Orakei Basin Management Plan

This document is a management plan for the Orakei Basin and surrounding public open space. It provides direction for the future development, management and use of this open space network.

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AUCKLAND City Council

Contents

Introduction

The Orakei Basin Management Plan outlines objectives and policies for the development, management and use of the public land that adjoins the water bodies of Orakei Creek and the Orakei Basin. The subject areas comprise eight discontinuous areas of public land of small to large scale. The reserves share a common connection with the water bodies and vegetated edges of Orakei Creek and the Orakei Basin. The plan also addresses environmental management of the water bodies. The Orakei Basin Bylaw 2006 controls water related recreational activities.

Part 1 – Background and context

1 Management plan approach

The plan outlines intentions for the management of the site via overarching objectives and polices followed by discussion of issues and opportunities.

These have been developed following a process of research, stakeholder and community consultation. The objectives and policies represent high-level aspirations that seek to achieve a quality well managed environment.

A number of projects and initiatives could result from the plan. The plan does not prioritise these, but empowers ongoing implementation via an advisory group made up of the Auckland City Council and community. The purpose of the advisory group is to prioritise areas of work via an 'action plan'. Available resources can then be directed to where they are considered to be needed most. This approach is chosen to keep the plan relevant over time, and to provide flexibility for the community and Auckland City Council to work together to prioritise actions.

The Auckland City Council has prepared this management plan in accordance with the process outlined within the Reserves Act 1977. As some areas of subject land are not classified as reserve under the Act, the plan is not a statutory document.

2 Land acquisition and tenure history

Following the initial Crown acquisition of the 3000 acre Mataharehare, Opou and Whau block in October 1840 almost all Ngati Whatua land on the isthmus had been purchased either by the Crown or Europeans (under the Fitzroy pre-emption waivers, 1844-45) by 1845, except for the Orakei block and the lands between Hobson Bay and Remuera Road. These lands were an area reserved by Ngati Whatua and were not intended for sale, although the Pukapuka block earlier had been gifted to Kati Te Wherowhero (brother of Potatau).

Orakei East and West Reserves: These reserves are within the 19th century land blocks known as the Remuera Block, and the Pukapuka No. 1 block.

In the late 1840s and early 1850s the Crown purchased the remaining Ngati Whatua land around Hobson Bay. Pukapuka No. 1 was purchased from Te Hira Kawau by the Crown in 1854. In 1890 a Native Reserve" (Section 238 Suburbs of Auckland 16) established on this block after the purchase was ruled by the Native Land Court to be the sole property of Ihapera Kati. After restrictions on the sale of Maori Land by the Native Land Act 1909, the property was purchased by Messrs Earl and Kent (solicitors) who subdivided and sold the land in the early years of the 20th century.

Pukapuka No. 2 was also purchased by the Crown in 1854 from Paora Tuhaere. A freehold title (ie: without restriction on sale) for the "Native Reserve" (Section 220, Suburbs of Auckland 16) on this block was issued to Paora Tuhaere in 1864. The land was leased it to a Mr Cheeseman who subsequently purchased it in 1868.

The Remuera block was purchased at the end of 1854 or early in 1855 (the original deed for this sale is lost; it is not known who the seller(s) was, nor what the terms of the sale were). Most of this block was rapidly sold to settlers but the Orakei peninsula was retained by the Crown or granted to the Superintendant of the Auckland Province for "educational purposes". In 1923 all of the northern part of the peninsula was taken for the construction of the railway. In 1971 the strip around the basin (Allotment 286 Suburbs of Auckland 16) was transferred from the Railways Department to the Auckland City Council. Part of the area (217 Orakei Rd) was subsequently returned to Ngati Whatua and this has been incorporated into the reserve under a perpetual lease.

The remaining portion of the Orakei Reserves around the southern side of the basin is made up of legal road and properties acquired by the Council in the mid-20th century by private purchase or acquired under the Public Works Act or through subdivision reserve contributions.

The other reserves considered in this report were within the Pukapuka No. 2 block. They were generally acquired by the Council in the early to mid 20th century, after the area had passed into private hands. Much of the area had remained farmland until well into the 20th century. The Council acquisition of each area is set out briefly below:

MacPherson Street Reserve: part of Allotment 220 Suburbs of Auckland 16: the southern end is the legal unformed end of Meadowbank Road, created in 1906. The northern end is unformed legal road (Purewa), created in 1950. The reserve area between these two roads is a reserve (gazetted in 1960) created when the Housing Corporation subdivided the area in 1954.

Bonnie Brae Reserve: part of Allotment 220 Suburbs of Auckland 16: This area was acquired by the Council as a recreation reserve in 1977.

Meadowbank Reserve: part of Allotment 220 Suburbs of Auckland 16: this area is part seabed and part legal road transferred to the Council in 1931.

Kelvin Reserve: this area was acquired by the Council from private owners in 1931 as a public reserve.

Waiatarua access: this area on the southern side of the creek it is legal road by Crown Grant. The accessway on the northern side of the creek was transferred to the Council when the area was subdivided in 1959.

Lucerne Road access: this unformed legal road transferred to the Crown in 1912 when Lucerne and Ngapuhi Roads were created.

An expanded history with images is included in Appendix 3.

3 Areas included within the Management Plan

The areas subject to the provisions of this management plan are reserves and public areas of open space which are owned or administered by the Auckland City Council. This includes all reserves adjacent to the Orakei Basin and Creek. The management plan also applies to the water bodies, to some extent.

The approximate areas of land are identified in Figure 1.

The subject land comprises of a number of parcels which are utilised as public open spaces, either connecting to form a larger area, or as stand alone local scale parks, including:

- The water bodies of Orakei Basin and Creek
- The Orakei East and West Reserves: these reserves border the west, south and part of the eastern side of the basin and consist of a number of titles, leased Ngati Whatua land, and unformed legal road.
- MacPherson Street Reserve: this reserve borders the edge of the eastern side of the entrance to the Orakei Creek between the end of Meadowbank Road and Purewa Road.
- Bonnie Brae Reserve: this reserve is situated on the southern side of MacPherson Street and continues along the Orakei creek edge to Meadowbank Road.
- Meadowbank Reserve: a small reserve on the eastern side of Meadowbank Road, opposite Bonnie Brae Road.
- Kelvin Reserve: this reserve occupies a small headland into Orakei Creek at the end of Kelvin Road.

Also included are two sections of unformed legal road, Waiatarua Road Access and Lucerne Road Access:

- Waiatarua Road access: is a section of legal unformed road between the end of Waiatarua Road and Orakei Creek. A footbridge across the Orakei Creek leads to the narrow MacPherson Street Access. This is essentially a footpath from the bridge to MacPherson Street.
- MacPherson Street access: is land held as an accessway that provides a route to the footbridge across Orakei Creek from MacPherson Street.
- Lucerne Road access: this area is the legal road end of Lucerne Road, leading to and along part of Orakei Creek.

The legal status of the land parcels varies. Full legal title information is provided within Part 3 of this document.

Within the plan, the word 'reserve' is used to describe the subject land areas identified in a plain language sense, as this is how these areas are commonly described, and is not limited to areas classified under the Reserves Act 1977.

The Crown holds title to the seabed of the Orakei Basin and Creek. Auckland City Council has a lease over the seabed that is due to expire in 2050.

The subject land areas are generally identified within the District Plan as being within the Coastal Management Area. Part 5B of the District Plan imposes strict controls on activities and developments proposed within the coastal environment to ensure that the design, appearance and location of buildings and structures are in sympathy with the natural and physical character of the coastline. Any proposed earthworks are to be in keeping with the existing landscape and minimise impact on water quality.

Figure 1: Orakei Basin – Indicative land areas subject to this management plan

The Orakei Basin as viewed from Upland Road

Figure 2: Location of Orakei Basin within the Auckland Isthmus

4 Orakei Basin description

The Orakei Basin is located at the south-eastern corner of Hobson Bay adjacent to the suburbs of Orakei, Remuera and Meadowbank.

The landform is a low lying volcanic explosion crater and tuff ring. From a regional perspective, its general form shares similarities with Panmure Basin, Onepoto Domain and Lake Pupuke, which are also volcanic craters that contain water. The Orakei Basin remains unique as the only large impounded body of seawater in the region.

The tuff ring is roughly circular in shape, 800m in diameter and is bisected by a rail embankment that forms the boundary between the impounded basin and Purewa Creek.

Orakei Creek flows into the basin from the eastern side and is the culmination of a wider water catchment that includes eastern Remuera, Meadowbank and the Waiatarua wetland areas. Local scale reserves, residential subdivision and development have occurred on the edges of Orakei Creek.

The western, southern and eastern shorelines of the basin are bounded by public reserves areas which provide a degree of amenity buffer between the water and adjacent residential development. The northern shoreline is formed by a railway line embankment that is part of the eastern rail corridor. Sluice gates are located within the embankment which control water discharge to and from Purewa Creek and Hobson Bay.

Reserve areas are generally sited on the inside slope of the tuff ring with residential development located predominantly on the upper inward facing and outer edges. The reserves variously contain areas of vegetation, grass and paths.

The plan also applies to reserves located outside the Orakei Basin tuff ring, as shown in Figure 1.

5 Orakei Basin

Impoundment of the basin

Prior to human intervention, Orakei Basin was a sea-breached volcanic crater with a marine mud seabed and mangrove forest. It supported tidal flat marine life and was part of the wider tidal area of Purewa Creek and Hobson Bay.

The basin was highly modified in the late 1920s when it was isolated from Purewa Creek and Hobson Bay by the construction of the railway embankment and further in the early 1930s when a set of sluice gates was installed to enable impoundment of the water within. In 1932 Auckland City Council removed mangroves to create an area for water-based recreation. This use is reflected in the original lease over the seabed between the Crown and Auckland City (since renewed and due to expire in 2050), which requires that "the City maintain the Orakei Basin as a public boating and associated water related activities area" (clause 3).

For the first 15 years, Orakei Basin was heavily used for swimming and other water-based activities such as water skiing. However, water quality within the basin declined over time and public use decreased.

Since 1996 Auckland City Council has commissioned a number of reports in response to concerns raised by local residents and recreational users. A study of these reports and the recommendations contained therein, have informed the development of the management plan.[1]

Current flushing regime

Prior to the 1960's the Orakei Basin was flushed only during the summer months, with the gates left open during winter allowing the water to flow in and out with each tidal cycle. In 1961 the Auckland Water Ski Club (AWSC) requested the gates be closed and water held in the Basin at set times during the winter to allow water ski events to be held.

In 1962 the AWSC requested the Orakei Basin be filled and emptied at times corresponding with peak tides. By 1964 the AWSC was responsible for operation of the gates, typically flushing the Orakei Basin at monthly intervals corresponding to spring tides.

In 1995, an Auckland Healthcare investigation reported direct exposure to water in the Orakei Basin posed a high health to users due to elevated levels of bacteria. As a result, the flushing regime increased to a fortnightly interval, corresponding to spring and lunar tides, if water discolouration was reported, or after 10 mm of rainfall in 4 hours.

The Orakei Basin Environmental Improvements Report and Strategy Plan 1998[2] again revised the flushing regime to include the additional trigger levels:

- odour complaints
- water discolouration
- 5 mm of rainfall in 1 hour
- 15 mm of rainfall in 4 hours.

When the Auckland Regional Plan: Coastal became operative in October 2004, Auckland City Council was required to obtain resource consent for the impoundment of Orakei Basin and the associated coastal occupation and operation of the sluice gates.

During the resource consent process the optimal flushing regime was investigated, including the following options:

- fortnightly flushing
- maximised flushing
- returning the Basin to a fully tidal environment
- reducing the gate height to allow partial flushing with each tide
- weekly flushing.

Following assessment of ecological and recreational impact of each option and consultation with public and key stakeholders, Auckland City Council decided to continue impounding Orakei Basin, with the continuation of the existing fortnightly flushing regime. This was based on the following key conclusions:

- Orakei Basin is a significant recreational water body, unique in the Auckland region.
- A lease is held over the sea bed for the express purpose of public boating and associated water related activities.
- A return to a tidal environment would result in a complete loss of water-based recreation.
- The resulting tidal environment would not be considered a return to a natural environmental state due to the ongoing restriction of the railway embankment.
- Maximised flushing will require a significant increase in operation but will not result in any significant improvement of water quality or environmental values.
- The current program is practical because it coincides with peak tides and is frequent enough to avoid water quality problems in the Basin.

The resource consent conditions specify that the Orakei Basin be flushed fortnightly (approximately 27 times a year), opening the gates during high tides. This flushing regime results in useable water levels for 78% of daylight hours during the year.

It was also agreed as part of the resource consent process, once the sluice gates refurbishment project is completed, that an independent party would operate the sluice gates rather than the Auckland Water Ski Club.

The operators of the gates are responsible for monitoring rainfall events and undertaking emergency flushing following rainfall events that exceed trigger levels (currently set at 5mm in one hour and 15mm in three hours), or as directed by Auckland City Council.

[1] Andrew Stewart Ltd, 2010, 'Orakei Basin Reserve Management Plan – Background Information Review'.
[2] Auckland City Council 1998: Orakei Basin Environmental Improvements. Strategy Plan and Assessment of Environmental Effects, Worley Consultants, Auckland.

Sluice gates and water levels

The sluice gates that impound water in the Orakei Basin leak. This reduces the water level over time. Due to the shallow depth of the Orakei Basin, any drop in water level impacts on the usability of the Orakei Basin for recreation. The drop in water level also exposes increasing areas of mud flats in the upper arms of the Orakei Creek, which would normally be covered in water, affecting amenity values.

Auckland City Council is currently replacing the gates, with works expected to be completed in December 2010. This will assist in maintaining maximum water levels in the Orakei Basin and Orakei Creek.

The water level of the Orakei Basin is influenced by the height of the sluice gates, tides and atmospheric pressure. The depth of water is determined by the difference between the water level and depth of sediment on the seabed of the Orakei Basin. Over time, silt builds up decreasing the depth of water and potentially hindering water based recreation.

A relatively lower water level can improve conditions for water skiing in the Orakei Basin. However, small decreases in water levels in the Orakei Basin can expose mud flats in the Orakei Creek, effecting amenity. At maximum water levels some tracks on the reserves can flood. Water levels also influence the effect of boat wakes on erosion of the banks of the Orakei Basin.

Establishing a baseline water depth with a maintenance dredging programme in the Orakei Basin would help to maintain depths suitable for recreational use. The hydrographical survey conducted following the dredging of the Orakei Basin in 2001 could be used for baseline depths.

Environmental effects of impoundment

The construction of the rail embankment created a relatively contained and sheltered water environment. The sluice gate flushing regime (currently fortnightly) has altered the natural tidal flow in and out of the basin since its construction in the 1930s.

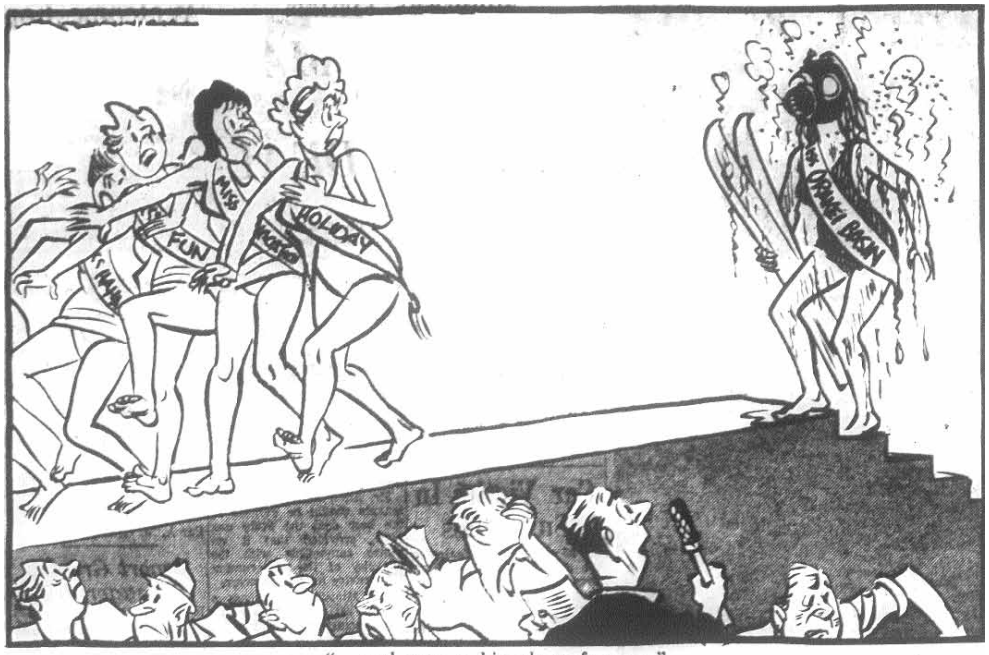
The impoundment of water combined with historic and ongoing stormwater runoff from surrounding properties and the wider catchment has resulted in sediment build up within the Basin and Creek. Land use practices on adjoining and surrounding properties can have adverse flow on effects to the basin, particularly in relation to erosion, sediments and nutrients. These effects are somewhat exacerbated due to the lack of natural tidal flushing, whereby sediment has time to settle and nutrients remain within the water body and augment algae growth.

Anoxic bacterial processes within the sediment have been known to cause the release of odours from time to time. Algal growth and decomposition can also cause odours and adverse visual effects particularly during the warmer months.

In 1935 the first complaints regarding offensive odours and algae blooms were received. Since this time Auckland City Council has regularly received complaints regarding odours, algae, water quality, sewer overflows, and sediment deposition.

From 1945 the water quality in the Orakei Basin decreased rapidly until the early 1950's when water quality had degraded to a point that few people used the basin for recreation.

Sluice gates: circa 2008



"...and now, a big cheer for-er-"

Source: NZ Herald, 7 January 1969

Over the last 7 decades Auckland City Council has attempted to identify and address the causes of the poor water quality and odour generation, with varying degrees of effectiveness.

During the mid 1990's, Auckland City Council undertook an environmental study of Orakei Basin and Creek in response to growing concerns from recreational users and adjacent residents.

This resulted in the Orakei Basin Environmental Improvements Report[3], ("the Worley report") which recommended a number of environmental improvement programmes, including partial dredging of Orakei Basin and Creek and algae removal. Auckland City Council undertook 3 stages of dredging, with a total of 21,664m^3 of sediment removed from the Orakei Basin.

The works were designed to improve amenity by increasing the depth of water for recreational users and to removing odorous sediments.

In 1999 City Design Limited was contracted by Metrowater to undertake a fully integrated study of the Orakei Basin catchment. The aim of the Orakei Basin Integrated Catchment Study (OBICS) was to identify the key pollution sources and to identify cost-effective remedial measures that minimise both public health risks and environmental impacts. Consequently, a number of significant projects have been undertaken, which have resulted in the water quality improvements. The OBICS and resulting catchment works are discussed in more detail below.

The lack of a natural tidal cycle also makes it difficult for both intertidal and sub tidal species to colonise the area. (Intertidal species live in the area between the high and low tide mark and are sometimes exposed to air and sometimes covered in seawater. Sub tidal species are those that live below the low tide mark and are always covered by seawater). This means that the species found in the basin are opportunistic species well adapted to disturbed environments. Despite the modified habitat, wider Hobson Bay, including the Orakei Basin and Creek, is recognised as a habitat for native bird species, including shags.

STENCH FROM WEED

Orakei Basin Being Flushed Out

Orakei Basin—the subject of angry complaints recently from near-by residents who have been plagued by a foul stench coming from it—was drained yesterday and will be left open for several days.

The unpleasant odour has been caused by decomposing weed in the basin emitting sulphuretted hydrogen fumes. Paint on local houses has changed colour and baths have turned rusty brown. Silverware has turned black.

The chief health inspector of the Auckland City Council, Mr R. Agnew, said yesterday that, following complaints from residents, the basin had been drained and would be left open to allow tidal water to ebb and flow in it. In this way some of the weed causing the smell might be flushed out.

After several days of this treatment, he said, a further look would be taken at the situation. It was not feasible to dredge out the weed as there was a huge quantity of it.

Residents of Upland Rd, Remuera, who overlook the basin, said yesterday that although the smell was not as bad as on Sunday, baths and silverware continued to become discoloured. A strong wind has been blowing the fumes over the houses.

Holiday Bets Total

Prospects Of Trade With India

From B. C. NAG
N.Z. Herald Correspondent in New Delhi

The possibility of in-

Source: NZ Herald, 7 January 1969

[3] Auckland City Council 1998: Orakei Basin Environmental Improvements. Strategy Plan and Assessment of Environmental Effects, Worley Consultants, Auckland.

Orakei Basin and Creek water quality

Modelling of potential storm events done for the Orakei Basin Impoundment Resource Consent, indicates that water quality in the Creek may exceed recreational microbiological alert level guidelines (enterococci >140cfu/100ml) for up to 40 events a year, with a the fortnightly flushing option. The duration of these events is anticipated to be approximately 40 hours. There are anticipated to be up to 25 events a year when action levels (enterococci >280cfu/100ml) are exceeded, with the pollution incidences lasting for up to 24 hours.

According to the model, there are no microbiological exceedences of water quality in the Orakei Basin. The model results are based on all stormwater and wastewater catchment works being completed. Under the fortnightly flushing regime, water quality in the Orakei Basin is suitable for all forms of recreation while the Creek is only considered suitable for secondary contact.

Modelling shows that Creek levels of ammonia and dissolved inorganic nitrogen are above guideline levels, and that Orakei Basin levels of ammonia and phosphorus are above guidelines. Nitrate levels are compliant with water quality guidelines. The indication is that the Orakei Creek and Basin still show potential for algal growth based on nutrient levels.

Flushes of high suspended solids are expected in the Creek during storm events, with a corresponding detrimental effect on the Creek ecology, as well as visual values. Monitoring of the water quality in the Creek has shown that it is not suitable for primary contact. Recreational users of the Creek could be made aware of this via signs.

Water quality monitoring should be undertaken as per the recommendations of the OBICS to determine the success of the various catchment improvement projects and current water quality, and to assist in re-assessing emergency flushing triggers and minimum required flushing frequencies.

Orakei Creek dredging

Due to the location of the main stormwater discharge points, the creek acts as a sediment deposition area and is slowly filling with sediment. This process is clearly evident at the heads of the creek arms. Historically sediments have also been contaminated by poor quality stormwater discharges and sewer overflows into the creek.

Following the successful completion of the Orakei Basin dredging programme (December 2001), environmental protection and local interest groups agreed that future dredging activities should focus on removing the contaminated sediments from Orakei Creek.

Given the historical instability of land around Orakei Creek, a detailed geotechnical investigation was commissioned by Auckland City Council (OCSSI, 2002) to ensure that proposed dredging works would not present a risk to public safety or private property. This report found that there was a measurable risk to Auckland City Council if slips occurred at surrounding properties following works in the Creek. Various options were considered to address this risk including retaining walls along the Creek banks as well as dredging of the Creek and infilling with gravel.

In 2003, the Auckland City Council sought feedback from residents adjacent to the Orakei Creek regarding the proposed dredging. Of those residents that responded, the majority (92.8 percent) supported the proposed works. The earlier OCSSI (2002) was reviewed by Riley Consultants in 2003 and it was determined that despite the evidence of instability, the project could proceed provided that an appropriate risk management methodology was adopted to mitigate the risk of slips at surrounding properties. In 2003, the Auckland City Council commissioned Simpson Grierson to prepare a legal opinion on potential liability issues related to the Creek improvement project (LLI, 2003). This legal opinion confirmed that the Auckland City Council and therefore the general public could be held liable in perpetuity for damage as a result of land movement.

Also in 2003, BECA was commissioned to prepare a Risk Management Action Plan (OCRMAP, 2003) outlining an appropriate risk management methodology. The two key elements of this methodology were tight control over the depth of dredging and a three-metre buffer that would be maintained between the creek bank and dredging area. No dredging of dredging equipment was to be allowed inside this zone.

Despite the methodology identified in the OCRMAP (2003) and the various mitigation options considered, the risk to surrounding properties was not eliminated completely. As per the recommendations of the OCRMAP (2003), the only way to completely eliminate risk was to obtain written approval from adjacent residents. This proved to be unobtainable. Whilst the risk remaining was admittedly small, it was measurable and would place an increased level of risk to over 390 homes in the surrounding area. Auckland City Council determined that it would be unreasonable to proceed with the works and place a significant potential financial burden upon the ratepayers.

6 Catchments

Catchment inputs to the Orakei Basin and Creek

A number of catchments feed into Orakei Creek and the Orakei Basin. Three catchments – Meadowbank West, Meadowbank East and Ellerslie (see Map 2.1: City catchments and ICS areas) feed into the basin and/or creek. These were extensively studied, and the pollution loads calculated, summarised as follows:

- Stormwater from the 158 ha Meadowbank East catchment, with an annual discharge of approximately 850,000m^3/yr. Stormwater from this catchment enters the tributaries upstream of the Creek and discharges into the upper areas of the Creek arms. At the time of the study this represented approximately 8% of the total pollution load to the creek.
- Stormwater from the 679 ha Ellerslie-Waiatarua catchment, with an annual discharge of approximately 7,800,000m^3/yr. Stormwater from this catchment discharges into the Meadowbank arm of Orakei Creek. At the time of the study this represented approximately 88% of the total pollution load to the creek.
- Overflows from the combined sewer system servicing a 225 ha catchment, with 8 overflows directly into the Creek. At the time of the study the Meadowbank combined sewer overflow load discharging into Orakei Creek was approximately 280,000m^3/yr, representing approximately 2% of the total pollution load.

The majority of contaminants that enter the Creek find their way into Orakei Basin over time, with only a 15 ha stormwater catchment discharging into the Orakei Basin itself.

The water quality of the Orakei Basin is affected by both the water entering from the above catchments, but also by the quality of the water in Hobson Bay and Purewa Creek from which the Orakei Basin is refilled after each fortnightly flushing event.

Catchment improvement works

Auckland City Council and Metrowater have invested significant resources to address pollution sources and sediment discharges into the Creek and Orakei Basin, including;

- Separation of the combined wastewater and stormwater system in the Meadowbank Catchment, and replacement of the under capacity trunk sewer
- Improvements to the efficiency of the Waiatarua Reserve wetland stormwater treatment system, from an original estimated 30% to 85% treatment efficiency
- Upgrades to the Kenneth Small stormwater treatment ponds
- Upgrades to the Ballarat stormwater treatment ponds
- Renewal of stormwater ponds at Remuera Golf Course to address flooding and erosion issues
- Various stormwater network upgrades to address flood hazards in the surrounding catchments.

The first two remedial works identified above have reduced the major sources of pollutants entering the Orakei Creek and Basin. It is estimated that such measures have reduced up to 90% of the pollutants entering the Orakei Basin and Creek (OBICS, 2000). Water quality monitoring at Waiatarua is undertaken, and has shown that the stormwater wetland is functioning as expected.

Cleaning of catchpit filters is in constant review. Regular cleaning of critical catchpits will assist in controlling sediment and contaminant discharges from the local stormwater catchment.

The affect of these works on water quality in Orakei Creek are becoming apparent, with the 2004/05 summer being the first in a number of years that algae blooms have not been a problem in the creek, despite ideal growing conditions. Algal blooms have not been a significant issue since this time.

The Hobson Bay sewer pipe project, will remove the leaking pipe across Hobson Bay, will improve water quality by reducing the flow of contaminants from Hobson Bay into the Orakei Basin and Creek during the tidal cycles.

The OBICS (2000) recommended that a dual siphon be installed to replace existing wastewater siphon that runs under the Orakei Creek. The siphon is a potential risk that warrants assessment to avoid wastewater leaking directly into the Creek.

Erosion control in watercourses feeding into the Creek was identified in OBES (1996) as an option that could contribute to reducing sediment entering the Creek. A large number of private stormwater systems from residential properties discharge directly into these creeks, potentially causing erosion and sediment discharge. This issue is exacerbated by infill development and vegetation clearance.

No erosion control measures have been implemented as the watercourses are on private land and relatively steep land. Both the OBES (1996) and OBEIR (1998) recommend education of residents in terms of sediment and silt control and the effects of runoff on water quality. Such a programme could encourage riparian planting and stormwater retention.

Map 2.1 City Catchments: 1999, City Design Ltd, Orakei Basin Integrated Catchment Study

Composite image of Orakei Basin West Reserve

Composite image of Orakei Basin East Reserve

Looking West – Orakei Basin West Reserve

7 Reserves

The Orakei Basin East and West Reserves

Orakei Basin West and East reserves are the main contiguous areas of open space located around the western, southern and eastern perimeters of Orakei Basin. The reserves cover an area of 8.63 hectares and contain a variety of vegetation, vehicle and pedestrian routes and buildings. The reserve areas are generally located on the inside slopes of the tuff crater.

Planted exotic and native species dominate the slopes and upper parts of the reserves. Woody and herbaceous weed species are also common, with privet species being the dominant mature woody weed.

A relatively flat grassed area and concrete path spans some 500m along the water edge of Orakei Basin West Reserve. This area contains some bench seats and a concrete footpath.

The northernmost part of Orakei Basin West reserve is located on the Orakei peninsula, which was formerly a headland pa site. This area has a centrally located grassed clearing and path, and a 380 metre long access road that follows and cuts into the inside contour of the slope. Parts of the landform adjacent to the road are subject to significant erosion particularly on the western side. Of particular concern is exposed shell midden and soil which is encroaching on the road and reducing its usable width. Some areas of erosion may have been exacerbated by vegetation clearance, which has resutled in exposed bare earth.

The no exit road provides access to a cluster of community leased buildings and steeply formed boat ramp, then continues to a water edge car park with a boat ramp and small jetty. The buildings are leased by the Orakei Sea Scouts and the Young Mariners organisations. Youthtown shares facilities with the scouts and has a shipping container located next to the buildings, which is used for equipment storage.

The Auckland Water Ski Club building is located at the eastern side of the basin within Orakei Basin East Reserve. Access to the building is pedestrian only, via Lucerne Road or the wider track network.

Pedestrian paths, including the access road, provide full access from the northernmost part of Orakei Basin West Reserve, around the basin, to the northernmost part of Orakei Basin East Reserve. The paths have a variety of surface treatments, from earth to concrete to asphalt, and are in variable condition.

Ground conditions within the reserves are variable. Significant erosion is visible at some places. For example, at the Lucerne Road steps and along the path between the communmity buildings and Orakei Road. Elsewhere low growing and understory vegetation has helped to prevent erosion.

Views toward the CBD from Meadowbank Road entrance to MacPherson Reserve

Unmarked entrance to Bonnie Brae Reserve walkway from Meadowbank Road

MacPherson Street Reserve

MacPherson Street reserve is located at the eastern side of the Orakei Basin at the upper reach of Orakei Creek as it exits to the basin. The 1.18 hectare reserve is situated on the inside slope of the landform which falls towards the water edge. The reserve is relatively narrow at the northern end and widens toward the southern end.

The Meadowbank Road entrance is set back from the street by about 10 metres and consists of a landing area with 2 seats. There is no sign to identify the public space and a private driveway is located between the road edge and the landing.

The landing offers extensive views of the western side of Orakei Creek, headland, Purewa Creek and wider views of Maungakiekie, the city centre and the North Shore. A cascade of steps provides access down the steep slope to the path which is cut into the slope and runs the length of the reserve. The path is realtively wide however is surfaced with bare earth and thinly spread large grade scoria gravel. The gravel can be unstable to walk on at places. Toward the northern end of the reserve, the path provides extensive westward views.

Vegetation is variable in quality and includes a mix of mature native, exotic and weed species, bare earth and established tracts of planted grasses and flax along the walkway edges. Native shags are known to roost and nest in this general area.

The northern entrance at Purewa Road is also without signage to identify the reserve or walkway. An open grassed area, that sits outside the reserve legal boundary, includes an asphalt path and pump station building. The reserve and walkway entrance to the left of this area is not readily discernable when viewed from Purewa Road.

Bonnie Brae Reserve

Bonnie Brae Reserve is a 0.6 hectare local scale reserve located adjacent to the northern shoreline of the eastern arm of Orakei Creek. The northern side of the reserve fronts MacPherson Street and the southern side faces Orakei Creek. The reserve has two distinct areas; a grassed park and playground that fronts MacPherson Street, and a bush clad margin that follows the edge of Orakei Creek to Meadowbank Road.

The grassed part of the reserve slopes down from MacPherson Street to a flatter area with a large central Pohutukawa tree and a playground. A path leads down the slope from a paved landing to the playground that contains swings, slides and climbing equipment. The rear boundary of the grassed area is fenced with a wire 'pool' style fence and gate.

The bush clad part of the reserve has a pathway that runs along the sloped bank of Orakei Creek. The walkway links the playground area with Meadowbank Road but is not identified with signs. The walkway experience provides views to Orakei Creek and shoreline. Vegetation includes native and exotic trees and some woody and herbaceous weeds.

Meadowbank Reserve

Meadowbank Reserve is a 650m2 unmarked reserve located at the eastern side of the intersection of Meadowbank Road and Bonnie Brae Road. The reserve slopes down to an adjacent tributary waterway that runs under Meadowbank Road and into the eastern arm of Orakei Creek. Meadowbank Reserve is well vegetated with trees and undergrowth, and is not identified as a public reserve by signs. Inorganic rubbish is present within the reserve particularly near the road boundary.

Kelvin Reserve

Kelvin reserve is located at the northern end of Kelvin Road on a small peninsula that divides the termination of the western arm of Orakei Creek. Trees and gardens on residential properties flank the eastern and western sides of the reserve and frame the entrance, which has a sign and bollards that identify the reserve as a public place. The upper part of the reserve is grassed and includes a large Eucalypt tree and a Pohutukawa, which provide shade. The flanks of the reserve are vegetated with maturing planted native trees up to around 4 metres in height. The northern part of the park has a distinct view shaft that provides views of Orakei Creek and shoreline and has a wooden seat. The last 20 metres of the peninsula falls down toward the water and is well worn by people accessing the water edge.

Entrance to Kelvin Reserve. The reserve vegetation blends with private gardens at each side.

Waiatarua Road access and MacPherson Street access

The Waiatarua Road and MacPherson Street access areas provide walkways to a 55 metre long footbridge that spans Orakei Creek.

The MacPherson Street access is located between residential properties and the upper section runs next to a driveway. The walkway is not marked by signs and blends visually with the adjacent residential driveway. The asphalt walkway runs parallel with the adjacent property boundaries before widening to a vegetated area where concrete steps provide access down to the footbridge. The footbridge is constructed in wood with painted white handrails. Street style lights are located at both ends of the bridge. The bridge provides a unique public viewing area of the upper part of the creek and its sloping vegetated edges that are not overly dominated by buildings.

The Waiatarua Road part of the walkway is a moderately sloped asphalt path with a white painted wooden handrail that is similar in style to the footbridge. The entrance to the walkway is not readily apparent from the street and is not marked by signage. The reserve is 600m2 in area, slopes relatively steeply down to the water edge, and contains a variety of maturing vegetation including native and exotic species. Just to the west of the base of the footbridge, where the land slopes to the water, is steep informal track that leads to a small, roughly constructed concrete landing at the water edge.

Entrance to Lucerne Road access (unformed legal road)

Pedestrian footbridge over eastern arm of Orakei Creek, from Waiatarua Road

Lucerne Road access

The Lucerne Road access is a bush covered reserve area, located on the western bank of Orakei Creek at the end of Lucerne Road, opposite the pedestrian walkway to Orakei Basin East Reserve. The road frontage contains driveways to adjacent residential properties, and as such, the reserve is not easily identifiable from the road as a reserve area. The reserve slopes down moderately steeply towards the water edge. The area is well vegetated with native and exotic trees and plants, including weed species. Native shags are known to roost and nest in this general area, especially on trees near the water edge.

8 The Walkway Project

A dual-purpose walk and cycle track along the length of the railway corridor is to be constructed during 2010. This track will form the first stage of a consented design to establish a continuous loop around the basin. The second stage involves the construction of an access track from the eastern side of Lucerne Road, a bridge over Orakei Creek and a boardwalk north to Macpherson Reserve. A full walkway circuit is intended to improve the user experience of the basin.

proposed route

existing walkways, or pedestrian accessible

Note: Route shown is indicative only. The crossing of Orakei Creek will be enabled by a bridge and boardwalk on the eastern side

Indicative walkway route. The rail corridor section will be a walkway/cycleway.

Part 2 – Reserve values

The values of the Orakei Basin and surrounding reserves can be considered in different ways. This section discusses values from the perspectives of recreation, community, landscape, geology, ecology, cultural heritage and archaeology.

9 Recreation values

The basin environment provides passive and active recreation opportunities by way of walking tracks, open grassed areas and the water bodies.

The impoundment and control of water levels allows water-based recreation at all tides and provides a regionally important resource for competitive water skiing. Part of the basin is reserved for non-motorised boat activities, such as yachts, kayaks and model boats. The open grassed areas and pedestrian routes around the basin provide for walking, running and on and off leash dog exercise.

The basin is well used for water-based recreation by community groups, in particular for activities such as waterskiing and sailing. Waka Ama secondary school competition events have been held at the basin. The Akaranga Young Mariners, Auckland Water Ski Club, and Orakei Sea Scouts all have their clubrooms on the basin's shoreline. Youthtown share facilities with the Sea Scouts and provide similar activities.

The Auckland Waterski Club (AWSC) has a clubroom at the eastern side of the basin and the Orakei Sea Scouts occupy a building on the western side and enjoys periods of exclusive use on weekend mornings, and for special events as provided for by the Orakei Basin Bylaw 2006. The AWSC host club, national and international competitions at the basin. Model yachts have been sailed at the basin since 1935 and the Orakei Yacht Club continues to actively sail model craft, predominantly from the western reserve boat ramp area.

Swimming and fishing are prohibited by the Orakei Basin Bylaw 2006.

The Orakei Basin East, West, Kelvin, Meadowbank, Macpherson and Bonnie Brae Reserves are classified under the Reserves Act 1977 as recreation reserves. The Act sets out that the primary purpose of a recreation reserve is to provide for recreation and sporting activities, the physical welfare and enjoyment of the public, for the protection of the natural environment and beauty of the countryside, with emphasis on the retention of open spaces and on outdoor recreational activities, including recreational tracks in the countryside. This purpose is consistent with the recreational values of the Orakei Basin and provides for the protection of the natural environment.

10 Community values

The reserves around the Orakei Basin provide focal points for the local neighbourhoods of Remuera, Meadowbank and Orakei.

The physical form and landscape contributes to a sense of place for the communities that surround the reserves. People naturally experience a strong level of ownership and interest over local reserve areas, and this is enhanced by the dominance of the basin within the environment and the distinctive forms of land, water and vegetation.

People value the coastal environment and the fauna that it supports. In particular, birds such as native shag species are active, visible and highly valued. The habitat that supports the shags is also highly valued and is considered to be important to their wellbeing and ongoing presence in the area.

The reserves provide green relief within a largely built environment and places for people from local and wider communities to meet and experience the water and natural environment through active or passive activities. The basin and reserves offer a range of social activities for people to enjoy, including informal and organised water sport, play areas for children, areas for picnicking and sitting, and walking and cycling links within the local community.

11 Landscape values

The Orakei Basin is an urban water body with landmark qualities.

The location, scale and natural basin landform enables visibility and experience of uninterrupted views toward Purewa Creek and valley, Hobson Bay and the slopes and ridges of the Orakei, Remuera and Meadowbank neighbourhoods. Pathways and open areas along the edges of the Basin and Orakei Creek provide opportunities to experience the visual amenity of the Basin and beyond at a range of elevated levels and near the water edge. At places vegetation partially obscures views out over the water to the basin slopes.

The Orakei Basin is formed by the ancient volcanic tuff ring landform that slopes from the ridges to contain the water body that drains off the St Johns, Orakei and Kepa Road ridges directly into the Orakei and Purewa Creeks on the eastern edge of the basin.

The landscape context and character of the basin is a unique, previously natural area now comprising a mix of natural and built elements. Significant landscape modifications have taken place that impact on the landscape values of the basin.

The coastal edges of the Orakei and Purewa Creeks are identified in the Auckland Regional Plan: Coastal as being Regionally Significant Landscapes.

Kepa Bush on the northern edge of Purewa Creek is an important remnant of coastal mangrove forest and includes other indigenous plant species such as mature kanuka, cabbage trees, kowhai and pohutukawa. This vegetative cover is indicative of the landscape character that would once have dominated the basin and its immediate surrounds.

The headland to the northwest that separates the basin from Hobson Bay protects the entrance to the basin and commands a clear view to the Waitemata Harbour. This was once the location of a pa site and an area of occupation, the physical evidence of which has largely been destroyed as a result of development. The sheltered harbour within the basin would have provided a safe anchorage for Maori, easy access to the Waitemata harbour and a valuable resource for shellfish gathering.

Prior to human intervention the distinctive volcanic landscape and its waterways would have been dominated by dense coastal forest and abundant wildlife. Today few elements of the original forested landscape character remain. Most of the original landscape character and integrity of the feature has been destroyed as a result of development. Landform and vegetation modification such as urban residential development, including the installation of structures including buildings, steps, walkways and erosion has further fragmented the original landscape values of the basin.

The landscape of the basin today is characterised by the water body and landform with sloping banks and a patchwork a natural and built elements – vegetation, stands of exotic and native trees and weedy species, pasture, the railway embankment, jetties, residential development and club facilities.

The fringe of mixed native and exotic vegetation around the basin includes privet, puriri, kowhai, cabbage trees, ngaio and pohutukawa. Although much of the vegetation is not of a particularly high standard or appropriate species mix, or good quality specimens, the 'green cover' does contribute to the landscape values of the basin and its immediate surrounding landscape.

To the north, the Pourewa Stewardship Area contains sloping banks characterised by horse grazed pasture, stands of exotic trees, horse tracks and residential development. A dominant feature at the northern edge of the basin, running from east to west, is the railway embankment providing a route for the North Island Main Trunk railway. This artificial landform forms a rigid edge to the basin and disconnects it physically and visually from its relationship with Purewa Creek.

The narrow western and eastern reserve areas on the edges of the basin are characterised by grass, a mix of native and exotic trees, shrubs and weeds that in places, merge with the water's edge. Within this public space are community leased buildings and carpark on the western water's edge and the Auckland Water Ski Club building and jetty on the eastern edge. These non-residential buildings introduce an element of privatisation into the public space and interrupt the public's immediate visual and physical access to parts of the basin. Beyond the vegetated edges, the upper western and eastern slopes are dominated by residential development characterised by dwellings that vary in size, style and character 'cascading down' the slopes.

Some private properties that abut public land around the Orakei Basin are encroaching onto public land eg garden extensions and domestic green waste storage areas. In some cases, it is difficult to identify the private/public edge.

Ongoing incremental degradation of the landscape has occurred in the form of erosion, weed infestation and deterioration of reserve assets, such as walkways, steps and the access road. The cumulative effect of these impacts has the potential to adversely affect public enjoyment of the landscape and visual amenity of the basin.

In spite of the high level of modification to the basin and its surrounds, the basin is a unique natural feature containing high landscape value as an urban remnant water body and vegetated volcanic feature.

12 Geological values

The Orakei Basin tuff ring and explosion crater is identified in the Auckland Regional Plan: Coastal as a nationally important geological feature and an area of significant conservation value.

Orakei Basin volcano is part of a wider volcanic landscape that comprises of several low-profile landforms including Little Rangitoto. This isolated volcano is one of many scattered over the isthmus, however the form of the landscape is rare on the isthmus and in similar volcanic fields elsewhere in New Zealand.

The dominant landform is the explosion crater surrounded by a tuff ring (about 800 m rim diameter) that has been breached by Purewa Stream and invaded by the rising postglacial sea level. The explosion crater has been breached on two sides and is now contains marine mud, but the original layout of the volcano has not been substantially changed.

Little Rangitoto, the external, severely-quarried scoria cone stands at the source vent for lava that flowed around the western exterior of the tuff ring. There is no central scoria cone in the Basin, but a solidified plug deep in the volcanic vent was detected in 2007 when geologists drilled an 82 m long core into the centre of the Orakei Basin. This shows that after eruption the crater became a lake and over the next 75,000 years or so it filled with mud carried in by the Purewa creek to become a freshwater swamp.

Rising sea level allowed the sea to flood the swamp 9000 years ago and transform it into a tidal basin that filled with sandy mud and by the time of settlement it was intertidal sand flats. The volcano produced tephra (airborne lithic tuff and ash) that mantles the prevolcanic ridge to the northeast (Orakei) as far as Okahu Bay.

The rocks that form the volcanic landforms are lithic tuff, basalt scoria, and basalt lava. These are characteristic of the isthmus' volcanoes, and typical of geologically young (Late Pleistocene), monogenetic, intra-plate volcanoes. The lithic tuff includes pulverised underlying sandstone and mudstone as well as some alluvial rhyolitic pumice.

Natural rock outcrops are not common within the geological structure. A slump head scarp high on the northern side exposes characteristic thin beds of tuff. These slumped areas are one of the best examples of largely intact, slow landsides within Auckland City. They provide a highly unusual example of volcanic ash plastered on the side of an existing sandstone ridge on the inside of Orakei Basin Explosion Crater. An old quarry face in the scoria cone exposes massive bedding. The short lava flow is broken by characteristic cooling joints. Some of the better exposures of tuff that make up the tuff ring can be found east of the AWSC, Orakei Road cut on the edge of the reserve and the outlet gate cutting.

There are no rare or conspicuous minerals or fossils within the rocks. Parts of this volcanic landscape have been modified by mass movement on the northern inner slope of the tuff ring (which sits outside the area included within the management plan).

Mass movement and erosion, are unlikely to alter the present landscape in the foreseeable future. There is no current volcanic activity.

(Geological information was obtained from known and unknown sources including a submission from Bruce Hayward on behalf of the Geoscience Society of New Zealand.)

13 Ecological values

Original ecological setting pre-railway embankment and Impoundment

Prior to the construction of the railway embankment in the 1920's, Orakei Basin provided a sheltered estuarine environment due to the remains of the surrounding tuff crater ring. It was known to provide habitat for mangrove forest. It is not known how extensive the mangroves were, but photographs dating to 1921 indicate fairly significant stands at least along the southern shoreline.

After the installation of sluice gates in the 1930's, the mangroves were removed to improve public access and utilisation.

The impoundment regime has prevented re-colonisation by mangroves, apart from a small area of mangroves on the northern side of the basin.

There is some evidence that prior to the construction of the railway embankment, sediments in the Basin were comprised of firm shelly sands. Construction of the causeway created a low energy environment, encouraging the deposition of sediment and development of soft muddy substrates. The subsequent installation of the sluice gates provided for increased velocities near the gates resulting in firm, fine sands and shell material in this vicinity, with soft muddy substrates elsewhere in the basin.

No published accounts of the Basin ecology prior to water impoundment are available. Only general predictions on what the general environment of the Basin would be like without impoundment can be made. Comparisons with similar nearby habitats confirm that the community predicted to best describe the Orakei Basin ecology in the absence of water impoundment would be one dominated by mangrove forest.

Orakei Basin (circa 1921) looking northwards with Hobson Point and North Head in the background.

Current ecological setting

The construction of the railway embankment in the 1920's and impoundment of the basin (with various flushing regimes) has resulted in a highly modified environment. Mangroves and associated habitats are no longer present due to long periods of impoundment. Algal blooms occur periodically due to the lack of flushing and high nutrient levels, though this seems to be becoming less of a problem.

There have been a number of pollution inputs to the Orakei Creek from stormwater and wastewater discharges which have resulted in the sediments with high levels of nutrients and metals. The nutrients have the potential to re-enter the water column and contribute to eutrophication and algal blooms, as illustrated by water quality modelling (City Design, Orakei Basin Integrated Catchment Study, 2000). The key issues identified by the modelling included the following:

- The concentrations of copper in the creek and basin exceed the aquatic ecosystem protection guideline.
- Ammonia levels currently exceed the aquatic protection guideline in both the creek and basin, for both large and small storm events, and are likely to increase significantly in the future. Current measured levels indicate the potential for limited ecological diversity as well as the potential to generate algal blooms.
- Existing and future phosphorus levels are high for both large and small events, and are likely to continue to contribute to algal blooms in the creek and basin.

The Orakei Basin Integrated Catchment Study concluded that in order for water quality and ecological values of the Creek and Basin to improve, pollution inputs to the Creek would need to be addressed.

The contaminated sediments, which result from the pollution inputs, provide for a degraded ecological habitat and limit the development of a diverse and abundant ecosystem. Auckland City Council has invested significant resources to address these pollution inputs.

Ecological surveys have indicated a habitat supporting a relatively low diversity of species, dominated by pollutant-tolerant species. The unnatural tidal regime present in the basin limits the establishment of both fully intertidal organisms and fully subtidal organisms.

Species assemblages are dominated by opportunistic species that are well adapted to disturbed environments. Abundance of these opportunistic, disturbance-tolerant species, (including polychaete worms, amphipod crustaceans and the Asian date mussel), can be very high in places.

Mobile epifauna appear to be the most affected group of organisms within the basin, with low numbers of all species, with the exception of sea hares. This low abundance is likely the result of the unnatural tidal regime and the volume of sediment entering the Basin. The high biomass of algae and associated potential for anoxic sediments over summer may also affect their abundance.

A number of common harbour fish species have been recorded as being found in Orakei Basin, the most common species being yellow-eyed mullet, flatfish, parore and eels. Along with short and longfin eels, common bullies, banded kokopu, and mosquito fish. Inga are present in Purewa Creek and are also likely to be present in the basin.

Fauna

The reserves, and adjacent areas of marine and coastal ecosystems, provide habitat for a range of native and exotic bird species. Birds recorded in terrestrial forest and shrubland habitat during the ecological survey work in 2009 included the following native species: tui, kingfisher, grey warbler, silvereye, and welcome swallow. Exotic bird species recorded during surveys included blackbird, song thrush, house sparrow, chaffinch, goldfinch, dove, rock pigeon, mallard duck, Indian mynah and starling.

Dr. Michael Taylor, a long time resident and bird observer of the Orakei Basin area and active member of the New Zealand Ornithological Society (Auckland Branch) has generously provided information that identifies 38 different bird species as common or regular users of marine and terrestrial habitats in the Orakei Basin area (22 native and 16 exotic species). Only one of these species is listed as threatened (grey duck) according to the most recent threat rankings for New Zealand bird species (Miskelly et. al. 2008). Of these 38 species, around 22 probably use the habitats in and around the basin for breeding (9 native and 13 exotic species). Dr. Taylor has recorded a further 8-10 bird species from the Orakei Basin area, however these are rare vagrant species that have only been noted a small number of times over several decades of observations.

Native shag species are often observed within the Orakei Basin area. Shags roost and nest at the western shoreline of Macpherson Street Reserve and on the eastern side of the headland opposite. A partially submerged fallen tree located at the waterline below Macpherson Street Reserve is a well used roost site.

The terrestrial invertebrate communities are characterised by some interesting species (e.g. puriri moth). However, because most of the trees in these reserves are planted, the insect populations are generally quite low diversity and are characterised by more mobile insect species, rather than those that would be found in mature stands of native forest (Nicholas Martin pers. comm.). The close proximity and connections to good quality remnants of native forest (e.g. Kepa Bush), and the young age of vegetation in the Orakei Reserves, mean that these sites are of some scientific interest as a system to study the colonisation of restored remnants by native insects.

There are very few published (or un-published) surveys on populations of other fauna that maybe present in the reserves and surrounds (e.g. insects, reptiles, spiders, fish, marine invertebrates and crustaceans etc.) Auckland City Council ecologists have recorded native skinks on private properties adjacent to Orakei East Reserve in the past, and it is highly likely that these (and perhaps other native skinks and geckos) are also present within the reserve areas.

Integrated management of all ecological issues could be enhanced by better information on the distribution and values of all the different faunal groups within this site (i.e. including marine and freshwater vertebrates and invertebrates, reptiles and terrestrial invertebrates).

As the current ecology in and around the Orakei Basin is highly modified due to the presence of the railway embankment, the ecology of the area is discussed in terms of pre-embankment and post-embankment situations. This is discussed in detail in the Kingett Mitchell Ltd report, Assessment of Management Options for Orakei Basin, 2005.

Vegetation

While they are narrow, the reserves around the main Orakei Basin comprise a relatively large area of habitat (c.8.6 ha including grassland ecosystems) for native birds and insects. Habitat patches of this size are rare on the Auckland City isthmus[4]. The vegetation around the crater rim also provides a physical and visual buffer between the crater and the surrounding city, and this substantially increases its value as habitat for native water birds and as a quiet/contemplative recreational space.

The Orakei Basin and wider Hobson Bay area are identified in the 'Auckland Regional Plan: Coastal' as breeding and feeding areas for shag species and other coastal birds.

The six different areas of reserve in the wider Orakei Basin and Waiatarua Creek areas collectively comprise c.10.8 ha of forest, scrub and grassland habitat (Table 1), and lie at the junction of two important ecological linkages, or corridors, in the wider landscape. The first link runs from Paritai Reserve to St Johns Road (and potentially[5] onto the Tamaki River coastline) via Ngapipi Road and Reserve, DoC land along Purewa Stream, Orakei Basin/ Macpherson St Reserves and Kepa Bush. The second link runs from Orakei Basin to the Central Business District area via Martyn Wilson Field, the Hobson Bay coastal margin, Shore Reserve, Ayr Street Reserve and the Domain.

Reserve	Approximate size	Ecosystems	Relative biodiversity values
Orakei Basin East and West Reserves and adjoining areas	8.63 ha	Native forest and scrub, mixed native/ exotic forest, weed infested forest and scrub, and mown grassland	High
Lucerne Road Reserve	0.36 ha	Weed infested forest	Low
Kelvin Reserve	0.20 ha	Mixed exotic and native scrub and mown grassland	Low
Waiatarua Reserve	0.05 ha	A small fragment of mixed exotic and native forest	Low
Bonnie Brae Reserve	0.60 ha	Weed infested forest and native forest	Moderate-low
MacPherson Street Reserve	1.18 ha	Planted natives and weed infested scrub and forest	Moderate
Total	**11.02 ha**		

Table 1: Size, general ecosystems and relative biodiversity value of the separate areas of Auckland City parkland surveyed for this report

[4] Orakei Basin is 24th, in terms of its size, out of the 180 ecological sites on the natural heritage database for the Auckland City isthmus.
[5] There is the potential to link Kepa Bush with Point England Reserve via Apirana, Eastview, Taniwha, and Maybury Reserves using restoration planting alongside the streams that run through these reserves, and on some NZTA land. This would create a c.8 km corridor of indigenous vegetation from the Waitemata to the Tamaki coastlines, with the only gap being a c.70m section across St Johns Road.

14 Cultural heritage values

The Auckland Isthmus has seen a millennium of Maori occupation and use.

Tamaki Makaurau or 'Tamaki – the bride sought by a hundred suitors' is the ancestral name for the Auckland Isthmus. Many tribes, descended from ancestral waka including Te Arawa, Mataatua, Aotea, Tainui and Mahuhu, flourished. Volcanic soils provided nutrient rich material for gardening consistently across the Isthmus. The short distance between the east and the west coast was also attractive as resources could be obtained easily from both coasts. Maori had food production organised into gardening and fishing circuits organised by soils, fish stocks and the native calendar (maramataka). The circuits involved establishment of satellite fishing and gardening camps away from the main centres for fishing and hunting during the summer months. Food would then be preserved and taken back to base camp stores for the winter months. The Orakei Pa formed part of the wider Orakei Kainga (Village) complex that also included the camps Te Tinana (near Burwood Crescent), Orakeiiriora (near Ngapipi Road - Paratai Drive intersection) and Okahu Bay (Sullivan, n.d.).

By 1740, the Waiohua tribe under their paramount leader Kiwi Tamaki, held the mana on the central isthmus. Kiwi had his residence at Maungakiekie (One Tree Hill) which was an elaborately built and impregnable fortified Pa. The Ngati Whatua tribes had been steadily moving from the far north and were well established in the south Kaipara region after displacing the Kawerau people. Ngati Whatua coveted Tamaki Makaurau and had cause to seek to obtain it after Kiwi had killed a number of prominent women while attending an unuhanga ceremony at the Kaipara. Under the leadership of Tuperiri the Taou section of Ngati Whatua undertook an intensive campaign against the Waiohua culminating in the death of Kiwi Tamaki, killed in battle near Little Muddy Creek, in West Auckland. After further battles on the Isthmus, Tuperiri took up residence at Maungakiekie and possession of all the lands formerly held by the Waiohua.

The 1820's period saw the Auckland Isthmus temporarily deserted as Ngati Whatua and other tribes in the wider Tamaki sought refuge in the Waikato, Mahurangi and Waitakere regions from the musket bearing tribes from the north who sought utu (revenge) for past defeats. Tamaki became generally unsafe to reside in during this period as war parties from the north travelling south frequently passed through using the short Otahuhu portage to access the west coast from the east, and vice versa. However, Ngati Whatua under Te Kawau, with the assistance of Te Wherowhero and their Waikato relatives returned to the central Isthmus permanently in 1835 as the power of the musket was balanced which in turn bought peace. Crops were re-established and the home fires burned again at the numerous settlements across Tamaki.

The Orakei Basin area is part of the rich history and heritage of Tamaki. Physical evidence of this can be seen in the large midden deposits crumbling out of both the northern and southern slopes of the tuff ring and elsewhere in the area.

The western tuff of the crater was formerly a ridge Pa, cut off by transverse ditches with lateral terraces on the Waitaramoa (Hobson Bay) side. It was easily defended and would have required only light defences as it was isolated by three bodies of water, Te Wai o Pourewa, Waitaramoa (Hobson Bay) and Orakei Basin. The only access by land to the Pa was from the Remuwera slopes.

The Pa is now mostly in Auckland City Council reserve with some in private ownership. Much damage to the Pa has occurred in the past. There have been a number of archaeological investigations in the past including an excavation in 1967 by L.M. Groube, which uncovered a house site. (Brown, 1959).

A village, Maunga Rahiri, more commonly referred to as Rangitoto Iti (Little Rangitoto), was located nearby near the foot of Orakei Road. This papakainga is associated predominantly with rangitira, Te Ara Te Tinana who lived there with around 200 of his fellow Te Taou – Ngati Whatua kin. Te Tinana rebuilt the Pa in 1835 after they had returned to Tamaki after spending the preceding 10 years in exile in the Waikato during the musket war period. Te Tinana signed the Treaty of Waitangi together with Te Kawau and Te Rewiti on behalf of Ngati Whatua in March 1840 (Jackson, 1974).

Another Papakainga was located nearby overlooking the basin, on the Orakei ridge to the north-east near the Kepa Road and Nehu Street intersection. This kainga was 'kept warm' by Ngati Whatua and their Te Kawarau a Maki kin into the 1930's, with burials still occurring at the village urupa in Rautara Street into the late 1960's. This village block was gifted to the Anglican Church for the purposes of building a school and church. These were never built, and the church sold the land to the Crown in 1926 and their Kawerau kin being evicted soon after (Waitangi Tribunal, 1987).

The lands at Orakei Basin were part of the sought after Remuera blocks. A young John Logan Campbell waxed lyrical with respect to this land in his book 'Poenamu'. He also noted Ngati Whatua's firm refusal to allocate lands there to settlers, recalling that after his visit there his party had tramped to Onehunga to meet Te Kawau and Te Hira. On explaining to them that they had "set their hearts on the Remuera slopes stretching down to Orakei Bay. But to the question, would they sell that land, a very prompt and decided 'kahore' (no) was unhesitantly given (Campbell, 1952). Te Kawau wanted to keep these lands as a 'nest- egg' for following generations of Ngati Whatua.

The Orakei Basin area has significant Maori heritage associated with it, as described above. The large midden deposits, terracing and documented house site demonstrates the significant value this area played in the traditional Maori economy and in customary resource management and use. The resources of the basin were also part of the changing Maori economy as those occupying the Rautara and Okahu papakainga continued to harvest kaimoana from Pourewa and the Orakei Basin to the 1930's.

Past land management practices and developments have had major effects on the physical environment and Pa. Despite this, there remains significant archaeological evidence of past occupation and use confirming the importance of the area to tangata whenua. Celebrated ancestors are also closely associated with the Orakei Basin, including Te Tinana, a signatory to the Treaty of Waitangi.

Although Kaimoana is no longer harvested by tangata whenua at Orakei due to the heavily contaminated and polluted waterways, the Orakei Pa retains significant cultural value to present generations. These values are not currently highlighted or celebrated within the reserves.

Tangata whenua are obliged to protect and restore these values as provided for in the Resource Management Act 1991, specifically sections 6(e), 7(a) and 8.

15 Archaeological values

A number of archaeological sites have been recorded in the vicinity of the Orakei Basin (see map in Appendix 5).

Much of the area around Orakei Basin was developed before any systematic recording of archaeological sites was undertaken. Consequently, only a few sites have been recorded. Above the northern shore of the basin, a cluster terraces and shell midden sites are recorded suggesting this was a favoured area for occupation. On the Orakei Peninsula itself there are, apart from the Orakei pa only two small remnant coastal shell middens recorded (R11/2350 and an unnumbered site on the eastern side of Orakei Rd). Extensive modification of the northern part of the peninsula in the early 20th century would have destroyed any archaeological evidence that may have been there. However, it is surprising that more substantial evidence is not present on the unmodified coastal edges than has been the recorded. The paucity of such coastal middens may indicate that the peninsula, away from the pa was not heavily occupied.

To the south of the basin the Maori settlement at Maungarahiri (Little Rangitoto) is recorded (R11/106), but the area has been quarried. A small area of shell midden on a property adjacent to the Little Rangitoto Reserve may be a remnant of the occupation site here. The recorded site R11/533 lies just to the east of Maungarahiri. This is the reported location of a 19th century Maori village, but no surviving physical evidence has been identified. The location is identified from a sketch in William Bambridge's 1845 journal that shows the area between St Johns and Parnell and has two "native villages" marked: one is in the area between the Orakei and Purewa Creeks and the other south of the Orakei basin approximately where R11/533 site is located. It has been suggested that the site shown in the sketch could be Maungarahiri and not a separate site. In respect it is of interest that the Native Reserve on this block did not include Maungarahiri and is quite possible that it had been created specifically to included the area where Kati settled, which would imply that Maungarahiri and the village of the Bainbridge sketch are in fact separate sites.

Around the southern edge of the basin two shell middens have been recorded (R11/1455 and R11/2539). The former is on private property but the latter is within the Orakei East Reserve. These are both remnants of what were probably more extensive sites on the tuff ring surrounding the basin. One historic site, R11/1625, an historic well has been recorded in Dell Ave.

To the east of Orakei Basin site R11/88 has been recorded from Maori Land Court records, although no details of which records are provided in the site record. A small area of disturbed and redeposited shell midden has been noted at this location. The first village recorded in Bambridge's sketch is fairly close to the recorded location of this site. Also to the east of the basin, site R11/2342, a small shell midden has been recorded in close proximity to the Lucerne Access.

Archaeological sites in the management area

Archaeological survey of the management plan area has identified five sites (R11/87, Orakei pa (Orakei West Reserve), R11/1765, shell midden (Kelvin Reserve), R11/2343, shell midden (MacPherson Street Reserve), R11/2536, shell midden (west end of Purewa Road) and R11/2538, shell midden (Orakei East Reserve).

The Orakei pa is a ridge pa occupying the ridge top between Hobson Bay and the Orakei Basin. There are also terraces on either side of the ridge on the slopes leading down to the basin and to Hobson Bay, the latter cut by Orakei Road. On the lateral terraces on the eastern side of the ridge huge quantities of shell can be seen spilling down the slopes from the terraces. Originally the pa was defended by double ditches and banks at its northern and southern ends. They were largely filled in by the construction of the Original Orakei Rd which ran along the ridge-top until the present road was constructed in 1932. However, their location can still be traced in the 1940 aerial photograph of the area, although it is hard to see them on the ground today. Limited archaeological investigations in 2002 and 2005 showed that there was also occupation evidence immediately outside the defences along the ridge top to both the north and south of the defensive ditches.

The lower terraces on the eastern (basin) side have been cut by the road to the boat ramp and some of the western lateral terraces were destroyed by the 1932 Orakei Road diversion. Surface features within the pa have been damaged by the original road and landscaping. However, much subsurface evidence is still largely intact and, with the notable exception of the several large pa on the various volcanic cones within the city, Orakei pa is now the best preserved example of the a pa that lies within the city limits.

R11/1765 is a shell midden in the Kelvin Reserve. Shell midden is visible eroding from the bare eastern slopes and subsurface testing showed that midden is present across the whole of the southern portion of this reserve, although notably none was identified at the northern end of the reserve. It is likely that further subsurface evidence of occupation is still present in this reserve.

R11/2343 is a small scattered area of shell just to the north of the bottom of the steps leading down into this reserve from Meadowbank Road. It is located above a storm water pipe that crosses the existing track. No in situ material appears to be present at this location and the shell appears to be thinly scattered shell redeposited from higher up. Some modern rubbish appears to be mixed into the shell, indicating the shell may well have been deposited down the slope in relatively recent years.

R11/2536 is a midden is located just to the west of the sealed end of Purewa Road, exposed in the side of the railway cutting (but in the legal unformed road that abuts the reserve proper). Here a layer of shell in the top of the railway cutting was probably the edge of a larger site that was mostly destroyed when the railway cutting was made.

R11/2358 is made up of a number of small lenses of shell that are evident in the cutting for steps to the ski club building.

It is difficult to build up a picture of the settlement pattern that existed in the wider area around the Orakei Basin as there has been relatively intensive 20th century development throughout most of the area. Only a few scattered sites, or locations where sites existed or are thought to have existed, have been recorded. The Auckland isthmus was occupied for hundreds of years before Europeans came to settle here. A wide variety of sites would have been present throughout the area that would have reflected the changing requirements of the inhabitants. Ngati Whatua had gardens and associated sites right across the area of which no physical evidence has been found. Their predecessors would have done likewise. The concentration of sites in the relatively undeveloped land around Kepa Road to the north of the basin suggests there was quite intensive use of favoured areas and give an indication of what has been lost elsewhere.

At the basin itself there is the Orakei pa, a site where there is evidence of intense occupation over a period of time. The few middens that have been identified elsewhere around the basin hint at occupation at various places right around the basin on the tuff ring and its slopes, although the small areas of midden that have been found do not indicate such concentrated use as that at the pa.

In am area like this, where so much evidence must have been lost without trace, it is important to preserve those places where evidence of the past use of the area are still to be found.

An expanded description of the archaeological values, with pictures, is included in Appendix 4.

Part 3 – Objectives and policies

Part 3 of the management plan outlines objectives and policies to guide the future development and management of the reserve areas. These have been developed from background information outlined within Part 1, and consultation with stakeholders and the wider public. A discussion section follows, which expands upon issues, opportunities and implementation.

16 The natural environment

Objective:

To manage reserves in a way that ensures the protection and enhancement of the natural environment and provides for increased indigenous biodiversity.

Policies:

- Prepare and implement an overarching vegetation enhancement and weed control plan.
- Measure changes to flora and fauna biodiversity, via initial, and follow up surveys.
- Utilise weed control methods, consistent with Auckland City Council policy, with a view to minimising adverse environmental effects.
- Prepare and implement an ongoing pest management programme to control pests including rats, possums and feral cats.

Discussion:

The vegetated areas of the Orakei Basin can be enhanced to improve visual amenity and to better contribute to Auckland's indigenous biodiversity and the wider network of ecological systems. Ongoing weed management and plant restoration work around the basin will be improved by the development and implementation of an overarching programme. A number of specific issues relating to vegetation and weed management have been raised by submitters to the management plan and should be considered when the vegetation enhancement and weed control plan is developed.

These include:

- planting and weed control methods to mitigate erosion
- planting to enhance habitat for birds, including shags
- managing vegetation to maintain views
- increasing the amount of native vegetation at the basin
- the suitability of spraying and weed control methods, including the removal of privet.

Auckland City Council undertook an ecological survey in 2010 which has been drawn upon in the preparation of this plan. The survey classifies ecosystem types within the reserves and describes the vegetation present within demarcated areas. A summary of suggested vegetation management actions is provided, in relation to each demarcated area. Short, medium and long-term vegetation priorities are also provided. This information is appended to this management plan, which should be used as a source for developing the overarching vegetation and weed control plan.

Existing weed management and replanting work is in part delivered by the ERNBA programme and various SLIPS projects. These are explained below.

ERBNA (Ecological restoration Bush and Natural Areas)

ERBNA is and ecological restoration contract between Auckland City Council and a contractor. The contract covers weed and pest control and revegetation planting on land referred to as 'Bush and Natural Areas'. ERBNA covers approximately 265 hectares over 33 reserves, and aims to restore significant areas of bush to native forest. Due to budgetary restrictions, it is not possible to include all such areas across all Auckland City Council reserves.

The underlying philosophy of ERBNA is to return significant areas of bush across Auckland City to weed free native forest via a four stage process.

The four stage process to carry out this work takes a number of years and depends on a number of factors at each site such as the weed species present, amount of weed seeds in the seed bank, native regeneration, lie of the land and of course budget.

The four stages are:

Stage 1 involves removing existing weeds found within each reserve.

Stage 2 involves following up on these weeds in the following year to ensure that all weeds present at each site are under control.

Stage 3 is the seed bank phase. This can take a number of years to move through and involves targeting weed seedlings as they germinate. Once most of the seed bank has germinated and there is enough native cover/canopy across the site then the reserve moves into Stage 4 which is known as the Forest Protection phase. At this point the reserve has reached maturity and pretty much looks after itself other than a few visits per year to ensure no new weeds are invading or germinating from the seedbank.

It is important to note that this contract is separate and distinct from the regular parks maintenance contracts which cover grass mowing, garden maintenance, litter, park furniture, lighting, etc.

SLIPs (Small Local Improvement Projects)

SLIPs funding is allocated by community boards for local projects that are designed to improve and provide opportunities for the community. Individuals or community groups can propose projects directly to community boards for consideration. The projects may not cost a lot, but can make a real difference to the community.

SLIPs funding is allocated by community boards on a bi-monthly basis (every two months), through two budget streams:

- one for capital expenditure projects and
- one for operational expenditure projects.

Funding for SLIPs projects is part of the council's budget, but its use is decided by the community boards themselves. SLIPs funding has been used for community art works to combat graffiti, playground facilities, street plantings, park volunteer activities and handrails on slippery stairs. SLIPs can also be in the form of a grant. If a grant is awarded, it will be for no more than 49% of the total value of the project.

Most SLIPs projects around the Orakei Basin have been for weed control and replanting. SLIPs funding is allocated to significantly contribute to the walkway project which seeks to establish a continuous loop walkway around the Orakei Basin.

ERBNA programmes can continue to contribute valuable resources to this work, however should be tailored to fit within the overarching weed management and replanting plans that will be developed.

Vegetation enhancement

The vegetation enhancement and weed control plan should specify ecologically appropriate native plant species to benefit overall biodiversity and ecological values and outline a staged weed management programme to provide for native plants to establish as the dominant flora. Plant specification should also consider appropriate species for areas with known archaeology to reduce potential adverse effects on archaeological features.

Future planting programmes need to build on successful examples of restoration plantings in terms of species, planting times and techniques and post planting management that work well in the specific terrain and soil types within the reserves.

Vegetation management practises that aim to protect known shag habitat need to be considered in the development of the Vegetation and Weed Control Plan.

In addition to restoration and revegetation planting, consideration should be given to the planting of shade trees within the grassed area are Orakei west Reserve, as there is very limited shade available within this area.

Ngati Whatua o Orakei maintains a nursery of eco-sourced native plants[6], which may be considered as an appropriate source of plant stock. Knowledge of historic plant composition and locations within the Orakei Basin area is also held by Iwi. It is understood that Ngati Whatua O Orakei have developed a list of shallow rooted native species that would be suitable for archaeological site locations.

Weed control

Weed control is necessary to ensure that native plants are not overwhelmed by more competitive weed species, or to replace exotic dominated areas with native plants.

A strategic approach needs to be taken in order to get the greatest biodiversity and ecological gains from weed control. This approach should focus on (in order):

1. Prioritising weed control in areas where native biodiversity values are already high, and are threatened by exotic weeds;
2. Prioritising weed control in areas where weeds can be removed most efficiently and effectively (i.e. physical access to the site is easy, control methods for the weeds are effective, and the controlled area can be easily managed to ensure that the weeds do not re-invade);
3. Erosion control to ensure that weed removal does not result in erosion of soil and consequent adverse environmental effects.

Areas of weed infestation that do not fall into one of the two categories listed above could be managed as part of a longer-term approach.

The goal of this approach should be to remove weed species which threaten the long-term survival and health of native plant species, as resources allow, and re-place them with native dominated vegetation (or mixed native/non-weedy exotic vegetation). In some cases weed work will need to be staged to avoid erosion associated with large areas of bare ground.

It is important that, particularly where steep land is being cleared, the potential for erosion is considered and appropriate control measures (e.g. silt fences, mulching etc.) are undertaken. In some cases it might be appropriate to leave some of the (preferably less invasive) weed species in place, establish natives over several years, and then remove the remaining weed trees (or ring-bark in-situ) and establish natives in their place. This approach can be described as low-impact weed management.

The foreshore areas near the mouth of Orakei Creek contain trees which are roosting and nesting sites for native shag species. Special consideration needs to be given to any tree removals or works, including new structures, which may affect the wellbeing of the shags.

Weed control – spraying

Spray use is governed by Auckland City Council policy. It is expected that the policy will provide sufficient guidance to ensure that appropriate methods are used to mitigate adverse effects on the environment, however, if warranted a more conservative approach may be adopted at ecologically sensitive areas.

[6] Eco-sourced plants are obtained from plant material (seed or cutting) sourced from natural stands of vegetation and naturally occurring parent plants, then planted within the same ecological area.

Pest control

Fauna pests, such as rats and possums, are known to inhabit the Basin area. Pests animals have detrimental effects on native plants and animals and cause a nuisance to the public and private property. It is acknowledged that some pest animals, such as rats will always be present to some level. The goal of a control strategy should be to reduce pest populations to below 5% of original levels within a 5 year period.

Mustalids should also be controlled if evidence of their presence is found, although mustalids are generally rare within urban areas.

Control of introduced mammalian predators, using traps and bait stations, has been carried out in Orakei Basin East and West Reserves. A control regime needs to continue, be monitored and widened to other reserve areas around the Orakei Basin. This should have a range of positive ecological benefits, including:

- Reducing predation of native birds, invertebrates, reptiles, and plant seeds and seedlings;
- Reducing competition for food resources with native birds, invertebrates and reptiles;
- Increasing community involvement and appreciation of the ecological values of these reserves.

Biodiversity – measuring success

Over time, as restoration and weed control is carried out, the biodiversity and ecological values of the natural areas are expected to increase. Information about biodiversity change can provide a measure to assess ecological changes, and can inform improvements to programmes implemented at the Orakei Basin and elsewhere. Potential measurement techniques include:

- photopoint surveys
- monitoring relative pest abundance
- vegetation plot surveys
- bird count monitoring.

17 Water Quality

Objective:

To monitor and manage water quality to be suitable for recreational use as provided for within the Orakei Basin Bylaw 2006 and its lease from the crown.

Policies:

- Prepare and implement a water quality monitoring programme to monitor human health risk in terms of harmful bacteria. The plan should outline appropriate responses to mitigate risk to persons who use the water for recreation.
- Prepare and implement a visual algae monitoring programme during times of higher risk. The programme should outline trigger levels and methodologies for remedial action.
- Inform the public how to improve water quality within the basin and creek by undertaking measures on their own properties relating to erosion, siltation control, riparian planting and fertiliser use.
- Maintain silt mitigation devices within the stormwater infrastructure, (such as catchpits) to ensure effective operation.

Discussion:

Water quality

The objective is consistent with the Orakei Basin Bylaw 2006 which outlines that primary use of the basin is for motorised (water skiing) and non-motorised water sports. Swimming is specifically prohibited under the bylaw (cl. 19.7) Relevant sections of the Orakei Basin Bylaw 2006 and the lease are included in this document and the bylaw is included in the appendices.

Water quality monitoring and basin management proposed is consistent with the Bylaw any change to this approach would need to be undertaken via a bylaw review process. The objective supports 'Objective 32, Recreation and use'.

Bacterial monitoring

Swimming is prohibited at the basin under the Orakei Basin Bylaw 2006. Nevertheless, people come into contact with water via boating and recreation activities. The implementation of a water quality monitoring programme should enable appropriate and timely responses, should a risk be found. For example, a response may be to flush the basin within the next tidal cycle. Due to a nearly complete separation of the relevant stormwater and wastewater networks.

Algae

In recent times, instances of reported algae and odour nuisance have decreased. However, it is possible that algae nuisance events will reoccur. It is expected that visual algae monitoring should only be necessary during the spring and summer peak growth periods. Public reporting of algae bloom events, or odour, will complement formal visual monitoring.

The most practical method of removal is to allow algae to accumulate near the southern shoreline then remove by hand methods. Due to the size of the basin and difficulties with boat based harvesting, it is anticipated that shoreline removal would be the best method of control.

Public education

Water flows to the Orakei Basin over a relatively wide catchment that includes a number of private properties. Education of residents should communicate good practice in terms of erosion control and planting to enable residents to reduce discharge of siltation and contaminants to the basin. Fertiliser run-off from private properties contributes to nutrient loading within water bodies, and in turn can contribute to algae growth.

18 Heritage values

Objective:

To recognise and protect the natural and cultural heritage values of the reserves.

Policies:

- In consultation with Iwi, decide on the appropriate form of interpretation for sites of Maori cultural significance and treatment of these sites.
- Where appropriate, signs should be used to identify archaeological sites.
- Known archaeological sites should be managed to avoid any ongoing degradation.
- Avoid works that may significantly adversely affect the integrity and values of geological features.

Discussion:

Cultural heritage

The Orakei Basin reserves are generally lacking any literal or implied reference to the rich Maori history of the area, the physical evidence of which has been largely obscured by historic development and changes to the landform. An opportunity exists to enhance people's understanding and appreciation of the area by recognising this history. To complement the marking of archaeology and significant places with signs, a deeper level of cultural heritage interpretation should be developed in partnership with Iwi. To achieve this, tangata whenua should be involved in significant decision making in the operational management of reserves and capital works projects. Cultural recognition could take the form of stand alone art works, or reference within the design, materiality or other characteristics of physical works and park assets. A more subtle and contemporary cultural influence could develop over time if the prioritisation of programmes and works are better aligned with an Iwi vision for the area.

Archaeology

Archaeological sites are to be managed in a way to ensure that their physical structure and heritage values are not compromised by current or future use and development. Archaeological sites are evidence of the country's history. Any loss of archaeological evidence is a loss to our understanding of our past.

- It is important that when future developments are proposed that careful archaeological assessments are undertaken and that any evidence found is properly recorded so that information is not lost.
- Appropriate signage is a significant need where archaeological sites are present on public reserves, unless there is an overriding factor that outweighs the benefits, such as the need to protect a particularly sensitive site from possible disturbance. At the Orakei Basin West, East and Kelvin Reserves there are no signs to explain the archaeological sites that are there. Informational signage serves to inform the public of the values of a place. Where there is greater understanding of why a place is special there comes greater respect for and care of such places.

Archaeological sites are particularly at risk from erosion, public access and vegetation management include the pa at the Orakei West Reserve and the midden site in the Kelvin Reserve. Evidence of erosion is present at both sites R11/87(Pa) and R11/1765 (Kelvin Reserve).

Kelvin Reserve Midden (R11/1765) – R. Foster 2010

NZ Historic Places Trust

Is should be noted that any works that are likely to affect an archaeological site are subject to the requirements of the Historic Places Act 1993.[7] Any work that involves ground disturbance such as path construction or planting or the placing of any structures or signs on an archaeological site requires an Authority to Modify an archaeological site from the New Zealand Historic Places Trust. To apply for an Authority it is necessary to provide a suitable archaeological assessment of the project and proof of consultation with the appropriate iwi. It is necessary to obtain any necessary Authority prior to any works that might affect an archaeological site are started.

Natural heritage

Geology

The geology of the Orakei Basin has intrinsic value due to its particular attributes and as part of the wider Auckland Volcanic field. The tuff ring and crater form the basis of the distinctive basin landform and ridges. Proposed development must be informed by appropriate geological research and recommendations to ensure that significant adverse impacts upon the feature are avoided.

19 Implementation

Objective:

Support ongoing implementation of the management plan via an advisory group.

Policies:

- Establish an advisory group to prepare an 'action plan' to prioritise work to be delivered, based on the objectives and policies contained within the management plan.

Discussion:

The responsibility to form and administer the group will rest with the council which will develop the Terms of Reference for the advisory group. The Terms of Reference will outline the purpose, makeup and function of the group. The advisory group will have responsibility for preparing an action plan, developing a state of Orakei Basin report and a development plan. The advisory group will investigate the establishment of a Friends of Orakei Basin group. One of the roles of this group is envisioned to be assisting with education of residents regarding erosion management and weed control.

The advisory group will bring together a range of views and will include representatives of Auckland City Council and its successors, the wider community and other stakeholders such as iwi, the Orakei Basin Protection Society, water users groups and lease holders.

One of the first jobs of the proposed advisory group will be to work with the new local board to commission a current state of the basin report that is integrated with the monitoring programme proposed in the management plan. This report will be produced annually and will form a key driver for the advisory board's ongoing work. The state of the basin report should cover not only the basin and creek but also all the public park areas around the basin that are included in the management plan.

The objectives, policies and discussion contained within the management plan address a number of operational areas for the management of the reserves, and potential capital projects. Some initiatives may involve significant resources that would deployed over time. Therefore, prioritisation of initiatives is considered to be important to help Auckland City Council direct available resources to the areas of greatest need.

Following the state of the basin report, the next goal of the advisory group will be to determine areas of priority and seek to implement the objectives of the plan via an agreed 'Action Plan' which can inform Auckland City Council's decisions. A list of currently identified priority actions is contained within an independent "Issues and Actions" report, appended to this document (Appendix 2).

The advisory group will include council officers. It is therefore anticipated that the council will be particularly aware of operational and maintenance needs, and that these will be appropriately budgeted for in balance with overall funding available. The advisory group could also make formal requests for discretionary funding when considered appropriate.

The advisory group will be able to provide recommendations however, budget allocation decision making responsibility will rest with the council.

[7] In terms of the area under discussion the definition of an archaeological site in this Act is defined as: any place in New Zealand that was associated with human activity that occurred before 1900 and which may be able, through investigation by archaeological methods.

20 Buildings and structures

Objective:

To protect and enhance the natural character of the Orakei Basin by ensuring that buildings and structures are appropriately designed and located.

Policies:

- Ensure that proposals for new buildings or structures, or alterations to existing buildings are considered in terms of the following:
- The need to be located within the reserve.
- That existing buildings are fully utilised and are unable to accommodate additional uses.
- Visual impacts on the cultural and landscape values of the park.
- That the design and materials are appropriate for the site and the receiving landscape character.
- That any ecological impact is minimal.
- Long term maintenance cost.
- Ensure that structures which are no longer required are removed.

Discussion:

Buildings

New buildings and structures should be considered in terms of public need, and designed to be appropriate to the receiving environment in terms of site, construction effects and visual compatibility. Structures would include any significant built form including jetties or landings. Careful consideration must be given to impacts on archaeological, geological, heritage, landscape and ecological values. No new buildings should be located outside the main large reserve areas which adjoin the basin (Orakei West and East Reserves and adjoining land).

Existing buildings on the reserves are limited to a cluster on the western shore of the basin and the Auckland Water Ski Club building at the eastern side of the basin. Structures include a rock jetty on the southern shoreline of the basin, the sluice gates, jetties adjacent to the Auckland Water Ski Club building, the pedestrian bridge across Orakei Creek and a playground within Bonnie Brae Reserve.

There is currently a limited amount of furniture throughout the reserves and there are no public toilets within the reserves, or public changing facilities to support the public use of the basin for water recreation. It is anticipated that the walkway track will attract more visitors to the basin and that demand for a toilet and park furniture will increase over time. A potential location for a toilet and changing room building is at the lower car park area in proximity to the boat ramp. Should a toilet or additional furniture be proposed, the location and design will need to be carefully considered in terms of the policies outlined above.

Leases should be administered according to the Community and Recreation Lease Policy, or equivalent. It is intended that leases within the existing buildings around the Orakei Basin should provide for community groups who undertake water-based recreation activities within the basin.

21 Walkways and access

Objective:

To improve pedestrian access to and within the reserves.

Policies:

- Complete the consented walkway loop track including the pedestrian bridge across Orakei Creek.
- Maintain paths and access structures to a high standard
- Improve access by providing connections where gaps are apparent within the walkway network around Orakei Basin reserves and key connections to other public areas.
- Paths should be designed by universal access principles, where practicable.

Discussion:

Walkway Loop Track

Stage one of the walkway loop track is to be constructed during 2010, which involves a pedestrian/cycleway along the rail corridor and connections at each end. Stage 2 involves a bridge to cross Orakei Creek and connections through the Lucerne Road access reserve, and a boardwalk connection to stairs at MacPherson Street Reserve. Completion of the walkway loop should significantly add value to the basin as a destination, and will improve local neighbourhood connections.

Path maintenance

Paths and stairs provide for pedestrian access through the larger reserves and it is important these be maintained in good condition. The following areas have been identified as a priority for improvements:

- the track from the community buildings at Orakei Basin West Reserve to Orakei Road;
- parts of concrete path at Orakei Basin East Reserve that have become uneven;
- loose gravel at MacPherson Street Reserve;
- the access path down from the bottom of Upland Road; and
- the steps to the AWSC building from Lucerne Road.

Access opportunities

There is an opportunity for a pedestrian connection within Orakei Basin East Reserve where a section of reserve meets the corner of Upland Road and Darwin Lane. This location would provide an additional access at a midway point between the Orakei Basin West and East Reserves. Challenges would include dealing relatively steep terrain and thick vegetation.

Universal access principles

In designing new paths and walkways, every effort will be made to incorporate universal access principles. These principles may not be feasible for all paths due to steep topography.

22 Recreation and use

Objective:

To provide for a variety of recreational pursuits to the extent that these are compatible with the landscape, cultural and natural values of the water body and reserves.

Policies:

- Prepare and implement a sediment monitoring programme, which should measure the rate of sedimentation on an ongoing basis and be commenced as a matter of priority.
- Undertake dredging within the Basin should it be identified through the sediment monitoring programme that ongoing sedimentation is significantly adversely affecting water based recreation activities currently undertaken, such as water skiing and small boat sailing.
- Council will contract out the operation of the sluice gates so that they are operated in accordance with a set of performance standards including the conditions of the resource consent for impoundment of the basin.
- Retain a mix of active and passive recreational functions within the reserves, including open spaces, paths, vegetation, car parking and water access areas.
- Provide an appropriate quantity of park assets to support the recreational functions of the reserves and basin. For example, seats, bins, paths, fresh water supply and public toilets.
- Provide and maintain quality signs. Particular attention should be given to signs relating to water activities and the Orakei Basin Bylaw 2006. Signs should clearly identify dog off-leash exercise areas.
- Organise an annual clean up of inorganic debris within the water bodies and reserve areas. The clean up should be done prior to peak summer use.

Discussion:

Sedimentation

The Orakei Basin has been a receiving environment for marine sediments since it was breached by Purewa Creek in the post glacial Late Pleistocene period. Prior to the installation of sluice gates, the basin was a tidal mud flat. Since installation of the sluice gates, marine sediments loading is likely to have been significantly reduced and the main apparent source of sediments has occurred via stormwater discharge, over land, and via infrastructure networks.

The decommissioning of the Mt Wellington (Lunn Ave) Quarry, and the construction of the Waiatarua Wetlands have had a significant beneficial effect in reducing sediment discharge to the basin.

The primary purpose of water impoundment within the Orakei Basin is to provide for water based recreation, most notably, water skiing. A sedimentation monitoring programme will enable an understanding of current rates of sedimentation.

Historically, monitoring of sedimentation was undertaken via metal plates placed on the seabed. It may be considered more practical to monitor sedimentation via land based survey. Modern survey technology can measure seabed heights when the basin is empty.

The amenity enjoyed from properties and open spaces that front Orakei Creek is related to the water within the creek. Over years, noticeable sedimentation has built up, particularly within the upper reaches of the creek. Dredging of Orakei Creek has been historically considered by the Auckland City Council, however the small, but measurable, possibility of land instability for adjacent private properties, meant that dredging has not been done to date. The natural values of the creek could be enhanced by the planting of suitable riparian and water appropriate plant species. Also if the sedimentation monitoring programme indicates that dredging of the basin needs to be undertaken, the areas of the basin adjoining the Orakei Creek should be considered as this may have a positive impact on creek siltation levels.

Sluice gates and water levels

In 2010 the sluice gates will be upgraded to reduce leaking and improve performance. The improved gates should achieve better water retention within the basin, and will continue to provide for water impoundment. In recent times, the Auckland Water Ski Club (AWSC) has operated the sluice gates.

When water within the basin is retained to near the highest possible level, the water level is higher than some areas of the basin edge, resulting in at least partial inundation, particularly within Orakei Basin West Reserve. When complaints have been received, the water level is reduced to avoid this.

High water levels are enjoyed by residents near Orakei Creek who prefer the visual amenity of higher water levels within the creek.

Park assets

The reserves covered in this management plan offer both active and passive recreation opportunities. Appropriate facilities and park furniture should be provided to enhance the recreation use of the reserves and provide for a variety of pursuits, from water skiing, small boat sailing, walking and jogging, cycling, child play, and more passive activities.

Signs

Existing signs at reserves vary in quantity and quality. Some reserves have no name signs, and others are well marked. All reserves and stand-alone walkways should be marked with signs appropriate to the scale and type of place. For example, the Waiatarua and MacPherson Street access routes to the pedestrian footbridge would benefit from low-key identification signs that are sympathetic to the residential setting. Macpherson Reserve would also benefit from naming signs.

Clear and easy to understand signs relating to the Orakei Basin Bylaw 2006 and use of the basin should be provided at appropriate places. Existing signs need improvement in this regard. On-water speed limit signs, for example a 5 knot sign at the entrance to Orakei Creek, should also be provided.

Inorganic clean-up days

As with other larger open space areas, inorganic rubbish can accumulate over time. In addition to general upkeep, an annual summer clean-up could be held in conjunction with community groups and building lease holders. From time to time the AWSC have held clean-up days. Auckland City Council could assist with coordination and resourcing.

Waterskiing activity

The Orakei Basin is a significant venue for both recreational and competitive waterskiing in the Auckland region and the Auckland Waterski Club holds both national and international waterskiing events on the basin.

23 Water access

Objective:

To increase use and enjoyment of the basin by improving access to the reserves and the water.

Policies:

- Undertake improvements to existing water access areas. In particular, the main car park and boat ramps at Orakei Basin West Reserve.
- Improve the function of the access road to the main car park and boat ramp area at Orakei West Reserve. In particular, consideration should be given to the provision of for two-way vehicle passing and soil erosion that spills onto the carriageway.
- Consider new opportunities for water access. For example, appropriate scale landings and structures.

Discussion:

Car parking and boat ramps

The main car park area at Orakei Basin West Reserve provides for vehicle parking, boat launching and model boat sailing. The area also functions as a pedestrian path linking Orakei Road to the north and the water edge path to the south. The car park area could be improved with a pedestrian path that is separated from vehicles, perhaps along the water edge. The asphalt surface is eroding into the water due to an eroding edge. Model boat users have difficulty launching their boats due to the edge conditions.

The access road

The access road from Orakei Road provides vehicle access to leased buildings, car parks and boat ramps. The road is relatively narrow, is used by pedestrians and is not wide enough to provide for two-way traffic, which could cause difficulties for vehicles with boats in tow.

The sloped land at the western side of the road is eroding in places causing earth to be deposited on the road surface, which further reduces the usable width. The eroding earth includes large areas of shell middens that warrant appropriate archaeological consideration in terms of ongoing management and future road works.

New opportunities for water access

Water access points for small craft is could be improved in number given the widely spread reserve network. Consideration should be given to the merit and feasibility of providing access structures at Purewa Road and at Kelvin Reserve.

Planned walkways along the railway embankment and across Orakei Creek also provide opportunities to incorporate water access. Priority should be given to places where there is an obvious opportunity to improve an existing informal access, such as at Kelvin Reserve.

24 Encroachments

Objective:

To reduce private encroachments onto public land.

Policies:

- Undertake a process to catalogue and measure encroachments, by way of aerial photo and cadastral analysis, and survey.
- Enforce the Auckland City Council's 'Private use of public space' policy to resolve encroachments by way of authorisation or reinstatement of public land.

Discussion:

Encroachments can incrementally erode public area at the Orakei Basin and as a whole within the wider park network. It is important that public open space remains available for present and future generations, particularly as demand for open space is anticipated to increase with population growth over time.

A number of encroachments onto public land are may exist and result in poorly defined boundaries between reserves and private properties. This is particularly evident within Orakei Basin East Reserve.

25 Erosion

Objective:

To minimise adverse effects on the environment caused by erosion.

Policies:

- Physical projects, including vegetation planting, removal and maintenance, will be undertaken in accordance with erosion management practices.
- Stormwater outlets will be designed to avoid or mitigate erosion effects.
- Areas subject to surface erosion will be identified and practical methods will be implemented to remediate and minimize these effects.
- Areas subject to significant riparian erosion will be identified and practical methods will be considered to remediate and minimize these effects.
- The Orakei Basin Advisory Group will play a key role in public education on practises on private land to minimise erosion and silt entry into waterways.

Discussion:

Soils are subject to natural processes of erosion however land management and development can accelerate natural processes or cause erosion. In particular, vegetation management, earthworks and the design of paths and structures can all contribute to erosion acceleration.

Erosion presents risk to the geological and archaeological values associated with Orakei Basin through land degradation, reduction in water quality and harm to aquatic habitats through increased siltation. Erosion and consequent sedimentation also adversely impact recreational values via effectively reducing water depth, or by placing existing assets at risk of failure, such as pathways and the access road. Within the Orakei Basin and Creek suspended sediments have more time to settle due to the impoundment and limited flushing regime. Land scouring is unsightly visible evidence of erosion processes.

The objectives and polices seek to remediate existing problem areas and reduce erosion in relation to ongoing developments and land management. The three main areas of erosion at the Orakei Basin are:

- surface erosion
- riparian erosion
- deeper slips.

Surface erosion

Surface erosion is occurring at numerous locations around the Orakei Basin, and is caused by a number of factors including vegetation removal, stormwater overland flows, physical works and maintenance practices. Terrain is relatively steep at many places therefore any disturbance to the soil can lead to erosion. Structures, such as track edging or steps can channel water and quickly cause scouring. Vegetation removal can result in bare areas which become exposed to direct rainfall and significant erosion.

Key areas where this is evident are the stairs from Lucerne Road down to the Auckland Water Ski Club, along Troy Churton Track, and along the access road from Orakei Road to the public boat ramp and car park. It is important that these and other areas of significant concern are assessed and prioritised for remedial work.

Erosion control needs to be considered as part of any future works as it is easier and more effective to manage erosion upfront rather than on a remedial basis. It is important that erosion control is integrated during works, and a long-term effects are considered. For example, vegetation should not be removed without immediate ground stabilisation and replanting of suitable species. Structures should be designed to mitigate erosion effects.

Riparian erosion

A riparian area is the interface between land and the water. Erosion at the water edge occurs around the Orakei Basin and Creek and is caused by a number of factors including vegetation removal, stormwater runoff, soil conditions, steep bank edges, and in a number of locations appears to be exacerbated by wakes from ski and wakeboarding boats.

The riparian conditions vary considerably around the Orakei Basin and Creek. There is a historic seawall at the north western corner of the Orakei Basin and along the rail embankment (known as the Old Coach Road). Some rock fill has been placed at the bank edges around the car park and adjacent open grassed area. Some riparian areas have vegetation down to water level and others are bare earth.

Within Orakei Creek and tributaries the riparian strip is largely privately owned. In some cases land owners will be able to reduce erosion by managing overland flows and by introducing appropriate planting. Planting can have a dual function of soil stabilisation and slowing the velocity of overland flows. Section 25. Water Quality includes a supporting policy regarding public education of landowners and riparian management.

Erosion caused by stormwater outfalls should be mitigated by design that reduces endpoint flows and by avoiding direct discharge to land. Erosion caused by waterski activity also needs to be mitigated especially if basin water levels are maintained above current levels.

The treatment of riparian areas to reduce erosion is not simple. Each particular problem area may warrant a different approach comprising of some or all of physical structures, geotextile matting/mesh, and planting. It is considered practical to assess areas of greatest need and address these first on a case by case basis.

Deeper slips

Three historical large-scale slope failures have been identified around Orakei Creek. They are referred to as Ngapuhi Road, Macpherson Street, and Dover Place slides.

The majority of the land adjacent to the creek and some of the slopes around the Orakei Basin, is recorded by Auckland City Council as Unstable/Suspected Ground. Therefore, development of these areas will be generally avoided, however if considered, would be subject to engineering design and consent requirements.