Unrecorded	Te Teko Redoubt	An 1891 plan (SO 6107) shows two buildings labelled 'Old Barracks' on the western bank of the river immediately north of the Te Teko crossroads. Indications are that the site was where the school is today.
Unrecorded	Burial reserve	A Burial Reserve is shown slightly north of site V15/159 (on ML 8012 (1937) and ML 15820 (1937).
Unrecorded	Pukemotiti Urupa	Pukemotiti Urupa is marked on a 1930 plan (ML 14960), north of V15/1194 and close to the western bank of the river.

Of the 10 recorded sites, only three had visible surface archaeological features and three were under dense vegetation and had no visible surface features. Site V15/211 is currently being used as an urupa but had no surface archaeological features. One site had no recorded features. The last two sites recorded as possible cultivated soils were not able to be located again.

No surface features were identified at the three previously unrecorded sites,

Recorded Archaeological Sites above the Matahina Dam

Eleven archaeological sites are recorded in the vicinity of Lake Matahina. One pa is located on a small island in the lake, which prior to the construction of the Matahina Dam was located immediately adjacent to the river. The remaining sites are all located on farmland and consist of four pit sites, two terrace sites, a terrace/pit site, an early European dam, a trench or drain and a hut.

All of these sites were recorded during the 1970s. They all sit above the land that may be inundated by Lake Matahina. Of note is that the construction of the Scheme and the formation of the Lake may have destroyed and/or inundated unrecorded sites.

Summary

There are 25 sites recorded below the Scheme. Of these only 10 have the potential to be affected by the operation of the Scheme. Of the 10 sites only three have visible surface features. Two of the sites (V16/31 and V15/139) are of high archaeological value.

None the 11 recorded archaeological sites above the Matahina Dam are impacted by the operation of the Scheme.

2.7 Recreation

Rob Greenaway and Associates ('**RGA**') investigated the recreation resource adjacent to the Scheme. The following summarises the key findings of the RGA report that is attached as Appendix 2, Volume 2.

General Context

This investigation identified the recreational uses of the lower River (being below the Matahina Dam), Lake Matahina and the Upper River (being upstream of Lake Matahina).

The Ministry of Tourism identified the Rangitaiki River as a 'water body of national importance for tourism' although it did not seek to differentiate between the upper or lower River. RGA determined that the Upper River is potentially of national significance for recreation due to the angling, kayaking and commercial rafting uses it supports. Lake Matahina and the lower River were assessed as being of regional significance for recreation, principally due to the fishing opportunities at the River's mouth and the existence of jet boating activity.

Swimming is a notable recreational value in many water bodies and watercourses. Water quality is a key consideration when assessing 'swim-ability'. In 2007 the Rangitaiki River (from Murupara to its mouth) was subject to a contact recreation health warning. In this respect, contact recreation was not recommended due to the existence of cyanobacteria blooms.

The water quality in Lake Matahina has been found to be of good quality.

A survey showed that 90% of recreational users of the lake and lower River were from the Whakatane and Kawerau Districts.

The main recreational activities on the lower River include:

a. Fishing for kahawai at the river mouth.

b. Whitebaiting from the river mouth to Edgecumbe.

c. Hunting for wildfowl around the river margins, particularly around Thornton Lagoon and Orini.

d. Swimming is popular by the river mouth although it takes place throughout the Rangitaiki River.

Angling, waka ama, eeling and jet boating occurs on the lower River and are assessed as locally significant uses.

Of some note is the existence of a boat ramp immediately below the Scheme. The ramp principally provides access to the Scheme's tailrace but in recent years has been opened up for use by recreationalists.

The main recreational uses on Lake Matahina are:

a. Angling although this is predominantly in the upper reaches of the Lake.

b. Waka ama, particularly for training.

c. Power and jet boating associated with, for example, water skiing, wake boarding and angling.

d. Hunting wildfowl.

e. Swimming although this is principally associated with the beach area close to the Dam.

The Lake is also used by one commercial jet boat operator and some recreational jet boaters. It was a training and racing area for rowing prior to the 1987 earthquake, and supports a low level of flat water kayaking.

A viewing area, picnic area, floating pontoon and two launching ramps were established as a consequence of the Scheme and are presently maintained by TrustPower. While there is a toilet within the picnic area, it was installed and is maintained by WDC.

Off-water activities

A variety of other activities take place adjacent to the Rangitaiki River. They include camping and walking. There is an absence of formed walking tracks around Lake Matahina.

Summary

The lower River is most utilised near the river mouth for fishing, whitebaiting and swimming, with occasional local jet boating.

Lake Matahina supports a variety of recreational uses, including angling, waka ama, hunting and power and jet boating.

Lake Matahina and the lower River are of regional recreation significance, whereas the Upper River is potentially of national recreation and tourism significance.

2.8 Landscape, Natural Character and Visual Considerations

Boffa Miskell Limited ('**BML**') investigated the natural character, landscape and visual amenity considerations and values associated with the Rangitaiki River Catchment. The following summarises the key findings of the BML report that is attached as Appendix 3, Volume 2.

Existing Landscape Assessments

BML has previously completed three landscape assessments which cover the Rangitaiki Catchment. Of these assessments, two were completed for EBoP, with the third being commissioned by the WDC.

While the earlier assessments concluded that Lake Matahina supports landscape and natural character values of some note, the most recent evaluation found that while having amenity landscape and high aesthetic values, the Lake is not an Outstanding Natural Feature and Landscape at a regional level.

The assessment conducted for the WDC identified the water component and 20-metre landward edge of Lake Matahina as an Outstanding Natural Feature and Landscape at a district level. Of note, however, is that this recognition has not been carried over into the Proposed Whakatane District Plan.

The Scheme & Surrounds

BML concludes that the Scheme is well integrated into the wider landscape setting. This is due largely to the mature vegetation, both within the Te Mahoe Village and that which adjoins Galatea Road on the eastern approaches to the Matahina Dam.

When viewed from within the Te Mahoe Village itself the dam, powerstation and switchyard are well screened.

Once at the top of the dam Lake Matahina comes into view. The lake is a landscape feature with high visual amenity values.

Visually the Lake environment is dominated by pine trees, which in many areas extend down to the lake edge.

Lake Matahina has the appearance of being highly natural, although it is clearly modified.

Summary

The Scheme is well integrated into the wider landscape setting. This is largely due to the mature vegetation screening the site from several different angles, particularly below the eastern end of the dam and from Te Mahoe.

Lake Matahina has high visual amenity values but is not a regionally significant or outstanding landscape or feature.

The Lake, although obviously man made, has the appearance of a highly natural environment. The lake margins however, are considered to be more modified due to the existence of the pine forest.

2.9 Lakeshore Erosion

Shore Processes & Management Limited ('**SPML**') investigated the potential for the Scheme to cause lakeshore erosion. An important part of this assessment is a description of the lake process and profile. The SPML report is attached as Appendix 4 of Volume 2.

General Context

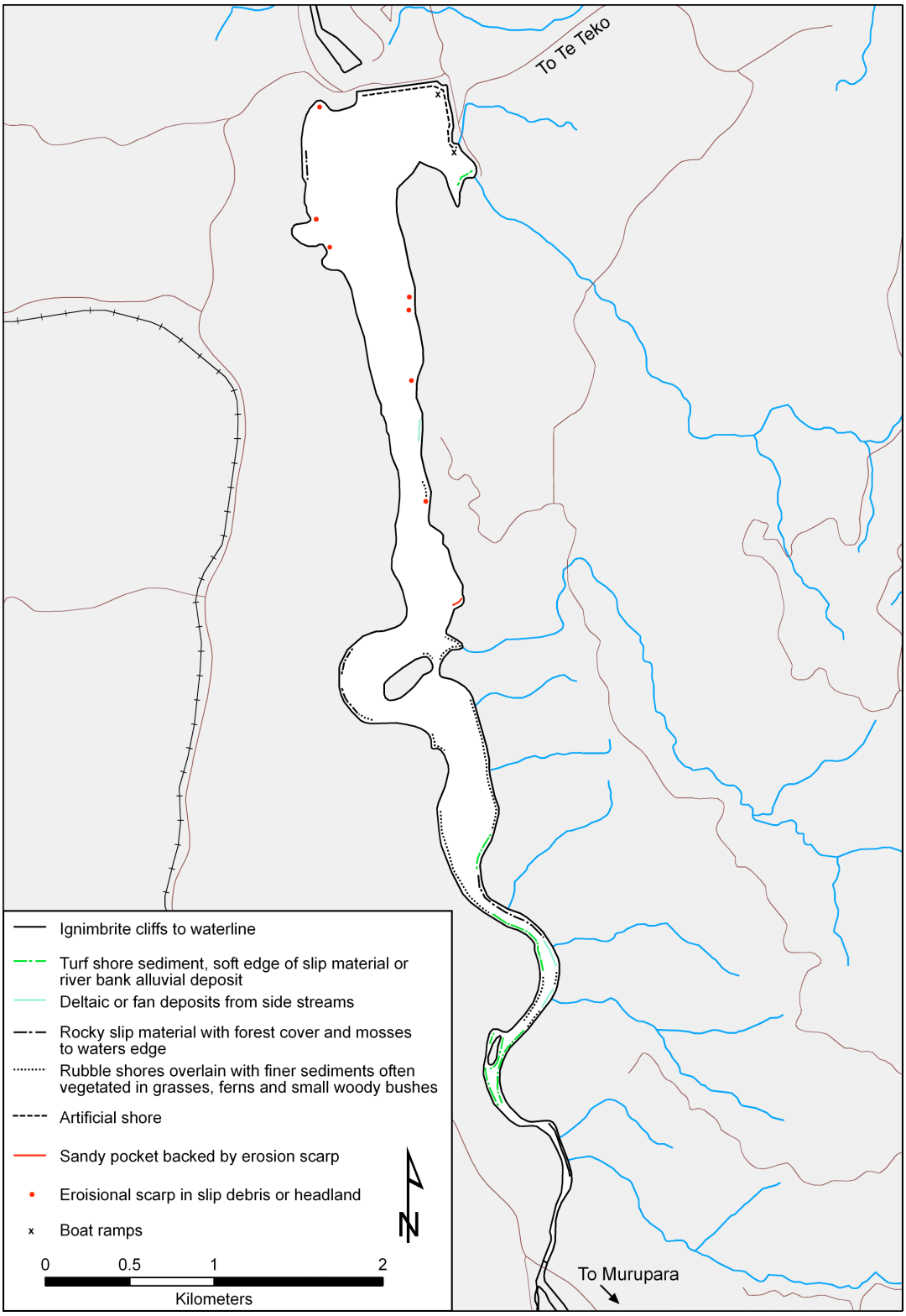
Lake Matahina inundated a long narrow sinuous gorge. The Rangitaiki River dominates the inflow into the Lake, although a number of small streams provide inflows from the Kaingaroa Plateau and the Raungaehe Range.

Water depth is greatest near the Dam (40 to 50m deep) while the upper reaches of the Lake are shallow. Because steep cliffs bound the Lake there are few shallow shelf areas or beaches.

The shoreline consists of near vertical hard rock or boulders although softer sediment beaches do exist.

Figure I (next page) highlights the nature of the shoreline.

Figure I – Lake Matahina: Shoreline Characteristics



Factors Affecting the Lakeshore

The hard rock and topography determines the character of Lake Matahina's shoreline. While there are exceptions, the dominant slope of the shoreline is steep.

Wave energy on the lake is limited due to the narrow width and sinuous nature of the gorge. However, waves up to approximately 0.3m can eventuate. Such waves tend to occur close to the face of the Dam.

There is limited evidence of erosion occurring within the Lake. What erosion that does occur is principally limited to reworking of fine material contained in slip debris. There is, however, evidence of localised erosion at (i) the north-western corner of lake, (ii) on headlands along the eastern shores, and (ii) along the embankment below the boat ramp access road.

In keeping with the preceding paragraph, the shoreline of Lake Matahina appears stable and fully adjusted to the lake environment. This finding suggests that the Lake is at, or close to an equilibrium. This is not to say that there will not be further erosion. Rather, the erosion that will occur will be typical of lake environments, which are always dynamic in nature.

The area around the boat ramps, floating jetty and picnic area is expected to adjust as a consequence of the wave energy it absorbs. Where erosion occurs, it can be addressed by moving sediment accumulations from the boat ramps to the beach areas. This activity is already occurring.

Summary

Lake Matahina is at, or close to reaching an equilibrium with regard to long-term development of the lakeshore. Consequently, while erosion is occurring, it is not out of keeping with what would normally be expected of a lake environment. In the one instance where erosion could threaten a recreational amenity, an effective mitigation strategy is already being implemented by TrustPower.

2.10 Hydrology, River Hydraulics and Riverbank Erosion

Beca Infrastructure Limited ('**BECA**') investigated the hydrology, river hydraulics and riverbank erosion associated with the continued existence, operation and maintenance of the Scheme. The sub-sections which follow principally summarise the BECA report, although other reports are cited as appropriate. The report itself is attached as Appendix 5, Volume 2.

Catchment Hydrology

The Scheme resides within the Rangitaiki River Catchment, which covers an area of 3005km^2. Of this, 2844km^2 (or 95%) is upstream of MAT.

Rainfall within the Catchment is typical of the Bay of Plenty, with high intensity storms occurring quite frequently. BECA report that the average rainfall is 1200 mm to 1800 mm per annum.

The mean monthly flows in the Rangitaiki River range from 33 cumecs to 184 cumecs. As previously highlighted, this corresponds to a mean annual flow of 71 cumecs.

BECA advise that the Rangitaiki River, at Te Teko (that is, downstream of the Scheme), has a median flow of 62 cumecs, a 7-day mean annual low flow (MALF) of 42 cumecs, and a Q5 (one in five year, 7 day low flow) of 38 cumecs.

The hydrological record suggests that major floods are more likely to occur in the Catchment in February, July and August. Table F sets out the estimated flood flows.

Table F – Estimated Flood Flows (Present Climate)

Return period, Years	Flood flow entering Lake Matahina, m^3/s	Flood Flow at Te Teko, m^3/s
5	370	320
10	470	410
20		505
25	600	
50	690	650
100	780	780
200	870	

Source: BECA

The probable maximum flood flow ('**PMF**'), when measured at the head of Lake Matahina, has been estimated at 2510 cumces. As a result of flood routing through the Matahina reservoir, it is estimated that the PMF outflow is approximately 2300 cumecs.

Much analysis has been made of the operation of the Scheme during the July 2004 flood in the Rangitaiki River. Section 6 of the BECA report describes both the event and the operation of the Scheme during it. In sub-section 6.4.3 BECA note that there is no evidence to suggest that the operation of the Scheme was responsible for the flooding of the Rangitaiki Plains. It is important to acknowledge that the Matahina reservoir is not designed for flood attenuation and has little storage available in relation to the volume of large floods.

Consented Takes

EBoP advises that there are 12 consented takes below the Scheme. When combined, they allow up to 43,818 cubic metres of water to be abstracted per day, at a rate of approximately 1,209 litres per second. The most significant of the abstractions is associated with Fonterra's Edgecumbe dairy factory. The remainder are for irrigation and frost protection.

An additional 28 consented takes exist upstream of the Scheme. When combined, the volume of water consented for abstraction is 77,057 cubic metres per day. This equates to a maximum instantaneous rate of take of 1,372 litres per second. The abstracted water is principally used for irrigation.

Sediment Capture

The Rangitaiki River historically carried a large amount of suspended sediment (termed '**bed load**'), principally in the form of pumice. The construction of the Dam trapped the sediment in the Lake, thus meaning that the reach of the River from the Scheme to the mouth had to readjust to obtain a new equilibrium.

Below the Dam, the Rangitaiki River passes through a defined valley for 4km before entering the Rangitaiki Plains. Here the River meanders through the plains, past Te Teko and Edgecumbe, to the coastline, approximately 37km below the Dam.

The accumulation of sediment in Lake Matahina reduced following the construction of the Aniwhenua Hydroelectric Power Scheme, but has resumed now that Lake Aniwhenua is technically 'full' of sediment.

Downstream Drainage Activities

Due to regular flooding events prior to the construction of the Scheme, the Rangitaiki-Tarawera River Scheme (the '**RTRS**') was constructed in the 1970's. This included stopbanks along the main channel downstream of Te Teko and the construction of Reid's Floodway ('**the Floodway**'). The RTRS is designed to convey floods of up to 780 cumecs. The Floodway operates when flows reach 610 cumecs. In practice, however, the RTRS cannot convey this flow.

Riverbank Erosion

Riverbank erosion is an issue with all rivers. This is due to their dynamic nature and tendency to meander across broad flood plains.

Several studies have investigated the cause of erosion downstream of the Scheme. They highlight increases in water velocity (induced by activities such as the 'stop banking' of the River), reduced sediment below the Dam and the weakening of the banks of the river (caused by activities such as vegetation removal and access by stock) as being the key causes of erosion.

The Scheme has the potential to influence the factors leading to riverbank erosion. While accepting that the Scheme's existence and operation does contribute to erosion (and equilibrium has not been reached), BECA conclude that the main cause of significant erosion is flood flows, which are a natural phenomenon.

Saline intrusion

BECA report that the river reach from Edgecumbe to the coast is subject to tidal effects. The sea level at the mouth of the River is expected to be very similar to the sea level at Whakatane, which has a normal range of 1.2m for neap tides and 1.6m for spring tides. BECA have advised that some form of saline wedge, or highly stratified conditions, exist in the lower Rangitaiki River.

Summary

The catchment of the Rangitaiki River is reasonably large and rainfall can be significant. This corresponds to the River having a moderately high mean flow of 71 cumecs with an estimated PMF inflow of 2510 cumecs and an estimated outflow of 2300 cumecs.

The Dam has impounded sediment since its construction. The amount of sediment impounded was, however, reduced by the construction of the Aniwhenua Hydroelectric Power Scheme (which is now technically 'full' of sediment).

There are 12 consented abstractions downstream of the Scheme, with a further 28 existing upstream. The abstractions are principally for irrigation and frost protection purposes, although Fonterra's abstraction from the lower River is of note.