are sites at Waitepuru Stream (dark blue), Waimea Stream (red), Clark Street drain (orange), lagoon sampling sites (green), Richmond Street groundwater (light blue), Awatarariki Stream at top (purple), and drain west of the Hotel (black), and drains near the lagoon. Sites with white numbers are from ESR/Beca sampling May and June 2012, and some previous sampling. Sites with black numbers are only from previous samplings. Site descriptions and results are in Table 11.

Table 11 *E. coli* sampling results from 2011 and 2012. Colours indicate exceedences of water quality guidelines for recreational waters.

Sampling site	*Site*	*BoPRC*[15]	[16]	*BoPRC*[14]	*BoPRC*[17]	*BOPRC*[18]	*BOPRC*	*BOPRC*	*BOPRC*	*BOPRC*	*ESR*[19]	*ESR*[15]
Date		June 1992	Jan, Feb 2004	Jul, Aug 2004	Oct 2011	23/04/2012	24/04/2012	27/04/2012	30/04/2012	10/05/2012	30/05/2012	6/05/2012
Waitepuru Stream upstream	**1**	76	1400, 390, 3100, 1100	370, 110, 200	210	40	26	360	50	90	60	20
Waiteparu Wilson St	**2**										160	
Waitepuru Nesbitt St	**3**	68									300	
Waitepuru Stream Heale Road	**4**	88				180	470	2700	180	170	360	130
Waitepuru Stream d/s	**5**	110, 300	2900, 3600, 4600, 1600	140, 1000, 370	240	120	1000	3000	870	280	1110	240
Waimea Stream upstream site	**6**		360, 220, 830, 490								60	
Waimea Division Rd	**7**			670, 330, 4700		140	150	>10000	650	130	150	345
Waimea Grace St	**8**										110	660
Clark Rd Drain	**9**										2140	1200
Clark Rd/Waimea Drain	**10**		770, 570, 2200, 4600	110, 390, 47		2800	580	2800	570	1000	570	
Awatarariki Stream upstream	11		530, 420, 1600, 630		3	73	24					
Awatarariki Stream downstream	**12**		430, 410, 1800, 710		10	57	24			50	60	
Richmond Rd Cutoff drain	**13**				40	23						<1
Cutoff drain #1	14						<1	36	<1			
Cutoff drain #2	15							1	<1			
Cutoff drain #4	16				10	<1	<1	<1	<1			
Cutoff drain Opp Matatā Hotel	17			6000, 73	10	1100	4	<1	<1			
Lagoon by Waimea/Clark Culvert	**20**										2380	490
Lagoon by Matata Pub	**21**										170	520
Lagoon by beach access track	**22**										570	
Lagoon outlet	23					130	76	210	60	2700		
Drain west of hotel	**30**				14000						>24,200	9,800

Red numbers indicate exceedances of the Recreational Water Guidelines Action/Red Mode threshold of 550 *E. coli*/100 ml, while the orange number indicates a value greater than the Alert/Amber Mode threshold of 260 *E. coli*/100 ml.

[15] Paul Scholes, (2005) Investigation of On-Site Effluent Disposal, Matata. Environment Bay of Plenty Environmental Publication 2005/04

[16] Peter Askey, (2004) Matata Wastewater Scheme Health Impact Assessment, Opus International Consultants

[17] Paul Futter (2011) File Note of Matata Sampling, Bay of Plenty Regional Council

[18] Paul Scholes, (2012), File Note of Matata Sampling, Bay of Plenty Regional Council

[19] This report

Appendix 5. Approximate locations of self reported septic tank problems and residents favouring or not favouring sewage reticulation.

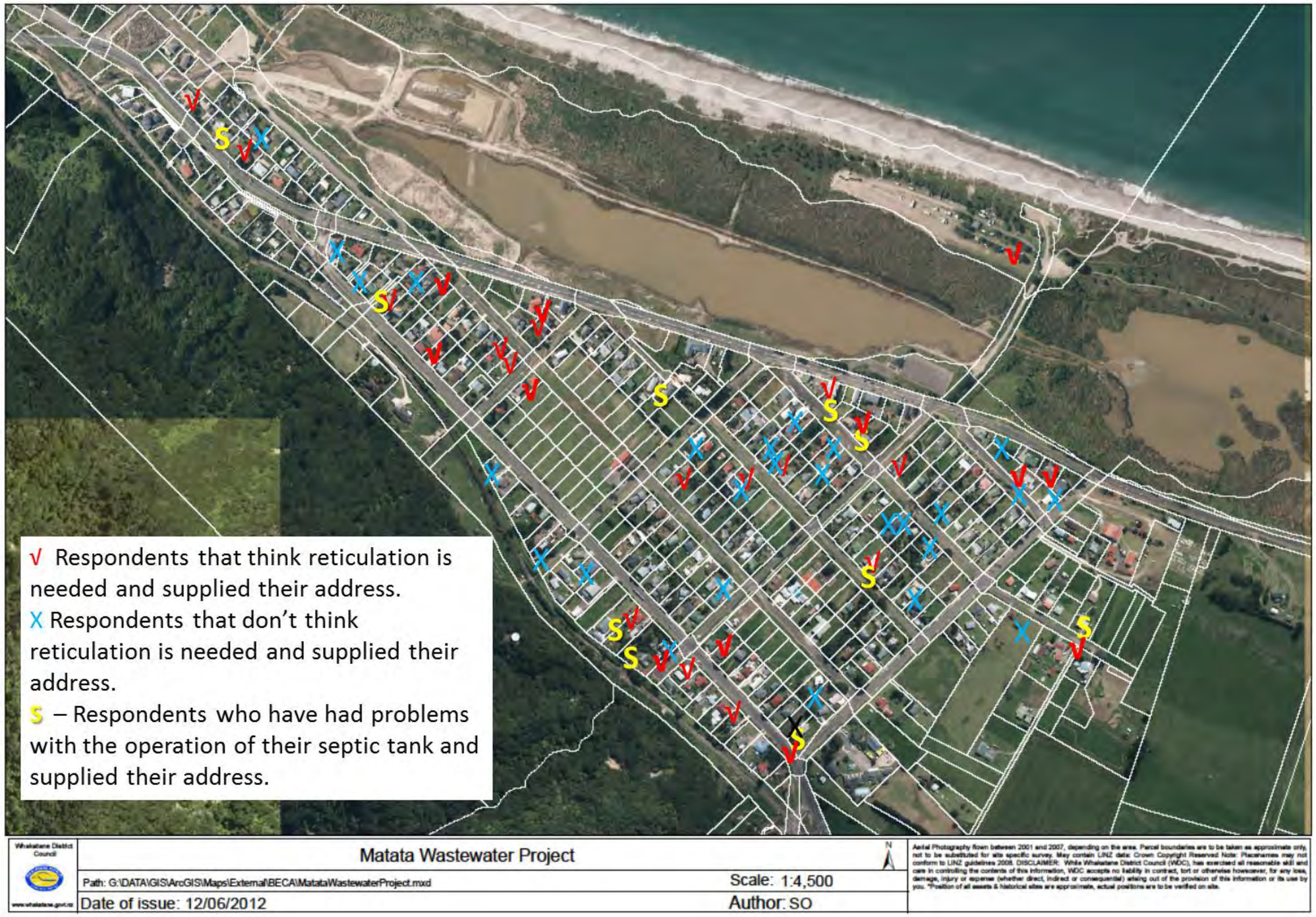


Figure 3 Spatial mapping of survey responses. Note positions are approximate only.