

MAKETU/LITTLE WAIHI WASTEWATER SCHEME

AFFORDABILITY VERSUS SUSTAINABILITY

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ABSTRACT

The Western Bay of Plenty District Council serves one of New Zealand's fastest growing areas.

With a current population of just over 42,000 the Western Bay District is forecast to grow to over 60,000 by 2026.

Against this background one of the challenges facing the Western Bay of Plenty District Council is managing expectations around prudent financial stewardship from a growing customer base in an environment of increasing compliance and monitoring requirements.

Fundamental to this challenge has been developing cost effective and environmentally sustainable solutions to address failing septic tanks in rural coastal communities.

Since 1998 the Council has been investigating wastewater collection and disposal options for Maketu, Little Waihi and Pukehina, a community of some 1,800 people situated 30km to the south east of Tauranga.

Four key issues needed to be considered and addressed as part of the investigation process:

- Affordability and inter-generational equity
- Environmental effects
- Cultural issues
- Engineering / physical constraint

This paper focuses on the merits of affordability versus sustainability applied to the development of a wastewater treatment solution for Maketu, Little Waihi and Pukehina.

KEY WORDS

Wastewater solution, Sequential Batch Reactor, Sustainability, Affordability

1 INTRODUCTION

The communities of Maketu and Little Waihi are two discrete coastal communities within the region of Western Bay. Maketu and Little Waihi estuaries are regionally significant coastal ecosystems; these communities are all unsewered.

Maketu and Little Waihi are located on the east coast of the North Island approximately 12kms east of Te Puke. Maketu (a culturally significant area) is a headland located between two estuaries with Maketu township nestled in a low lying valley to the northwest boundary of the Maketu Estuary and Town Point being the headland running north from the mouth of the estuary. Little Waihi lies under

the southeast side of the headland and is a compact, low lying settlement bordering the northwest side of the Waihi estuary. All communities serve a wide range of people in terms of lifestyle and usage. While the majority of residents at Little Waihi are permanent, those at Maketu include established permanent residents, tenants and owners who use their residence as a holiday “bach”. In the low lying valley at Maketu a number of open drains run to the estuary and have been found to be contaminated with septic tank effluent. The water table is high and appears to be tide influenced. The hill areas include the land surrounding the Maketu flats area and Town Point (Okurei Point) where the topography varies from gentle to steep slopes. Most low lying soils in Maketu and Little Waihi appear to exhibit poor soakage, whilst those on the hills are relatively permeable with good drainage characteristics, although they are stratified and can transmit seepage waters horizontally at various layers.

Little Waihi is a small settlement which was established in an informal manner with many illegally erected buildings, without clear title. The Te Arawa Trust Board are owners of much of the land which they lease to the residents. Little Waihi is low lying, prone to flooding and with a high water table. This area includes reclaimed land bordering the Waihi Estuary and a spit which runs south into the estuary that is utilized as a camp site including some semi-permanent campers. Directly to the north, the cliffs which rise above the settlement direct stormwater into the area. A community water supply is provided to the entire area of benefit.

The area is of high recreational interest and potential and during summer experiences a large population increase from temporary holiday residents, tourists and campers. Harvesting of shellfish in both estuaries is intensive and has continued, despite the erection of signs advising that the areas near the shore in the Waihi Estuary are contaminated. A community water supply is provided to the entire area of benefit.

The topography varies throughout the area of benefit. Maketu flats and Little Waihi are low lying and have been or are potentially, subject to flooding. Maketu hills are largely undulating to gently rolling slopes but some lots are moderate to steep.

2 IDENTIFYING THE ISSUE

All properties within the communities of Maketu and Little Waihi rely on a septic tank disposal system to treat household sewerage and wastewater.

There are already significant concerns in Maketu / Little Waihi relating to environmental and health risks from contamination of the estuaries and foreshore area associated with septic tank failures in both communities. A septic tank survey conducted by Regional Council in 1997 indicated that 50% of Maketu and 75% of Little Waihi of existing septic tanks are not operating correctly.

In March 1996 a report on the environmental and public health impacts focusing on the Little Waihi settlement, found that extreme levels of septic tank effluent contamination of the groundwater was occurring, this supporting the findings of the Environment Bay of Plenty Regional Council (EBOP) report of 1992. The report concluded that faecal streptococci, faecal coliforms and enterococci results identified the groundwater was grossly contaminated by septic tanks, that some houses were unsafe and/or unsanitary and that solutions for sewerage disposal be worked on in partnership with the parties concerned. Significant elevated ammonium nitrogen concentrations were recorded.

The Regional Council have previously established that effluent from septic tanks and on-site disposal systems at Maketu and Little Waihi are contaminating shellfish in both estuaries. A more recent survey was carried out in 2009 under a Joint Agency approach, involving WBOPDC, Tauranga City Council, EBOP, NZ Food Safety Authority, ESR, Toi te Ora Public Health and BOP District Health Board Hauora a Toi¹. The report looked at the quality of shellfish in the estuarine areas within the

Bay of Plenty, including Little Waihi. The Study found that enteric virus contamination of shellfish was occurring in the Waihi Estuary. In addition, the Medical Officer of Health has also raised concerns about the seriousness of health risks associated with septic tank contamination issue at a public community meeting held at the Whakaue Marae in October 2009.

The community have complained to WBOPDC and EBOP about septic tank seepages and the effect these seepages are having on public health issues related to bathing water quality in the harbour.

In addition to these factors, population pressure on coastal areas particularly in the Western Bay of Plenty is high and SmartGrowth predictions show that this growth likely to continue.

All parties recognise that steps need to be taken. The Bay of Plenty On-Site Effluent Treatment Regional Plan (OSET) states that finding solutions for sewage treatment at Maketu and Little Waihi is of high priority. These communities are identified as areas where degraded water quality is a significant issue. The OSET Plan currently requires all septic tanks to be surveyed and regularly maintained every three years.

The OSET Plan requires that from December 2013 all residents either connect to a reticulated system, provide an advanced treatment system on-site or obtain resource consent from the Regional Council for their existing system as a discretionary activity. As such, many of the private householder disposal beds at Maketu / Little Waihi will require significant upgrade or replacement to meet the OSET Plan requirements.

Maketu and Little Waihi communities are amongst the lowest social economic groups with the Western Bay of Plenty region, with a deprivation index of 9.7. There is potential to create significant financial hardship within the communities by the implementation of a wastewater scheme, or any attempt to upgrade existing facilities to a minimum standard. The introduction of a subsidy grant applicable for community wastewater scheme offers a significantly better position than individuals dealing with their own properties with no government subsidy available.

It is for these reasons that WBOPDC has undertaken a comprehensive study and consultation of the options for disposal of wastewater from Maketu / Little Waihi communities.

2.1 COMPREHENSIVE STUDY

WBOPDC has undertaken a comprehensive study of options for wastewater disposal in broadly three stages.

Stage 1 involved the investigation and identification of sewerage disposal problems and impacts. Stage 1 studies demonstrated:

- There is evidence of contamination by sewage of shellfish and waters in general at both Maketu and Little Waihi. This was further confirmed by the 2009 Joint Agency study mentioned above.
- Little Waihi and Maketu Flats areas are classified as having unsatisfactory wastewater systems, as both have high groundwater levels, substandard effluent disposal systems and soils with poor seepage characteristics.
- Large areas of the elevated portion of Maketu Peninsula have soils with good seepage characteristics, but horizontal tracking of the groundwater (effluent) may occur. Many areas are satisfactory; others are poor or marginal but could be made satisfactory by upgraded on-site systems.

Environment Bay of Plenty's Environmental report 2001/24 August 2001, Monitoring of On-Site Effluent Treatment Regional Plan detailed survey, revealed that some 4% of properties had either no disposal system at all or utilized a long drop, 54% relied on soak holes alone (see Table 1 Distribution of On-Site Disposal). Disposal via soak holes means no ground treatment, only dispersal.

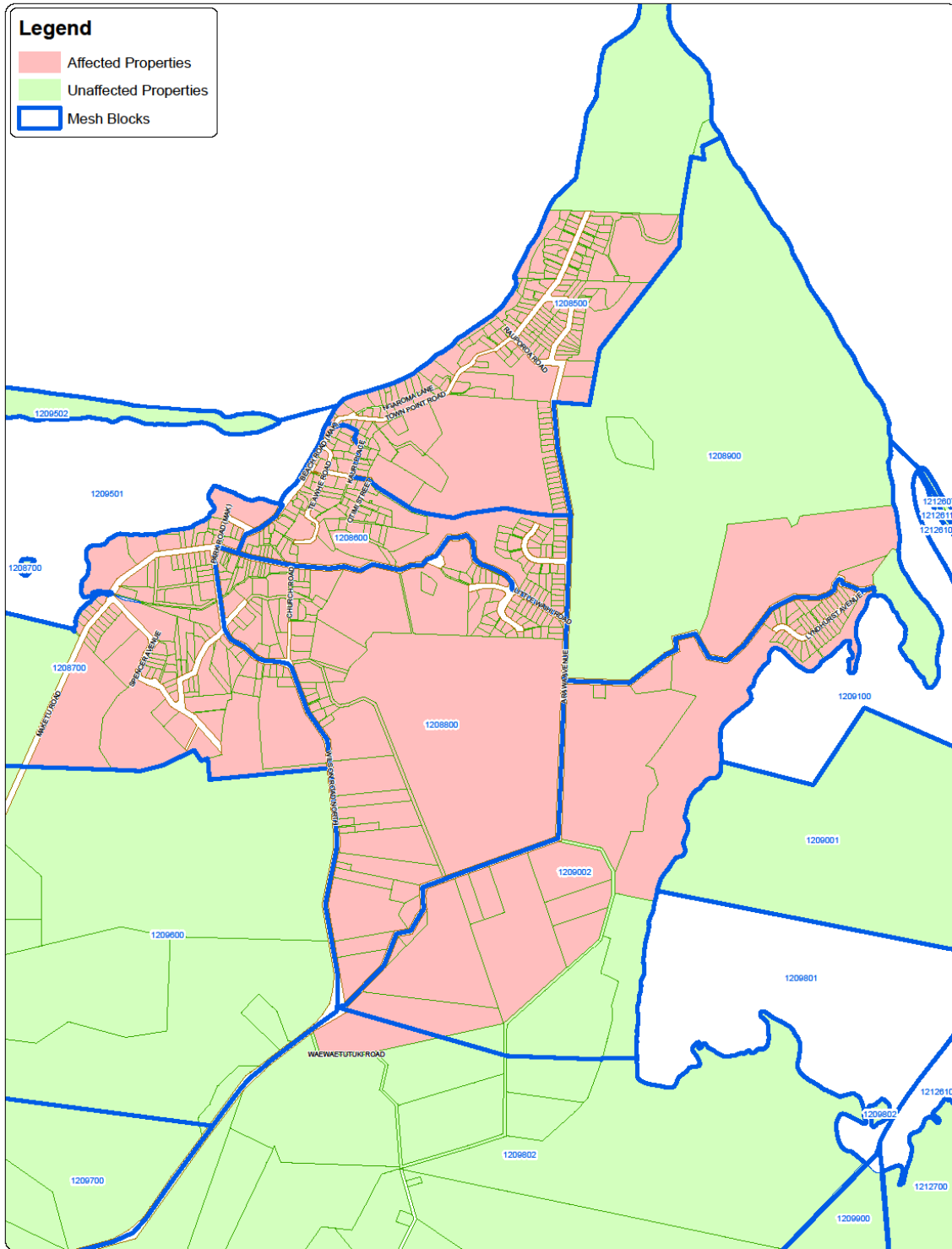
Inspections confirm that the majority of on-site effluent disposal systems are soak holes, even in low lying areas, having high water tables. It is acknowledged that the significant issue of the high water table at Maketu Flats and Little Waihi, resulting in direct contamination of the ground water and a high failure rate of on-site effluent disposal systems.

Table 1 – Distribution of On-Site Disposal

Area	Soak Holes	Evapotranspiration	Seepage Trenches	Mixed	Long Drop	None	Unknown
Maketu	40%	<1%	15%	5%	1%	0	39%
Little Waihi	33%	0	17%	0	25%	0	25%
Pukehina	65%	0	6%	3%	0	3%	23%
Total	54%	<1%	10%	3%	2%	2%	29%

The Bay of Plenty On Site Effluent Treatment Plan is the Regional Plan charged specifically with addressing the issue of on site effluent treatment (OSET) in the Bay of Plenty. The Plan requires communities in certain “maintenance” areas to install a reticulated wastewater system or install (as individuals) “advanced” wastewater treatment systems.

The OSET Plan is a Regional Plan and, accordingly, its rules can override peoples presumed existing discharge rights. It is a reasonably new plan having been made operative in July 2006 and has a considerable impact on people who previously thought they could rely on existing, and often woefully inadequate septic tanks.



Legend

- Affected Properties
- Unaffected Properties
- Mesh Blocks

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Email: gis@westernbay.govt.nz
 Date: 5 May 2010
 Operator: MBL
 Map: 409 - Maketu Wastewater Properties.mxd

Scale A4 - 1:8,289
 0 0.0408 0.16 0.24 0.32 kilometers



Maketu Wastewater



Map 1

3 CONSULTATION

The Objectives of the OSET Plan are clear – namely avoiding environmental contamination and nutrient discharge from human effluent discharge.

The way the OSET Plan achieves its objectives are straight-forward. Firstly, the plan zones communities as being within or outside a “maintenance zone” – the term used to describe areas requiring improved wastewater treatment. Communities, like Maketu and Little Waihi, that are within the zone are required to improve their wastewater treatment.

Stage 2 involved an investigation of possible solutions from as early as 1999 and an evaluation of the options. Options considered have included an offsite reticulation scheme consisting of a treatment plant, an aerated lagoon, a surface flow wetland, UV disinfection and disposal via high rate irrigation (which would involve some overland flow to wetlands). Since 1999 various technical developments in the industry have allowed further options to be considered and evaluated by WBOPDC.

Stage 3 involved consultation with the community, selection of the preferred option, which comprises the installation of a local reticulation system to both communities and a wastewater transfer pipeline from each community to the wastewater treatment plant at Arawa Avenue, with subsequent disposal to land via subsurface irrigation.

A consultation strategy was developed by WBOPDC with the aim of ensuring a proactive approach which gave members of the local community and key stakeholders adequate opportunity to consider the various options available for the treatment and disposal of wastewater in the communities. The consultation strategy involved the provision of information and the opportunity for discussion and feedback on the information available.

The consultation and participation process undertaken included various newsletters, questionnaires, open days and community. Three Community Liaison Groups were also established in 1996. In addition, WBOPDC has undertaken separate consultation with Te Arawa Maori Trust Board, tangata whenua, Department of Conservation and landowners in the vicinity of the proposed treatment plant.

Community Liaison Groups (CLG) were established for each of the Maketu, Little Waihi and Pukehina communities in 1996 and are comprised of local ratepayers from each of the communities.

As noted above, the Technical Steering Group (TSG) was established in 1998. The TSG has met on a regular basis to assist in the preparation for and participation in public consultation, and to consider feedback comments.

Meetings have been held with the TSG and CLG initially on a monthly basis. In addition, Open Days have been held for the local community and key stakeholders.

In particular, the Community Liaison Groups and members of the communities (through the Open Days) were provided with the results of WBOPDC 1996 study on community sewage problems in the Maketu / Little Waihi area, and asked to provide feedback on the various options available for sewage treatment and disposal. WBOPDC has sought feedback from the communities from six major sources:

- Technical steering group
- Community Liaison Groups
- Tangata Whenua
- Open Days

- Written responses from the community
- Feedback to the community questionnaire

There was a strong desire for the community to be involved in the consultation process which is based on strong environmental concerns and the fear of having to address high costs for the option selected.

The Council Workshop held on 28 February 2000 identified the preferred option as a fully reticulated community system with HRI disposal at the Maketu Gully treatment site. The workshop also addressed concerns related to the Regional Council approach to farm management, water quality monitoring and enforcement action for individual septic tanks. The concerns related to the Kaituna River re-diversion strategy and Department of Conservation involvement were also addressed. The Medical Officer of Health stressed how serious the health risk is, and how the septic tank contamination issue must be resolved quickly under the current legislation.

There were two further significant matters arising from this workshop relating to enforcement action and affordability. The Council has since then approached the Government to seek financial assistance and confirmed that a Small Community Government Subsidy will be made available for capital expenditure costs.

In January 2006 a change in personnel both at Council and technical support groups, offered opportunities to revisit the project. Hence consultation with the community was put on hold as it moved into the next level of investigations. Over the next two years reviews were undertaken of the project, looking at other viable options. From January 2008 WBOPDC recommenced consultation with the community which included an updated publication on the project and setting three monthly community meetings.

A cultural impact assessment (CIA) was commissioned by WBOPDC in 2009 under Beca Consultants.

Throughout the process WBOPDC has recognised the special relationship tangata whenua have with the area, and the importance of kaitiakitanga. Inherent in this concept is the understanding that members of the present generation have a responsibility, passed onto them by preceding generations, to care for the natural environment. Kaitiakitanga carries with it an obligation not only to care for the natural environment, but also for each generation, by ensuring that a viable livelihood is passed on.

Te Arawa Lakes Trust Board recognises the significance of Maketu for its people and the importance of kaitiakitanga in this area. WBOPDC has undertaken extensive consultation with the Trust both on cultural issues and with the Trust as landowner of the disposal area.

Te Arawa Lakes Trust has entered into a Memorandum of Understanding (MOU) with WBOPDC in relation to the proposed Maketu / Little Waihi Wastewater Scheme, which provides for the ongoing relationship between parties and consultation process. Te Arawa Lakes Trust intend to redevelop their property at Maketu and have expressed their support for the proposed wastewater scheme in the MOU. A Te Arawa Lakes Trust presentation was given to WBOPDC Councillors in May 2010 confirming their commitment to the project and acknowledging the significance of the MOU in developing infrastructure for both the local community and their future subdivision.

The main issues identified during consultation included the following:

- Affordability (costs, subsidies, inter-generation equity, community equity);
- Addressing all other effects comprehensively (upstream, farms, Kaituna diversion);
- Conclusive evidence of source of contaminants (monitoring of upstream and urban areas);
- Alternative options (latest technology, cluster community schemes, separate community schemes);

- Environment Bay of Plenty actions (monitoring compliance / enforcement costs of septic tanks vs farm management monitoring);
- Growth rates and future development implications;
- Cultural impacts;
- Protection of waterways and water quality and seafood gathering;
- Environmental impacts of the options selected.

There has been much discussion with the community and stakeholders on possible options for wastewater treatment and potential treatment sites for more than 10 years.

The community and stakeholders have always provided clear opposition to any discharge to the ocean, estuaries and rivers, and hence a land based disposal system is favoured.

WBOPDC's consideration of possible sites and potential sewage treatment and disposal systems has taken into account the issues raised during consultation – in particular community affordability, generational equity, environmental effects, cultural issues, and engineering / physical constraint issues.

4 AFFORDABILITY INVESTIGATION

Maketu is the ancestral seat of the Te Arawa. The Maketu Estuary is the landing place of the Te Arawa Waka and where the Te Arawa people have a long period of continuous occupation of the Maketu Headland.

The communities of Maketu, Little Waihi and Pukehina are amongst the lowest socio economic groups in with the Western Bay of Plenty district. As such, there is the potential to create significant financial hardship within the communities by the implementation of the wastewater scheme.

A report prepared by Council staff provides a demographic profile to update and better understand the socio-economic circumstances experienced by the residents, consideration of how the scheme will impact financially on the residents and what options are available to residents to assist in paying for the wastewater scheme.

5 DEMOGRAPHICS

A demographic profile was undertaken to gain better understanding of the communities affected by the Maketu Wastewater scheme, in particular from an affordability perspective. A demographic profile and affordability analysis was also undertaken in 2003 as part of the application to central government for a subsidy for the introduction of a wastewater scheme. The report in 2003 relied on 1996 census figures and was undertaken as part of a broader analysis of the ecological issues and to inform consideration of the most appropriate waste water scheme.

The profile focuses specifically on those households affected by the waste water scheme, in Maketu and Little Waihi, as outlined on the map in attachment one.

In 2006 Maketu and Little Waihi had a population of 1167 or 435 households. The number of households has been increasing over the past ten years from 351 to 435. The average household size is 2.7, consistent with household sizes in the District and nationally.

The median age is 39 years old. The number of children young people and adults, adults in Maketu and Little Waihi is similar to the Districts' rates, although like the District, Maketu and Little Waihi have a lower than average numbers of young people, compared with 20% of the national population aged between 15-29. Those aged over 65 is consistent with the national average but lower than the percentage in the District.

Fifty percent of the population are of Maori descent with the majority of other residents of European descent. This represents a far higher number of residents of Maori descent than the rest of the District (17%) and nationally (15%).

Age	Percentage of population
0-14	22%
15-29	16%
30-44	21%
45-64	28%
65+	13%

The population is expected to increase slowly, population projections so far have been accurate in terms of population but have estimated that there would be a higher number of households ie; in 2006 there were 435 households. It is unlikely that there will be an increase of over 200 households between 2006 and 2011 to 660, although a significant development is being proposed by the Te Arawa Lakes Trust which would potentially increase the number of dwellings. Population and household projections for the Maketu community are:

Year	Households	Population numbers
2011	660	1300
2016	710	1400
2021	760	1500
2026	800	1550

5.1 EMPLOYMENT AND INCOME SOURCE

Just under half of those aged 15 years or over are working either fulltime or part-time, with three-quarters of those working fulltime. This is lower than the District and national proportion of 65% of the population working either fulltime or part-time. The working age population has increased significantly from 747 in 2001 to 915 in 2006. Although just under one half are either not in the workforce or are of an unidentifiable workforce status, the latter number has increased significantly since the last census in 2001. Fourteen percent of the population are on either the Domestic Purposes Benefit, sickness benefit, unemployment benefit or the invalids benefit.

The most common occupation was labourers, followed by managers (this often refers to self-employed people e.g. farmers), then professionals. The spread of occupations is consistent with the District's occupational profile which differs from the country as a whole who have higher numbers of professionals and less labourers and managers. The most common industry was manufacturing (possibly referring to employment at nearby AFFCO freezing works). The other industries are agriculture, construction, education and training, health care and retail.

5.2 EDUCATION

In terms of education over one-quarter have no qualification, 20% have some form of qualification gained at school, with one-sixth have a post school qualification, most commonly vocational or from a

polytechnic. Maketu and Little Waihi have lower than District and national rates of school and post-school qualifications and slightly higher number of residents with no educational qualifications.

5.3 DEPRIVATION AND INCOME LEVELS

In terms of overall deprivation Maketu and Little Waihi are at level 9, with 10 being the most deprived communities. Deprivation is measured by looking at household income, employment status, home ownership, education and access to a car and phone. Median personal income, as outlined below, is between \$18,000-22,000 per annum. The District median personal income is \$22,600 and New Zealand as a whole is \$24,400.

Median household income for the five affected mesh blocks (see Attachment 1) has increased significantly over the past ten years, in some cases almost doubling from \$22,500 to \$43,500. The median household income for Little Waihi and Maketu is significantly lower than the District's at \$53,500 and far lower than the national household income of \$59,000. The main sources of income are from wages, superannuation or self-employment, in that order.

5.4 HOUSING

Just over half the dwellings are either owned by the residents or by Family Trusts, it seems from the census in 2001 to the census in 2006 the use of Family Trusts increased substantially. Approximately one-quarter of residents are renting their dwellings, the remainder have other arrangements for accommodation. Rental accommodation is solely through the private sector with no Housing New Zealand Corporation or Council housing available. The proportion of ownership and rental accommodation is reasonably consistent with the District and national trends.

6 FINANCIAL IMPLICATIONS

The projected capital costs/ expenditure for the Maketu / Little Waihi Wastewater Scheme (based on today's rates) stands at \$15.2 million.

Included in this cost is all associated design, development, engineering, professional consulting support, procurement of equipment and physical construction works.

The financial projections used for the Maketu / Little Waihi Wastewater Scheme include growth at 410 additional lots, 300 lots by Te Arawa Lakes Trust and a further 110 additional lots as outlined in SmartGrowth forecast (2% growth). The growth related capital expenditure (capacity for future residents) will be recovered by financial contributions over a 25 year period from future rates. These also include an allocation for interest.

Having recognised that funding of the project was of serious concern to the community, WBOPDC has sought and obtained funding from the Ministry of Health. The funding was first sought by WBOPDC in February 2003 under the Ministry of Health's Sanitary Works Subsidy. The application was received but due to the lengthy ongoing investigations into the most suitable option, the funding has not been drawn down yet. The Government reviewed the subsidies in 2008 and increased pressure was placed on WBOPDC to proceed with the wastewater scheme. The contributing factor to such pressure was that the number of applications received for funding outstripped the available Government funds by \$350 million, meaning that WBOPDC needed to secure funds while they were still available to enable the project to be advanced for the community.

The Ministry of Health has agreed to subsidise funding of \$10.5 million recognising the deprivation level of 9 for the communities of Maketu and Little Waihi. The Ministry of Health's requirements for utilizing the subsidy available to WBOPDC required a consent application to be lodged with EBOP by December 2009. Depending on the outcome of this process, or if further action is required to be taken in the Environment Court and dependant on the timeframe required to complete this process then the subsidy may not be available for this project. Ministry of Health have stressed that positive direction through this process must occur otherwise the funding will be reallocated to another

Council. Part of the requirement of the subsidy is it must be a community reticulated scheme and cannot be used to provide individual upgrades to properties to meet the OSET Plan requirements.

EBOP has also agreed to contribute towards the cost of funding the project. As such, the current funding of the project is as follows:

Ministry of Health Subsidy (SWSS)	\$10.5 million
Environment Bay of Plenty Subsidy	\$2.1 million
Community Contribution (rates)	\$2.6 million
Total	\$15.2 million

The Uniform Annual Charge (UAC) for the community is divided into a capital component (cost of the actual treatment plant) and an operational component (which is the cost of servicing the associated equipment, plant, disposal field, reticulation of the wastewater scheme, including land lease costs and Council over costs).

The estimated capital component of the UAC to service the \$2.6 million loan equates to \$55 per annum and the operational component equates to \$586 per annum (in total, \$641 per annum plus GST). This amount is indicative only.

By way of comparison, rates with Western Bay of Plenty district for similar wastewater solutions are as follows:

Omokoroa	\$874 (excl GST)
Te Puke	\$508 (excl GST)
Katikati	\$714 (excl GST)
Waihi Beach	\$868 (excl GST)

As noted above, the Ministry of Health are expecting Council to start drawing down these funds by the start of 2011 with progress claims concluding December 2012. The subsidy only applies to a community reticulated system. By way of comparison, if Ministry of Health funding could not be secured an estimated UAC for the system would be \$1600/per annum. The average cost of installation of an advanced onsite treatment would be in the vicinity of \$15,000 to \$25,000 depending on property size and terrain and soil conditions.

7 PREFERRED SOLUTION

The preferred solution for solving the harbour contamination at Maketu and Little Waihi is to collect, treat and dispose of the wastewater via a fully reticulated small bore community system, to pump untreated wastewater to a biological wastewater treatment plant site at Arawa Avenue prior to disposal of the treated effluent via sub-surface ground soakage in an adjacent land treatment and disposal field.

The Maketu and Little Waihi communities have a significant increase in population, and consequently flow, during the summer period resulting in substantially increased summer peak wastewater flows. Therefore any wastewater treatment system needs to be able to cope with seasonally variable flows and biological loads as well as low flows at other times of the year.

Table 1 Summary of Waste Water Flows

Maketu						
	Number	Number of	Number of	Population	Flow rate	ADF
	of Lots	people per lot	pans		per person per day (L/p/d)	(m ³ /day)
Residential - Present	525	3		1575	200	315
Residential - Future additional	338	3		1014	200	203
Bayview Holiday Park				100	150	15
Marae*						
Primary School					57	0.0
Fire Station					100	0.0
Council Toilets*			12			2.4
Surf Club				4	100	0.4
Additional Activities				100	49	4.9
Maketu Beach Holiday Park				520	175	91.0
Total Maketu						632
Little Waihi						
	Number	Number of	Number of	Population	Flow rate	ADF
	of Lots	people per lot	pans		per person per day (L/p/d)	(m ³ /day)
Residential - Present	65	3		195	200	39
Residential - Future additional						
Campground				635	130	83
Total Waihi Beach						122
Total - Future Flow						753
					Allow	760

Note: Number of person's per lot is the projected populations rather than existing which are 2.7 persons per lot.

The above wastewater flow assumes that WBOPDC will install water meters at the same time as the wastewater scheme is installed as WBOPDC's experience is that the provision of water meters minimises wastewater volumes.

The maximum peak flow rate into the treatment facility would occur during wet weather and has been estimated to be approximately 10% more than the average daily flow based on typical guideline values used on well maintained small bore reticulation systems. This peak flow would likely only last for a number of days and subside after the wet weather event. Therefore the maximum flow rate at the treatment plant is estimated to be 835 m³ per day assuming the wet weather event occurs at the same time as peak occupancy. The treatment plant would need to be gradually expanded to handle this peak daily flow rate for the ultimate population.

For the purpose of establishing the discharge concentrations and land treatment and disposal a estimated figure of 760m³/day average flow should be taken as the peak wet weather flow.

OPTIONS INVESTIGATED

Table 2 Wastewater Treatment Options Considered Previously

Date	Options Considered	Conclusions
August 2003	<ul style="list-style-type: none"> • Nine household lot schemes raised by Maketu Community Group for the Environment including:- <ul style="list-style-type: none"> ▪ Lifestyle Wastewater Solutions ▪ Biocycle North ▪ Enviroflow ▪ Bliver Aerator ▪ Innoflow Technologies ▪ Various articles and miscellaneous concepts raised by the community and other parties 	<p>Four schemes were not complete wastewater treatment systems and failed to meet the basic requirements. Several only addressed grey water management not sewage.</p> <p>The remaining options are all better than septic tanks but do not adequately reduce nitrogen, phosphorus nor provide disinfection, without significant add on cost. Suitable disposal remains an issue.</p> <p>The Lifestyle and Biocycle systems are almost identical and use an activated sludge system – community wide these are more expensive than a centralised treatment system.</p> <p>Enviroflow, Bliver Aerator and Innoflow-similar “contact stabilisation” systems (one using a fixed media the other sand). Variable nitrogen reduction capability. Still need to pipe effluent to remote site for further treatment (nitrogen, possibly phosphorous and disinfection) and land disposal.</p>
October 2003	<p>Two additional treatment options were evaluated at WBOPDC’s request being:-</p> <ul style="list-style-type: none"> • SAF treatment system • MBR (Membrane Bioreactor System) 	<p>These are centralised treatment options.</p> <p>SAF is a moving media system which can result in a significant reduction in treatment plant sizing. Effluent quality is similar to a conventional WWTP.</p> <p>The MBR produces a high quality effluent but needs a relatively constant inflow rate.</p> <p>Neither plant significantly reduces total nitrogen levels in the effluent by themselves, requiring a biological nutrient reduction step as part of the process.</p>
September 2005	<p>Independent review of Fraser Thomas reports and proposed conventional sewage, “IDEL” wastewater treatment scheme and high rate land disposal.</p>	<p>URS made 12 recommendations the principal ones being:-</p> <p>Options selection process be better summarised to demonstrate how selected option was arrived at more clearly.</p> <p>The suggested compliance with ANZECC guidelines and total mass balance approach to nutrients in effluent quality could be beyond the capability of conventional WWTP and</p>

Date	Options Considered	Conclusions
		<p>result in a treatment facility having to treat to unusual and very stringent standards. This will result in a very expensive and complex treatment steps (beyond MBR technology) including chemical treatment.</p> <p>Review concluded that additional investigation of land disposal site was required, particularly hydrogeology and phosphorous uptake capability.</p> <p>A “black box” approach for selecting a treatment process was viable provided appropriate assessment for visual, noise and odour was carefully considered (due to the potential need for chemical and filtration treatment requirements).</p>
June 2006	Option of pumping to Rangiuru Business Park and thence to the Te Puke WWTP	<p>This option was for a conventional sewerage scheme, transfer pump station and pipeline to the Rangiuru Business Park and thence to the Te Puke WWTP for disposal via the existing discharge into the river.</p> <p>The option was not taken forward by WBoPDC as the timing of the development of the Rangiuru Business Park did not suite the Maketu funding and development timing</p>
October 2009	<p>In light of changes to scheme, desire to minimise I/I WBoPDC commissioned URS to review proposals for STEP/STEG systems and considered viability of alternative centralised treatment options.</p> <p>In particular the Textile or Recirculating Sand filter system (STEP/STEG with centralised treatment) and High Performance Household MBR system</p>	<p>URS concluded that which ever system was selected it was imperative that the whole scheme including on-site facilities, the reticulation, treatment and disposal are carefully integrated to minimise costs and ensure that appropriate treatment can be effected.</p> <p>The High performance MBR Household system is treatment only and still required land disposal. However the very high quality effluent could be discharged in household lots with sufficient area and suitable soils type(s)</p> <p>Alternative treatment options considered included SBR and MBR systems.</p> <p>The next section describes the key issues in more detail.</p>

CONCLUSION

Overall, the below average median household incomes and deprivation status indicate an area of very low income, particularly in Little Waihi. The average rates bill in Maketu and Little Waihi is \$1900 per year. However, not all residents are on low incomes, approximately 10% of households earn over \$70,000 (although this does not automatically translate into being more able to afford increased rates given lack of knowledge of their other financial commitments e.g. dependents, they maybe renting etc).

The preferred option needs to meet the following criteria:

- A community wastewater scheme that provides an affordable level of service to the communities of Maketu and Little Waihi.
- The scheme design must be a proven system already in operation within New Zealand.
- Focus on the operational costs of the plant given the sensitivity to the UAC.
- All properties are connected to the scheme from day one at no additional cost.

RETICULATION

The preferred option is for a small bore reticulation system with 24 hour diurnal flow buffering and an enclosed collection system to minimise inflow and infiltration to minimise the volume of wastewater to be treated and thereby need to be discharged. In addition since there is a significant requirement for nitrogen reduction within the treatment plant, as much of the biologically available carbon as possible should be transferred to the treatment plant. A grinder pump solution would ensure that biological carbon is retained for future use in treatment in the Maketu WWTP and is Council's preferred solution unless the whole of life costs for a STEP/STEG system, including carbon dosing at the treatment plant could be shown to have a lower whole of life cost.

TREATMENT

The preferred treatment option, best suited to the Maketu situation of high peak holiday loads and small population loads at other times is an SBR system (which can be configured to provide BNR capabilities) or possibly an Extended Aeration/BNR process involving several parallel wastewater process streams.

In summary the proposed community wastewater scheme comprising a small bore reticulation option integrated with an advanced biological nutrient reduction treatment facility matched to a land treatment and disposal system will provide a sound, safe, reliable and vastly improved environmental outcome for the Little Waihi and Maketu community.

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NOMENCLATURE

<i>AEE</i>	Assessment of Environmental Effects
<i>ANZECC</i>	Australian and New Zealand Environment Conservation Council
<i>BNR</i>	Biological Nutrient Reduction
<i>Directional Drilling</i>	Placement of a pipeline using construction technique for installation of a pipeline within a borehole cavity drilled through the ground
<i>EBoP</i>	Environment Bay of Plenty
<i>I/I</i>	Infiltration and Inflow. Being water flows into the sewerage system that enter either via infiltration through cracks in manholes, pipework or other defects or inflows being water entering via overland flow through septic tank lids, manhole lids and similar locations
<i>lps</i>	Litres per second
<i>m/s</i>	Metres per second
<i>m³</i>	Cubic metres
<i>m³/s</i>	Cubic metres per second (cumecs)
<i>MHWS</i>	Line of mean high water springs tide
<i>MBR</i>	Membrane Bioreactor
<i>MOU</i>	Memorandum of Understanding
<i>mm</i>	Millimetres
<i>mPVC</i>	Modified polyvinylchloride
<i>Nominal Diameter</i>	Approximate size of a pipeline
<i>NZHPT</i>	New Zealand Historic Places Trust
<i>OSET</i>	On –Site Effluent Treatment
<i>PS</i>	Pump station
<i>Rising main</i>	Pipeline under pressure from pumped system. Connects from low to high level points.
<i>RMA</i>	Resource Management Act 1991
<i>SAF</i>	Submerged Air Flootation
<i>SBR</i>	Sequential Batch Reactor
<i>STEG</i>	Septic Tank Effluent Gravity
<i>STEP</i>	Septic Tank Effluent Pressure
<i>Telemetry</i>	Remote controlled radio communications system
<i>TN</i>	Total Nitrogen
<i>TP</i>	Total Phosphorus
<i>WBOPDC</i>	Western Bay of Plenty District Council
<i>WWTP</i>	Wastewater Treatment Plant
<i>Wetwell</i>	Underground concrete tank which houses submersible wastewater pumps and acts as a collection tank for wastewater inflows.
<i>HRI</i>	High Rate Irrigation