C – Guidelines for Managing the Taking and Damming of Water

10 Management Objectives

10.1 Introduction

Water resource management objectives reflect the values of a water body which are to be maintained, protected or enhanced. These include both

- Instream values associated with the quantity and quality of water *in situ*; and

- The value of that water for out of stream (abstractive) uses;

Instream values may be intrinsic (or natural), for instance ecological values, or amenity values assigned by people and communities to reflect cultural associations and recreational opportunities afforded by a water body. The out of stream value of water is generally economic. Water is abstracted in the Kaipara River catchment for several uses including irrigation, industrial uses and stock drinking water supply. Chapters 7 and 8 of the resource statement describe the instream and out of stream values of the catchment's water resources in detail.

A water body can be managed to maintain or enhance any of these values, or a combination of several of them. However, management objectives must be consistent with the purpose and principles of the Resource Management Act 1991, such that a water resource can only be managed for out of stream uses providing that adverse effects on the environment can be avoided, remedied or mitigated. It is therefore inherent to the setting of water resource management objectives that they have regard to maintaining (or enhancing) instream values.

10.2 Proposed Management Objectives

In most catchments, there are spatial variations in the instream values associated with different sub-catchments or individual tributaries. The setting of management objectives for the Kaipara River catchment aims to identify those spatial variations and to assign objectives accordingly.

Whilst recognising that there are significant gaps in our knowledge, particularly of the functioning of aquatic ecosystems throughout the catchment, the information documented in the Resource Statement gives some direction on the setting of management objectives. Management objectives are proposed on the basis of current knowledge. These can be modified or refined to reflect the results of further monitoring and research.

On the basis of current knowledge, the key resource attributes which drive the setting of management objectives are considered to be:

- Sub-catchment variations in water quality and instream ecological values; and

- Sub-catchment variations in demand for abstractive uses of water.

There is no indication that amenity (cultural, recreational and landscape) values are significant to the setting of management objectives throughout the catchment or at the sub-catchment scale. However, there may be specific locations with significant cultural associations or of particular value for recreational activities that should be taken in to account at a more local scale. A flexible approach to the setting of management objectives, both at different scales and over time, will allow more specific values to be accommodated.

Three broad management objectives are proposed:

I. To maintain the flow, water quality and habitat requirements of aquatic ecosystems in those parts of the catchment where habitat value is currently good.

II. To maintain a flow regime which will provide for contaminant assimilation during periods of low flow in the main Kaipara River.

III. To provide for abstractive uses of water from streams with lesser instream values, whilst enhancing the habitat values of these streams and providing for fish migration to the headwaters of the catchment.

The proposed water resource management objectives are presented in map 13 and, by sub-catchment, in table 10.1.

Table 10.1 Proposed management objectives

	Management Objectives		
Sub-catchment	I	II	III
Upper Kumeu - headwaters - main streams	X		 X
Kumeu			X
Ararimu	X	X	
Tikokopu	X	X	
Waimauku - Wharauroa Stream - Other streams	X		 X
Lower Kaipara			X
Awaroa			X
Moau			X

The setting of management objectives aims to give guidance for decision making on resource consents (along with guiding other actions) in different parts of the catchment. However, it is not intended to pre-determine the outcome of the consent process. For example, the identification of the Ararimu Stream as as a Management Objective I area gives potential applicants a signal that there are relatively high instream values to be maintained in this stream catchment, but does not indicate that no water is available for allocation.

11 Issues, Conflicts and Management Solutions

11.1 Introduction

11.1.1 Issues

The investigations, information reviews and consultation documented in the resource statement lead to the identification of a range of issues in relation to water allocation and management in the Kaipara River catchment. These reflect potential conflicts with the proposed management objectives described in chapter 10.

The issues may be categorised as:

- Effects of abstractions on stream water quality and ecology;
- Effects of abstractions on wetlands;
- Effects of dams on fish passage;
- Cumulative effects of dams;
- Dam safety;
- Effects of taking and damming water on cultural values;
- Effects of taking and damming water on recreational and landscape values;
- Changes to water quantity; and
- Changes to demand for water.

All of these issues relate, at least in part, to the effects that the taking and damming of water can have on surface water bodies in the Kaipara River catchment. However, the taking and damming of water are only two out of a wide range of activities which contribute to some of these effects. For instance, certain land and riparian management practices and the discharge of contaminants also play a key role in the degradation of water quality, weed infestation of streams and the loss of habitat for native fish.

The water allocation strategy aims to develop and implement measures to ensure that the adverse effects of taking and damming water are avoided, remedied or mitigated. The development and implementation of actions to address the effects of the wider range of land and water based activities on the quality and ecology of the catchment's water bodies lie outside the scope of the strategy: they are matters for an integrated catchment management approach.

However, whilst recognising the limits to the scope of the water allocation strategy, the interrelationships between various activities and their effects mean that it is unavoidable to consider options to address issues facing the taking and damming of water without some of these options also being of relevance for wider catchment management. Riparian planting, for instance, can not only help to mitigate the effects of taking water but also to remedy a range of effects relating to poor land management practices. The content of this chapter reflects the fact that such cross-linkages occur.

11.1.2 Management Solutions

Water resource management solutions are actions or measures to be implemented to resolve issues and conflicts which may compromise the ability to meet a specified management objective. For instance, the stated management objective for a particular stream may be to provide for water abstraction whilst maintaining flows to provide a corridor for the migration of native fish. The objective may be compromised by the over-abstraction of water which causes the stream to dry up during summer. A management solution is needed which allows water users to continue taking water whilst maintaining sufficient flow in the stream.

The following discussion considers management solutions to address each of the issues, or group of issues, listed in section 11.1.1. The solutions are listed as either those that can be implemented through the resource consent process, or 'other options' that that can be implemented through alternative statutory and non-statutory processes. Some of the 'other options' are of relevance for wider catchment management purposes, for the reasons outlined in section 11.1.1.

The listing of options is followed by a discussion of the reasons for favouring certain solutions over others. Recognising, that further work is required to improve some areas of understanding, certain of these measures will not be implemented until a program of further investigations has been undertaken. Some solutions may be amended as a result of that work.

Other solutions can be implemented in the interim, as they are of value irrespective of the validation of management objectives in the catchment. In this way a precautionary approach can be adopted until management objectives and appropriate long term solutions have been determined.

11.2 Effects of Water Abstractions on Stream Water Quality and Ecological Values

11.2.1 Issues

- The abstraction of water during periods of low flow can result in the drying up of streams, or in prolonging the period over which they would normally be dry or subject to low flows.

- Where abstractions from on-stream dams exceed inflows, dammed watercourses can run dry or be subject to prolonged periods of low flows.

- Changed flow regimes can affect the life supporting capacity and ecological functioning of streams. For instance, an increase in the duration of low flows has the potential to result in reduced levels of dissolved oxygen, elevated water temperatures and reduced habitat availability.

- The assimilative capacity of watercourses in the catchment is most likely to be compromised during periods of low flow. A reduction in the magnitude of low flows, or increase in their duration, can lead to increased nutrient loading, weed growth and sedimentation.

- The abstraction of water through inadequately screened pump intakes can result in the entrainment and impingement of native fish and other aquatic biota.

- The community of the catchment have indicated water quality, weed growth and the management of riparian and aquatic habitats to be key concerns.

11.2.2 Management Solutions

Resource Consent Options

- Set minimum flows below which habitat availability and the assimilative capacity of the water body is compromised. Do not allow abstractions at lower flows.
- Set flow thresholds and implement rostering, prioritisation, or variation of abstractions in relation to these thresholds.
- Require minimum residual flows from dams.
- Require off stream storage to provide for the taking of water during periods of higher flows.
- Require consent holders to undertake mitigation such as riparian planting and weed clearance as conditions of consent.
- Require consent holders to maintain appropriate intake structures so as to avoid the entrainment and impingement of aquatic biota.
- Promote efficient use of the water resource by allocating appropriate quantities relating to crop types and growing practices, or on the basis of the efficient demand of other activities (eg industry, municipal supply).
- Provide for a review of conditions of consent, to take into account changes in water availability and demand.
- Enforce the lapsing of consents which are not exercised.
- Require consent holders to monitor and record water use, and allow for this to be taken in to account when reviewing consent conditions.

Other Options

- Promote (rather than require) the installation of off stream storage and taking of water during higher flows.
- Promote rainwater capture and use, for instance in new glass house developments, by making submissions on relevant applications to territorial authorities.
- Promote the efficient use of water through non-statutory means, for instance through education and the dissemination of results of research into crop water demand, irrigation efficiency and industrial water use audits.
- Undertake appropriate statutory processes to control discharges, for instance implementation of the Regional Plan: Farm Dairy Discharges, consenting other discharges and review of conditions on existing discharge consents.
- Continue to monitor flow and water quality in the Kaipara River catchment and investigate new opportunities for additional monitoring, especially the relationship between low flows and the functioning of aquatic ecosystems.
- Undertake studies to identify key areas for implementing improved riparian management.

- Encourage voluntary riparian planting and maintenance, for instance through the establishment of land and stream care groups.
- Take statutory opportunities to advocate riparian planting and maintenance, for instance by making submissions on district / structure plans and consent applications to territorial authorities.
- Consider the requirement for financial contributions from consent holders for riparian planting and maintenance in the development of the Air, Land and Water Regional Plan.
- Establish water user groups to assist with setting and implementation of allocations and any restrictions.

11.2.3 Discussion

Minimum Flows and Restrictions on Abstractions

In conjunction with implementing appropriate controls on discharges (such as through the Regional Plan: Dairy Farm Discharges), the adverse effects associated with the taking and damming of water during periods of low flow can be avoided by setting a minimum flow and prohibiting abstractions when flow falls below this threshold. The minimum flow might, for instance, mark the lowest flow at which the life supporting capacity of the stream and functioning of aquatic ecosystems is not compromised.

There are two key difficulties with this approach: problems associated with implementation, and limiting the access to the resource for water users. The following discussion outlines the general nature of these problem before focusing on the specific practicalities of implementing minimum flows and abstraction restrictions in the Kaipara River catchment.

Implementation Difficulties

The most straightforward way for an individual water user to identify when stream flow reaches or falls below a minimum flow is to install a staff gauge at the point of abstraction. The water level corresponding with the minimum flow is marked on the staff, this being determined from instream flow requirements at the specific site.

There are three key difficulties for a consent authority in adopting this approach:
- the setting of individual minimum flows at each site would require the collection and analysis of an extremely large amount of data;
- the consent authority has no routine way of checking that abstraction restrictions below the minimum are being observed; and
- the approach does not take account of the cumulative effects of all abstractions in a catchment.

An alternative approach is to set a minimum flow at a key location on the river or stream, for instance at a flow recorder site. However, to ensure that abstractions cease once the minimum flow at the key site is reached, it is necessary to relay this water level information to the individual water users. This could be done by providing real time access to water level information by a phone link to the site.

Limits to access to the resource

The setting of a minimum flow carries with it the risk that water users will be unable to take water for a certain number of days a year. This risk can be stated as a probability.

The simplest approach to implementing a minimum flow based allocation regime is to allow all users to take water providing that the minimum flow is met, and to prohibit them if it is not. One problem associated with adopting an 'on – off' approach such as this is that, in order to ensure that the minimum flow is maintained, users must be denied access to the resource over a range of flows above the minimum.

For example, if two water users were authorised to take water at a rate of 5 l/sec, providing that a minimum flow of 10 l/sec is maintained, then the flow at which they would be required to cease pumping is actually 20 l/sec. A 'buffer' of 10 l/sec is added to the minimum flow because, if both users were to pump at flows of less than 20 l/sec, then the minimum flow of 10 l/sec would not be maintained. The users should have access to the resource at flows of between 10 and 20 l/sec, but are denied it.

A solution to this problem is to set more than one flow threshold and provide for priorities of use, rostering or variation of abstraction rates in response to flows falling below these thresholds. In the example presented above, thresholds could be set at 20 l/sec and 15 l/sec. Both users may take water when flows are above 20 l/sec, but neither when flows are below 15 l/sec. Access to the resource when flows are between 15 and 20 l/sec would be authorised by either:

- rostering - for instance, one user has access on even numbered days and the other on odd numbered days.
- prioritisation - one user is deemed to have greater priority and is given exclusive access to the water between these flow thresholds.
- variation - both users may take water, but at a lower pump rate of 2.5 l/sec.

There are practical difficulties with varying the rate at which a pump operates, both for the water user and in terms of the consent authority's ability to monitor and enforce pumping rate restrictions. Under either rostering or prioritisation (or a combination of the two), implementation, monitoring and enforcement increases in complexity with the number of thresholds and the number of users.

Minimum flow sites in the Kaipara River Catchment

Monitoring and modelling of water quality at sites in the Kaipara River catchment has established that, in some places, the following effects occur during periods of low flow in the summer months:

- the lowering of dissolved oxygen levels;
- the elevation of water temperatures; and
- the reduction in available habitat for aquatic biota as a result of reduced water velocities, depth and width.

As described in section 6.3 of the resource statement, WAIORA modelling predicts a minimum flow at each of six sites in the catchment, below which the life supporting capacity and ecological functioning of the streams are compromised. Pending further data collection and analysis, and the determination of management objectives, certain of these minimum flows could be adopted as the basis for managing abstractions in the catchment.

The analyses suggest the following minimum flows should be set in order to provide acceptable instream habitat conditions at the three flow recorder sites:

Site	Minimum Flow (l/sec)
Kaipara River at Waimauku	180
Ararimu Stream at Old North Rd	145
Kumeu River at Maddrens	40

As indicated above, which of these, or other, minimum flows are adopted depends on the management objectives set for each sub-catchment. Where streams are managed to provide corridors for fish migration, as opposed to year-round habitat, it may be appropriate to set lower minimum flows, or vary them seasonally. Further investigations aim to quantify these sorts of variations.

The discussion above highlights the difficulties of implementing minimum flows at a large number of sites across a catchment. It is likely that any minimum flows set in the Kaipara River catchment would be tied to flows at the three recorder sites. This would not preclude the setting of individual minimum flows for other parts of the catchment providing that a relationship is established between flows at each such location and those at one of the flow recorder sites.

Possible Abstraction Restrictions

The low gradient, ponded nature of much of the Kaipara River system means that abstractions occur, at least partially, from storage rather than directly from run-of-stream flow. As a result, the effects of pumping are felt over a period of time, as storage is depleted, rather than instantaneously. Rather than use the instantaneous pump rate to calculate the total abstraction rate of all users pumping concurrently, it is therefore appropriate to use the average abstraction rate of each water user (daily allocation over 24 hours).

When calculated in these terms, the total abstraction rate from run-of-stream flow upstream of the Waimauku flow recorder site is approximately 20 l/sec. This includes all current consents, applications for consents, permitted activities and estimated stock and domestic use.

As noted above, there are various ways in which abstraction restrictions can be imposed. The most simple of these is to prohibit abstractions when flows fall below a threshold equivalent to the minimum plus a buffer. For example, in order to maintain a minimum flow of 180 l/sec at Waimauku, abstractions would be prohibited when flows fall below 200 l/sec.

Alternatively, a system of rostering could be imposed for flows of, say, between 190 and 200 l/sec. Abstractions would remain prohibited below when flows fall below 190 l/sec but

alternate groups of users would have access to the resource when flows are between 190 and 200 l/sec.

However, analysis of historical flow records demonstrates that, in most years, such a system would not significantly add to the number of days on which water could be taken (ARC, 2000). This is due to the 'flashy' nature of flows in the catchment: flows rise and fall rapidly such that they rarely remain in the 190-200 l/sec band for significant periods of time. In view of the limited extent to which rostering would increase access to the resource, and the extra complexity which such as system adds to the management of abstractions, it would appear that the more appropriate approach to adopt in the Kaipara River catchment is to restrict all takes when flows fall below a single threshold.

Future Applications for Water Permits

In the example discussed above, the preferred allocation regime would allow all current water users to take water when flows at Waimauku are greater than 200 l/sec. However, any additional upstream abstractions could potentially cause flows to fall below the minimum of 180 l/sec because cumulative abstractions would then be more than 20 l/sec.

In order to allow any additional users access to the resource, future applications for water permits could be accommodated by authorising abstractions at flows above some higher threshold. A higher threshold of 220 l/sec, for instance, would allow the allocation of a further 20 l/sec on top of current allocations.

Further water permits could be granted in accordance with this allocation regime until the combined pump rate in this group of users reached the ceiling of 20 l/sec. Any further applications could then only be granted if a yet higher minimum flow (of, for instance, 240 l/sec for another group with maximum combined take of 20 l/sec) was maintained.

In this way, water permits would take on different priorities based on water availability when they were granted. Priority 1 permits (current users) would be restricted by a minimum flow of 200 l/sec, priority 2 permits would have to meet a minimum flow of 220 l/sec, and priority 3 permits would have to meet a minimum flow of 240 l/sec.

Risk of Restrictions on Abstractions

An allocation regime similar to that described above would result in restrictions on abstractions for varying lengths of time each year. An analysis of the historical flow records measured in the Kaipara River at Waimauku has been undertaken to identify the probability or risk to users of these restrictions (ARC, 2000a). The results of this analysis, may be summarised as:

- In the majority of years, restrictions would have first occured after New Year and last occured in April. However, in 1985-86 (a middle ranked summer) restrictions would have started as early as October and ended in May.

- In the majority of summers, the longest consecutive 'no take' period would have occurred during the period January to March.

- In the driest years, for instance 1982/83 and 1993/94, no abstractions would have been allowed for a total period of around 2 - 3 months out of the 6 month period November to April.

- There is a 10% chance, or a probability of 0.1, that flow will fall below 200 l/sec for a consecutive period of 28 or more days in any one year.

- There is a 50% chance, or a probability of 0.5, that flow will fall below 200 l/sec for a consecutive period of 13 or more days in any one year.

Although this analysis indicates that abstractions will almost certainly be subject to some form of restriction every summer, and that these will be for significant lengths of time during dryer summers, this need not necessarily compromise water permit holders' activities. They can choose to install appropriate off stream storage which will ensure that their water demand can be met during periods of low flow when abstraction restrictions are in place.

Water User Groups

The setting of minimum flows would clearly have significant implications for water users in the catchment. It is also clear from the discussion above that there are a range of potential difficulties with the implementation of this approach to water allocation. The establishment of a water user group to represent consent holders in the catchment is one means by which the merits of such an approach, and consideration of alternatives, can be debated and the best solution adopted and implemented. Not only does such an approach assist with the discharge of statutory duties but also provides for water users to take more responsibility for management of the resource.

Interim Measures

This discussion of minimum flows and abstractions restrictions indicates the direction which the water allocation strategy may take pending further investigations. Stream water quality and ecological values are compromised during periods of low flow and existing users might not, therefore, continue to have unlimited access to the resource.

Adopting a precautionary approach, whilst existing users have been granted replacement consents to take quantities of water which reflect the efficient demand of their activities, the consideration of further consent applications to take water during periods of low flow (1 November to 30 April) should have regard to the significant cumulative effects on instream values that additional takes are likely to result in and should require applicants to demonstrate that the effects on the environment (including additional cumulative effects) will be avoided, remedied or mitigated.

Residual Flows Associated with Dams and Abstraction from Dams

Dams provide storage of water accumulated during times of higher flows for use during periods of water demand. The abstraction of water from dams need not impact on low flows providing that water is taken from storage rather than from inflows occurring at the time. Where inflows to a dam occur, but there is no corresponding outflow, due to either

abstractions or evaporation, then the dam is no longer solely acting as a store but also as a 'sink' or point of loss of water from the hydrological system. The bypassing of low flows around the dam or release of residual flows ensures that this does not occur.

The setting of minimum flows, as discussed above, recognises that the life supporting capacity of, and values associated with, a stream will be compromised if flow falls below some threshold. Low flows bypassed or released from dams could be set in relation to these minimum flows based on the proportion of the minimum flow which the catchment of the dam would be expected to contribute. However, when higher inflows occur to each dam, then correspondingly higher outflows could be required, to allow access for downstream water users.

There are difficulties in implementing and monitoring a precise low flow to be bypassed or released from a dam. Inflows to dams vary from estimates derived from the average catchment yield, depending on the nature of the catchment (and possibly the existence of other dams) upstream of each dam. In certain cases this can mean that a theoretically derived low flow to be bypassed simply does not occur naturally at a specific location.

A solution is to require the bypassing or release of low flows in response to the occurrence of inflows into each dam. As long as there is some inflow to the dam during periods of dry summer weather, then an equivalent flow should be maintained downstream. If there are no inflows, because the stream is ephemeral above the dam, then no outflows are required. In either case, abstractions from the dam can be authorised because water is taken from storage and not from run-of-stream flow.

In a catchment in which a minimum flow has been set, the threshold below which all inflows are bypassed or released should be related to the occurrence of flows at or below this minimum. When a flow equal or less than the minimum or less is recorded each dam should be releasing or bypassing flows at least equivalent to the inflow. Dams that release no, or lesser, outflows are contributing to the 'below minimum' flow at the recorder site. When flow at the recorder site is greater than the minimum, the dam owner is not required to bypass all inflows (although, providing some inflows are occurring, some outflow must be maintained).

The effects of multiple dams in series on a watercourse adds to the complexity of assessing residual or low flow requirements. As indicated in section 9.2 of the resource statement, the effects of multiple dams on stream flow is one area which as been identified as a significant knowledge gap. A project is currently under to way to develop a Regional guideline for assessing the effects of multiple dams. This is likely to be of value for the further development of the water allocation strategy.

Interim Measures

The requirement for bypasses on existing dams is dependent on management objectives and, possibly on the setting of any minimum flows. Irrespective of the latter, residual or bypassed flows should be considered in those parts of the catchment where streams are managed for habitat purposes and to provide flow for downstream contaminant assimilation.

Elsewhere, bypasses should continue to be required where a previous need has been identified, for instance to ensure water is available for downstream water users. Low flow requirements should also be considered on any new on-stream dams unless applicants are able to demonstrate that any adverse effects will be avoided, remedied or mitigated in other ways.

Riparian Management and Stream Maintenance

Consultation with the community of the catchment has identified the choking of watercourses by weed growth to be a key concern. In particular, this is seen as a major contributor to flooding in certain parts of the catchment.

Excessive weed growth is also a problem because these plants respire (or use up) dissolved oxygen at night time. Low DO levels associated with macrophyte respiration can compromise the life supporting capacity of the catchment's watercourses.

The taking and damming of surface water can contribute to weed proliferation by reducing the available water for the assimilation of nutrients and by limiting the effectiveness with which watercourses are flushed of sediment and debris. However, other activities are arguably more important as causal factors behind this problem, particularly waste discharges and the lack of maintenance of watercourses.

Another, and related, issue is the management of riparian margins. Vegetation clearance and poor management of bankside vegetation adversely affects instream values in several ways: for example, a lack of shade can result in elevated temperatures and poor stream bank stability leads to increased sediment loadings. Good riparian vegetation not only helps to avoid these effects but also helps to shade out aquatic weeds and create a better bankside habitat for invertebrate fauna.

Since the abstraction of water during times of low flow can contribute to increased temperatures, lower DO and weed growth it is relevant to consider whether or not water users can implement any measures which would avoid, remedy or mitigate this effect. Each consented water user could be required to be responsible for weed clearance downstream of their abstraction point or dam. In addition they could be required to plant, fence and maintain the riparian margin to improve shading of the stream in this location.

There are, however, difficulties with this approach. Stream length and riparian margin vary greatly between properties, and not necessarily in proportion to the quantity of water an individual takes. Some users have no stream length on their property downstream of the take point whilst others take from streams on neighbours' land. These variations make it difficult to ensure that each water user would be able to mitigate the effects of their activity on an appropriate length of channel. Nor would it ensure that the cumulative effects of the taking and damming of water were mitigated, as the effects of each individual user would be considered in isolation. Most probably, such an approach would lead to a piecemeal pattern of riparian management and weed clearance that would not address the problems at the catchment or sub-catchment scale. Recent research indicates that whilst discontinuous riparian restoration provides localised improvements in characteristics such as stream shading and invertebrate community composition, it is less successful in improving water quality (Scarsbrook and Halliday, 1999).

An alternative approach is to require a financial contribution from consented water users towards the planting and maintenance of targeted streams. This would overcome inequity problems caused by differences in the access of individuals to streams by scaling the contribution required of each user in relation to their authorised quantity.

Under Section 108 of the Resource Management Act 1991, a financial contribution can only be required as a condition of consent on a water permit for a purpose specified in a Regional Plan. There is currently no Regional Plan containing a provision to require financial contributions from holders of water permits. However, the ARC has embarked on the development of the Air, Land and Water Regional Plan and this option could be investigated as part of that process.

Improved riparian and stream management can be implemented by the imposition of relevant conditions on other types of resource consents, such as subdivision consents. District plans and structure plans also provide an opportunity to guide and implement relevant rules.

An alternative, and complementary, approach is to consider non-statutory means of implementing improved riparian and stream management. Arguably, voluntary action by local communities has the greatest chance of success, for instance with the establishment of land care groups to tackle the problems of specific streams and sub-catchments. The ARC can both advocate and be actively involved in establishing such groups, for instance through undertaking studies to determine where riparian restoration can be of most benefit. The ARC is also currently developing Riparian zone management guidelines which will provide guidance on plantings and maintenance. In addition, the Environmental Iniatives Fund recently established by the ARC can provide financial assistance to groups undertaking, for example, riparian restoration.

Interim Measures

Given that the most effective way of achieving mitigation through improved stream and riparian management is likely to be at the stream or sub-catchment scale, a first step is to establish which parts of the catchment should be targeted. This will be the aim of appropriate further investigations. In the interim, where opportunities exist to implement planting or maintenance to mitigate potential adverse effects, these should be considered when reaching decisions on water permit applications.

Intake Design

The ARC holds generic guidelines for the design and operation of water intakes. A key requirement is for adequate screening to prevent fish and other biota being entrained, or sucked into the intake. Different screen mesh sizes are appropriate for different parts of the catchment. Intakes in streams through which larval fish migrate generally require a finer mesh than those in streams providing habitat for mature fish. Impingement results when fish or other biota are held against the intake due to high velocities. Again, appropriate intake velocities vary with the lifecycle stages.

The location of the intake is also important. Fish movements up and downstream tend to be concentrated along river banks. Intakes should therefore be located away from the bank to minimise the risk of entrainment or impingement.

Interim Measures

Conditions on resource consents to take water should reflect these guidelines. As further monitoring provides a clearer indication of the distribution of fish within the catchment, it may be appropriate to adopt specific intake standards for different parts of the catchment.

Water Use Efficiency and Alternative Water Sources

The ARC holds information on crop water use guidelines based on the results of recent research (Green et al, 1996). It is appropriate to use this information to guide water allocation.

However, actual water requirements can vary significantly with physical factors such as soil type, topography and micro-climate and with growing and irrigation practices. Providing that an acceptable level of water use efficiency can be demonstrated, it is reasonable to allocate water according to the demand demonstrated by individual growers. Where an individual grower can not provide this sort of information, allocations should be based on the most recent crop water use guidelines. This approach, adopted throughout the Region, will allow flexibility in allocation as new information can be taken in to account as it is made available. It is anticipated that this approach, to be adopted during the continued development of the water allocation strategy as an interim measure, will continue in the longer term.

Similarly, industrial and municipal water supplies are expected to be able to demonstrate an acceptable level of water use efficiency in providing the ARC with details of their water demand. Each year, the ARC commissions research aimed at establishing ways to assess and improve water use efficiency as part of its water conservation program. This information should be disseminated through appropriate education programs.

The ARC can impress the need to consider alternative water sources in making submissions on relevant applications to the territorial authorities, for instance, by advocating that new glasshouse operations be required to utilise roof water collection. Consent holders may need to invest in off stream storage where they are restricted from taking water during periods of low flow. This can be encouraged, providing that it does not lead to any adverse effects associated with the damming of water.

Wastewater re-use, for instance from existing or proposed sewage treatment plants, may provide a further alternative to run-of-stream flow abstractions. However, it should be recognised that certain activities are precluded from using treated wastewater on the basis of health and market considerations.

Monitoring, Reviews and Lapsing

All consent holders of resource consents to take water in the Auckland Region are required to monitor water use and return readings to the ARC. This not only allows for the monitoring of

compliance with consent conditions but also provides information on water use which is taken into account in reviewing the consent conditions at specified intervals. At these times, allocations can be adjusted to take into account efficiency of use (by comparing use with irrigation guidelines, for instance) and water availability, including any long term climatic trends.

Further, and more detailed, opportunity for reviewing allocations comes with the expiry of consents. The expiry of consents in the Kaipara River catchment is programmed for December 2013, with reviews in 2003 and 2008. Under section 125 of the RM Act consents which are not exercised lapse two years from the date of commencement or at some other time specified on the consent. It would be sensible to set the lapse date in this catchment to coincide with the first review date of December 2003. This may allow the allocation of water to other users who would otherwise denied access to these 'locked up' parts of the resource. It is anticipated that these measures, to be adopted during the continued development of the water allocation strategy as an interim measure, will continue in the longer term.

It is also important to monitor the effects of the taking and damming of surface water along with the success of any mitigation measures. However, as these effects are generally most evident at the cumulative scale, there is limited value in requiring each consent holder to monitor parameters relating to flows, water quality and the health of aquatic ecosystems. These are best monitored at the catchment or sub-catchment scale by the ARC. The annual fees paid by consent holders contribute to such programmes and it is reasonable for them to expect that relevant monitoring will take place in the catchment within which their activities occur.

11.3 Effects of Water Abstractions and Dams on Wetlands

11.3.1 Issue

- Changed flow regimes and water levels could affect the functioning of wetlands in the catchment and contribute to the further loss of these habitats.

11.3.2 Management Solutions

Resource Consent Options

- Require applicants for consent to take or dam water from or upstream of wetlands to demonstrate that adverse effects on wetland functioning will be avoided, remedied or mitigated.

Other Options

- Consider prohibiting or other controls on the taking and damming of water from or upstream of wetlands in the development of the Air, Land and Water Regional Plan.

11.3.3 Discussion

The majority of naturally occurring wetlands in the Auckland Region have been lost (ARC, 1999a). It is therefore appropriate to provide a high level of protection for these

environments, also taking into account the important role wetlands play in regulating water quality and hence, the life supporting capacity of streams. Under sections 6(a) and 6(c) of the RM Act, the preservation of the natural character of wetlands and protection of significant habitats of indigenous fauna are matters of national importance.

One way to ensure the protection of wetlands is to adopt policies which prohibit activities such as the taking and damming of water from or upstream of wetlands. Such policies can be investigated during the development of the Air, Land and Water Regional Plan. In the absence of a Regional Plan, applications for resource consents to take and dam water upstream of wetlands may currently be lodged with an appropriate assessment of effects. There may be opportunities to maintain and enhance wetlands through requiring mitigating conditions on such consents. Where this is not the case, conditions which at least ensure that any adverse effects are avoided, remedied or mitigated will be imposed.

A key knowledge gap exists in the Kaipara River catchment (and at the Regional scale) in relation to our understanding of the interactions between flow regimes and the ecological functioning of wetlands. Further investigations will aim to address this gap and any proposal to take or dam water from or upstream of wetlands should be required to consider this issue in as part of an assessment of effects.

11.4 Effects of Dams on Fish Passage

11.4.1 Issue

- On-stream dams can act as a barrier to the movement and migration of native fish.

11.4.2 Management Solutions

Resource Consent Options

- Refuse consent for on-stream dams.

- Require installation of fish pass measures on consented dams, unless an assessment of effects demonstrates that adverse affects on fish passage can be avoided, remedied or mitigated in other ways.

Other Options

- Consider the requirement for dams to provide for fish passage and/or imposing restrictions on the damming of watercourses where significant upstream habitat exists in the development of the Air, Land and Water Regional Plan .

- Advise applicants of the need to seek approval from Department of Conservation under Freshwater Fish Regulations 1983.

11.4.3 Discussion

The management objectives proposed in chapter 10 include the maintenance of instream habitat where it is currently good, and providing for fish passage through other parts of the catchment to enable fish to reach these higher value streams. On-stream dams represent a major barrier to the passage of fish, and therefore to the ability to meet these management objectives. In such streams, it is therefore appropriate to refuse consent for the construction of any new dams and require the installation of fish passage measures on existing dams.

Other streams, for instance those on which a number of dams have been built in series, provide less flexibility to manage for these sorts of ecological objectives. In such cases, the priority management objectives will continue to be providing for the abstraction of water by authorised water users, whilst at the same time taking opportunities for stream enhancement. Enhancement can take the form of improving habitat and providing for fish passage. The installation of fish pass measures is therefore relevant throughout the catchment wherever there is good habitat, or an opportunity to restore habitat, upstream of existing dams.

Fish passage measures may not be sufficient mitigation on streams with significant values, and abundant and diverse fish populations. On such streams, dams could be prohibited or controlled by relevant rules in the Air, Land and Water Regional Plan, given that under section 6(c) of the RM Act, the protection of significant habitats of indigenous fauna are matters of national importance.

In the absence of a Regional Plan, applications to dam any watercourse may be made with an appropriate assessment of effects including a description of ways in which any adverse effects will be avoided, remedied or mitigated. Applicants proposing to build dams (or intake structures) should also be advised of the requirement to obtain approval for, or dispensation from, the provision of fish passage under the Freshwater Fish Regulations 1983.

11.5 Cumulative Effects of Small Dams

11.5.1 Issue

- The relatively high density of dams in the Kumeu, Upper Kumeu, Tikokopu and Moau sub-catchments reflects the significance of lifestyle living in these sub-catchments. Further rural subdivision could lead to additional intensification of small dams throughout the catchment. Although many of these dams are ‘off stream’, they can have a significant cumulative effect on the stream flow regime through a reduction in the contributing catchment area, and the damming of springs and ephemeral headwater streams.

11.5.2 Management Solutions

Resource Consent Options

- Do not provide for small low risk dams to be Permitted Activities, so that all dams require a consent.

Other Options

- Improved education and enforcement of the Permitted Activity rule relating to the construction of small, low risk dams.
- Review the Permitted Activity rules relating to small low risk dams in the development of the Air, Land and Water Regional Plan, including consideration of the introduction of controls on damming which reflect catchment management objectives.
- Take statutory opportunities to advocate alternatives (for instance, submissions on district / structure plans, consent applications to territorial authorities).

11.5.3 Discussion

In certain sub-catchments, the spread of lifestyle blocks has been identified as contributing to a proliferation of small dams which may contribute to a reduction in flows at the catchment (or sub-catchment) scale if this trend continues. There is currently no mechanism under which the construction of dams can be prohibited, although resource consent can be refused for individual dams where they will result in an adverse effect on the environment.

Under the Transitional Regional Plan (ARC, 1991), small low risk dams can be constructed as a permitted activity providing certain criteria are met. Rule 7(i) allows the construction of small risk dams provided that:

"in catchments for which Regional Council Management and Allocation Plans are in force, the plan provides for such a Permitted Activity."

This rule therefore allows the ARC not to authorise dams as permitted activities in certain catchments, by not providing for them in the relevant "management or allocation plan". The result of disallowing permitted activity dams would be that consents would be required for all dams in the catchment (or sub-catchments), irrespective of their size, location, or environmental effects. This might lead to a check on the spread of small dams, as some landowners will not be prepared to go through the consent process. The cost of such an approach is that it would lead to significantly increased resourcing requirements for regulation, compliance and enforcement.

There is also considerable doubt as to the legality of this clause as it provides for the implementation of a regional rule through a non-statutory 'plan'. The rule has not been challenged, but this is probably only because Permitted Activity dams have not been disallowed in any part of the Auckland Region since the Transitional Regional Plan became operative in 1991.

The development of the Air, Land and Water Plan involves reviewing the rules of the Transitional Regional Plan and it is likely that the existing rule authorising small low risk dams as permitted activities will change. There is considered to be limited value in attempting to disallow small dams under the existing PA rule, given that the review of the rule is the subject of a separate (and regionally applicable) statutory process and taking account of its possible *ultra vires* status.

In the interim, a more effective approach to restricting the further spread of small dams is to educate landowners and contractors of their obligations under the existing PA rule, which

include providing notice prior to construction and providing for fish passage where appropriate. The giving of notice prior to construction provides an opportunity for the ARC to advocate alternatives to the construction of on-stream dams.

11.6 Dam Safety

11.6.1 Issue

- The damming of water carries with it a risk that the dam will fail, with possible damage to the downstream environment, including property and people. Dams should be appropriately designed, constructed, operated and maintained to ensure that this risk is minimised.

11.6.2 Management Solutions

Resource Consent Options

- Impose conditions on consents to dam water to ensure that dams are designed, constructed, maintained and operated to minimise the risk of failure, having regard to the Auckland Region Dam Safety Guidelines.

Other Options

- Ensure that non-consented (Permitted Activity) dams are designed, constructed, maintained and operated in accordance with the Auckland Region Dam Safety Guidelines through on-site assessments and education.
- Review the Permitted Activity rules relating to small low risk dams in the development of the Air, Land and Water Regional Plan, having regard to the Auckland Region Dam Safety Guidelines.

11.6.3 Discussion

Dams can fail for a number of reasons. Some problems, such as those relating to poor design or construction can lead to instability early on the life of the dam, whilst the risk of other potential causes of failure increases with the age of the dam. Lack of maintenance can lead to excessive vegetation growth, blocked outlets and spillway erosion.

The failure of a dam can cause the sedimentation of downstream watercourses and destruction of habitat. Property, buildings, roads, and in the extreme, human life, can also be at risk.

The risk of failure can be minimised through appropriate care being given to the design, construction, maintenance and operation of dams. The ARC has recently published dam safety guidelines which have been developed, and peer reviewed, by professional engineers experienced in all aspects of dam safety (ARC, 2000b). The assessment of applications for consent to dam water should have regard to these guidelines, whilst the imposition and implementation of appropriate consent conditions will ensure that the ARC exercises an appropriate duty of care in authorising dams. Compliance with these conditions will ensure that dam owners are undertaking appropriate measures to minimise the risk of failure.

Owners of existing permitted activity dams are also obliged to ensure that the risk of dam failure is minimised. The dam safety guidelines give details of minimum safety standards for 'minimal hazard' dams. The development of the Air, Land and Water Regional Plan provides an opportunity to develop controls on the damming of water which take into these guidelines.

11.7 Effects of Water Abstractions and Dams on the Values of Tangata Whenua

11.7.1 Issue

- Maori occupation of the catchment extends back over at least seven centuries. Cultural associations with the water bodies of the catchment, as evidenced by place and stream names and the results of archaeological investigations, are strong. The inappropriate abstraction and damming of water has the potential to compromise these associations, including the value of these water bodies for the collection of food and the disturbance of archaeological sites.

11.7.2 Management Solutions

Resource Consent Options

- Require applicants for consent to take and dam surface water to undertake consultation with tangata whenua.

- Require applicants seeking consent to construct new dams to undertake an archaeological assessment.

Other Options

- Undertake consultation with tangata whenua to guide the further development of management objectives and solutions.

11.7.3 Discussion

Under section 6(e) of the RM Act the relationship of Maori and their culture and traditions with ancestral lands, water, sites, waahi tapu and other taonga are matters of national importance which shall be recognised and provided for. In addition, particular regard should be had to kaitiakitanga (section 7(a)) and the principles of the Treaty of Waitangi shall be taken into account (section 8).

The management objectives proposed in chapter 10 of this report are largely concerned with maintaining or enhancing ecological values. However, these objectives coincide with many of the values which iwi of the catchment have indicated that they hold, as reported in chapter 7 of the Resource Statement. For instance, tangata whenua value the life supporting capacity of rivers and streams, particularly as migratory routes for fish and eels.

Similarly, some of the issues identified as conflicts with the proposed management objectives are also key concerns that have been raised by tangata whenua. These include: a possible

reduction in the supply of kaimoana; the placement of obstructions in water courses; and the pollution of water courses. Many of the management solutions discussed in the previous sections of this report are therefore directly relevant to ensuring that conflicts with the values of tangata whenua are addressed.

Other values, such as those relating to the mauri of streams and rivers and spiritual associations with waahi tapu and other important sites in the catchment, are not as explicitly recognised in the proposed management objectives. To some extent, however, the protection of stream mauri is implicit in objectives which seek to maintain and improve water quality and stream ecology.

The further development of management objectives will continue to have regard for the values of tangata whenua and, where important features of the river system are identified, specific management objectives can be developed. These can be complimentary to other wider sub-catchment objectives. For instance, the setting of minimum flows and implementation of riparian planting to maintain fish habitat might also ensure that a stream reach valued for eeling or for its spiritual value is enhanced.

Through consultation, tangata whenua of the catchment have indicated a desire to be directly involved in statutory and non-statutory processes affecting resource management. Recognising this, the further development of the Water Allocation Strategy should provide for effective consultation with iwi of the catchment and allow for the exercise of kaitiakitanga. Consultation should also be undertaken by applicants for resource consent to take and dam surface water, whilst decision making should have due regard had to any concerns raised.

The assessment of effects accompanying applications involving the construction of new dams should, where appropriate, include details of any potential disturbance of sites of archaeolgical, historical or cultural significance. ARC heritage officers should be involved to give guidance on the requirement for archaeological assessments to be undertaken, for instance where there is existing information on the presence of archaeological sites, or where there have been no prior surveys in locations where archaeological evidence is considered likely to exist.

11.8 Effects of Water Abstractions and Dams on Amenity Values

11.8.1 Issue

- Amenity values such as fishing and boating, and the aesthetic value of landscape features such as waterfalls, can be influenced by the availability of suitable flows. Other forms of recreation, such as duck shooting, can benefit from the creation of artificial water bodies by damming streams. Different forms of recreation can therefore have conflicting requirements of the catchment’s water resources.

11.8.2 Management Solutions

Resource Consent Options

- Have regard for amenity values in the assessment of resource consent applications to take and dam water.

Other Options

- Have regard for amenity values in the development of the management objectives, both in the context of this Water Allocation Strategy and in the development of the Air, Land and Water Regional Plan.

11.8.3 Discussion

No flow requirements for specific recreational or landscape values were identified in the collation of information for the resource statement. Water quality and ecological values appear to be of more significance in determining management objectives and solutions. However, the maintenance of low flows, and the implementation of ways to achieve improved riparian and stream management, will be of benefit for the aesthetic appeal of streams and recreational pursuits such as swimming.

Where specific amenity values are identified as a result of a consent application, regard should be had to both the potential adverse and beneficial effects of the proposal. For instance, a dam may create recreational opportunities that could help to mitigate any adverse effects.

The further development of management objectives for each sub-catchment should take into account any localised recreational or landscape values. The development of the Air, Land and Water Regional Plan provides an opportunity to develop a wider framework to take account of such values.

11.9 Changes to Water Quantity

11.9.1 Issues

- Although it is unclear whether or not the increased frequency and intensity of El Nino phases represents a long term trend towards dryer conditions, such a change has the potential to alter flow regimes and water availability.

- Future land use changes in the catchment have the potential to alter flows regimes. Although urbanisation can result in reduced baseflows, the most likely effects of the future growth of Kumeu-Huapai and Helensville are increases in the magnitude and rate of rise of peak flows. Afforestation and bush regeneration can cause reduced baseflows, whilst forest harvesting typically results in the opposite effect.

- The discharge of treated wastewater to the Kumeu River has the potential to increase water availability for downstream users whilst the availability of treated wastewater for re-use has the potential to reduce demand on the surface water resource for certain uses,

depending on the quality to which the wastewater is treated. Conversely, the discharge of treated wastewater has the potential to impact on water suitability for downstream users, the assimilative capacity of the Kumeu and Kaipara Rivers and instream values (ecological, cultural, recreational and landscape).

11.9.2 Management Solutions

Resource Consent Options

- Promote the efficient use of the water resource by allocating appropriate quantities relating to crop types and growing practices, or on the basis of the efficient demand of other activities (eg industry, municipal supply).
- Provide for a review of conditions of consent, to take into account changes in water availability.
- Take into account potential changes in water availability when assessing future consent applications.
- Promote the use of transfer of water permits.

Other options

- Promote the efficient use of water through non-statutory means, for instance education (dissemination of results of research into crop water demand, irrigation efficiency, industrial water use audits).
- Promote rainwater capture and use, for instance in new glass house developments by making submissions on relevant applications to territorial authorities.
- Ensure regard is had to potential effects on low flows of urbanisation, afforestation and forest harvesting by making submissions on district plans, structure plans and relevant applications to territorial authorities.
- Consider controls on uses of land uses which adversely affect low flows in the development of the Air, Land and Water Regional Plan.
- Encourage exploration of opportunities to boost river low flows or provide alternative water supplies for irrigation (for instance, waste water reuse), providing that any adverse effects relating to that proposal are avoided, remedied or mitigated.
- Continue to implement a program of low flow investigations throughout the catchment.

11.9.3 Discussion

Section 5 of the RM Act defines sustainable management of natural and physical resources to include sustaining the potential of these resources to meet the reasonably forseeable needs of future generations.

The allocation of water based on irrigation guidelines and the efficient water demand of other activities aims to ensure that excessive water use does not occur, allowing more users access to the resource and avoiding over allocation should there be any future reduction in availability.

The monitoring and regular review of water use by consent holders enables the ARC to respond to changes in demand and availability when allocating water.

The use of alternative water supplies, such as rainwater collection and wastewater re-use, helps to reduce the dependence of individual water users on a single water source and the pressure on the surface water resource as a whole.

Section 136 of the the RM Act provides for the transfer of water permits within a catchment. This provision allows for users to access more or less of the available resource in response to changing demands and is of most value in a fully allocated catchment. In the absence of a regional plan, consent holders must seek the approval of the ARC before transferring all or part of a water permit. This allows the ARC to ensure that the transfer will not result in adverse effects at the location to which the permit is transferred. Because of the small nature of most of the streams in the Kaipara River catchment, transfers are only likely to be straightforward where they involve two abstractions from the same tributary or channel reach.

The ARPS (ARC, 1999a) provides guidance on ways in which the ARC can seek to influence land use change which might impact on low flows. Under method 9.4.2.1, the ARC will seek "the inclusion of appropriate provisions in district plans or, where desirable, through the provisions of regional plans." Submissions should be made on district plans and also structure plans and land use consent applications where there is a potential for changes in land use such as urbanisation or forestry to affect low flows. The development of the Air, Land and Water Regional Plan can also address this issue at a regional level.

The options for the disposal of treated wastewater from existing and proposed wastewater treatment plants in the catchment include the discharge of wastewater to the Kaipara River and its tributaries and the provision of wastewater for re-use by some water users, although this may exclude certain irrigated crops. Either option has the potential to reduce demand for the surface water resource.

The continued gauging of low flows is an essential part of environmental monitoring in the catchment. Combined with the records of flow measured at the automatic recorder sites, such information helps to establish any trends in flow and, hence, water availability. Recommendations relating to the continuation of low flow gaugings in the catchment are made in ARC (1999b).

11.10 Changes to Demand for Water

11.10.1Issue

- The proposed construction of a dam and abstraction of water in the Ararimu Stream valley for bulk water supply has the potential to impact on water availability for other users, the assimilative capacity of the Kumeu and Kaipara Rivers and ecological and cultural instream values.

- The growth of Helensville and Kumeu as envisaged by the Draft Regional Growth Strategy and structure plans for these towns will increase the demand for water supply in these areas. Any additional demand on the surface water resource in these localities has the potential to impact on water availability for other users, the assimilative capacity of the Kumeu and Kaipara Rivers and ecological and cultural instream values.

11.10.2 Management Solutions

- Require a reduction in unaccounted for water losses from existing bulk water supply sources though conditions of consents relating to these sources.
- Advocate improved demand management and reduction in unaccounted for water losses from existing supplies.
- Advocate efficient use by the end users of bulk water supplies.

11.10.3 Discussion

An assessment of future bulk water supply sources for Auckland identified the construction of a dam in the Ararimu Stream catchment as the preferred future option to cater for the projected increase in demand beyond that which existing sources and the Waikato pipeline can provide for (Watercare Services Ltd, 1995).

The Auckland Regional Growth Strategy (Auckland Regional Growth Forum, 1999) and structure plans (Rodney District Council, 1998a and 1998b) envisage the growth of Kumeu and Helensville, with an associated increased in demand for water.

Any proposals to take or dam water for bulk or municipal water supply will require authorisation by one or more resource consent. The process by which the decision on any application for a resource consent is determined is prescribed in the RM Act. This process is designed to ensure that adverse effects on the environment are avoided, remedied or mitigated.

Through its water conservation program, the ARC advocates that bulk and municipal water suppliers adopt improved demand management. Conditions are imposed on relevant resource consents which aim to improve network efficiencies and to reduce unaccounted for water losses. These measures could help to delay the requirement for further bulk and municipal water sources. The ARC's water conservation program also provides an opportunity to educate the end water users of ways to improve water use efficiency.

12 Actions and Timeframes

12.1 Further Work

The development and implementation of the water allocation strategy is an ongoing process. There are significant knowledge gaps to be addressed before management objectives and solutions can be confirmed, and the strategy fully implemented. Figure 12.1 presents the proposed actions and timeframes for undertaking this further work.

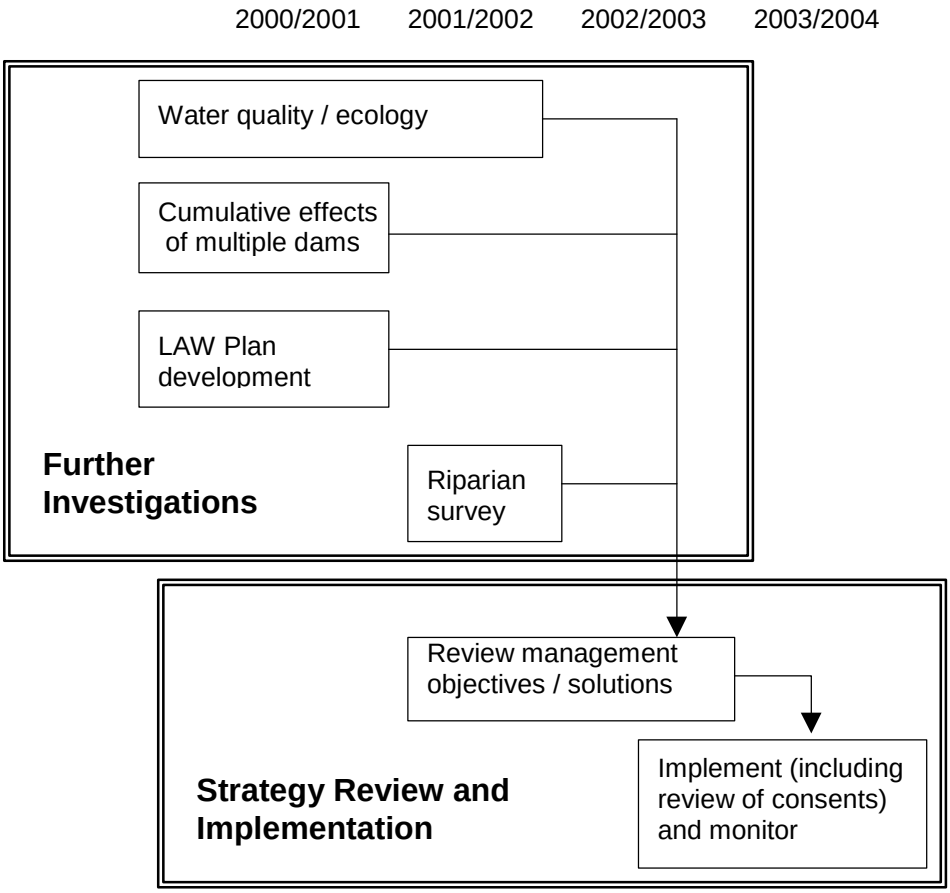

Figure 12.1 *Proposed work programme*

In more detail, the proposed work program, starting from the 2000/2001 financial year is:

2000/2001

Water Quality and Ecology

- survey to establish the spatial and temporal distribution of fish and macroinvertebrates, focusing on periods of low flow and high temperature;
- concurrent monitoring of water quality, especially dissolved oxygen and temperature during summer conditions.
- analysis of this information to validate previous modelling of interactions between flows, water quality and ecology.

Cumulative Effects of Multiple Dams

- continuation of current project.

Air, Land and Water Regional Plan

- The ARC hopes to notify the Proposed Regional Plan: Land , Air and Water in the latter part of 2001, with continued development up until that time. Section 12.2.3 lists recommendations that the development of the Air, Land and Water Regional Plan should consider.

2001/2002

Water Quality and Ecology

- Further data collection and analysis relating to summer stream conditions, as necessary.
- Investigations of interactions between flow regimes and the ecological functioning of wetlands.

Riparian and Wetland Survey

- Catchment survey to establish the spatial variation of riparian vegetation and to identify target areas for riparian planting.

Review proposed management objectives and solutions

- Analysis of results of further investigations to confirm proposed management objectives or to determine alternatives, having regard for other (cultural, recreational and landscape) values.
- Determination of solutions to meet these objectives.
- Consider establishment of water users group to assist with this process.
- Have regard to the proposed Air, Land and Water Regional Plan for direction.

Develop monitoring programme

- Develop a programme to monitor effectiveness of water allocation strategy implementation, for instance monitoring of flows, ecology, water quality and analysis of consent applications.

2002/2003 and beyond

Implement

- This will mark the completion of the development of the water allocation strategy and provide for its continued implementation. The conditions on consents granted in the interim will be reviewed at this stage.

Monitor

- Implement the programme of monitoring.

12.2 Interim actions

12.2.1 Introduction

During the period of further development of the water allocation strategy the ARC will continue to carry out its functions and duties in relation to the taking and damming of water in the catchment. A range of interim actions are proposed in accordance with the discussion of alternatives described in chapter 11.

A large number of applications have been received for replacement water permits. Under Section 21 of the RM Act, the ARC has a responsibility to avoid unreasonable delay in processing these applications. It would be unreasonable to delay completion of processing until the review of the proposed allocation strategy in 2003, such that a decision on these applications must be made in the interim. Applications for new consents to take and dam water might also be lodged over the period until the proposed allocation strategy is reviewed. Adopting a precautionary approach, this section contains guidance on appropriate consent conditions and matter to consider in reaching decisions on applications for new consents. There are some variations to reflect the differences in proposed management objectives in different parts of the catchment.

Chapter 11 does not only identify actions to implement through the resource consent process, but also other complimentary statutory and non-statutory measures. Many of these can be acted on both in the interim and in the longer term.

12.2.2 Resource Consents

Taking of Surface Water

The following actions are proposed for the **entire Kaipara River** catchment.

Decisions on Applications

That, in reaching a decision on applications for consent to take water from run-of-stream flow, regard be had to enabling the continued abstraction of water by established, efficient water users. The consideration of consent applications for new proposals to take water from run of stream flow during periods of low flow (1 November to 30 April) should have regard to the significant cumulative effects on instream values that additional takes are likely to result in. Applicants should be required to demonstrate that the effects on the environment (including additional cumulative effects) will be avoided, remedied or mitigated.

Allocations

That, in the consideration of consent applications to take water, the efficient use of the water resource be promoted by allocating appropriate daily and annual quantities relating to crop types and growing practices, or on the basis of the efficient demand of other activities (eg industry, municipal supply). Allocations should take into account information from applicants, along with water use guidelines held by the ARC.

Monitoring

That, in the consideration of consent applications to take water, regard should be had to providing for the monitoring of water use by requiring consent holders to fit and maintain a water meter, monitor and record water use, and to return this information to the ARC.

Intake Structures

That, in the consideration of consent applications to take surface water, regard should be had to providing for the potential adverse effects of intake structures to be mitigated by requiring consent holders to locate, maintain and operate intakes so as to avoid the entrainment and impingement of aquatic biota.

Damming of Water

The following actions are proposed for the **entire Kaipara River** catchment.

Decisions on Applications

That, in reaching a decision on applications for consent to dam water, regard be had to enabling the continued damming of water with established structures subject to appropriate maintenance, monitoring and mitigation conditions. The consideration of consent applications for new proposals to dam rivers and streams should have regard to the significant effects on instream values that additional dams are likely to result in. Applicants should be required to demonstrate that the effects on the environment (including additional cumulative effects) will be avoided, remedied or mitigated, or that any adverse effects are offset by any benefits which may accrue from the damming of water, for instance stormwater control and treatment.

Dam Safety

That, in the consideration of consent applications to dam water, regard should be had to providing for dam safety by requiring consent holders to ensure that dams are designed, constructed, maintained and operated to minimise the risk of failure, having regard to the Auckland Region Dam Safety Guidelines.

That the ARC ensures that any existing dams constructed in accordance with the rules of the Transitional Regional Plan are maintained and operated in accordance with the Auckland Region Dam Safety Guidelines through on-site assessments and education.

Archaeological Assessments

That, in the consideration of consent applications which involve the construction of new dams, regard should be had to the potential disturbance of sites of archaeological, historical or cultural significance by requiring applicants to

undertake assessments in areas where sites have been previously identified or where other knowledge indicates that evidence is likely to be found.

The following actions are proposed for the **Ararimu** and **Tikokopu** sub-catchments, the **Upper Kumeu headwaters** and the **Wharauroa Stream**:

Dam residual or bypassed flows

That, in the consideration of consent applications to dam water, regard should be had to avoiding adverse effects on downstream low flows by requiring consent holders to maintain residual or bypass flows, unless an assessment of effects demonstrates that potential adverse affects during periods of low flows can be avoided, remedied or mitigated in other ways.

Fish Passage

That, in the consideration of consent applications to dam water, regard should be had to mitigating adverse effects on fish passage by requiring consent holders to install fish pass measures, unless an assessment of effects demonstrates that potential adverse affects on the functioning of aquatic ecosystems can be avoided, remedied or mitigated in other ways.

The following actions are proposed for the **Lower Kaipara**, **Awaroa**, **Moau**, **Kumeu**, **Upper Kumeu** (excluding headwaters), **Waimauku** (excluding Wharauroa Stream) sub-catchments:

Dam residual or bypassed flows

That, in the consideration of consent applications to dam water, regard should be had to avoiding adverse effects on downstream low flows by requiring consent holders to maintain residual or bypass flows where necessary to ensure that potential adverse affects during periods of low flows will be avoided, remedied or mitigated.

Fish Passage

That, in the consideration of consent applications to dam water, regard should be had to mitigating adverse effects on fish passage by requiring consent holders to install fish pass measures where necessary to ensure that potential adverse affects on the functioning of aquatic ecosystems will be avoided, remedied or mitigated.

Duration, Review and Lapsing of Resource Consents

The following actions are proposed for the **entire Kaipara River** catchment

Duration of Consents

That, in the consideration of consent applications to take and dam water, regard be had to providing for efficient allocation of the available water resource by granting consents with a concurrent expiry date of 31 December 2013.

Review of Consent Conditions

That, in the consideration of consent applications to take and dam water, regard be had to providing for efficient allocation of the available water resource by allowing for concurrent reviews of the conditions of consent in December 2003 and then every 5 years, to take into account at least the following matters: changes in water availability, demand and use; water quality; the functioning of aquatic ecosystems; new environmental knowledge; and the rules of any relevant regional plan.

Lapsing of Consents

That, in the consideration of consent applications to take and dam water, regard be had to providing for efficient allocation of the available water resource by allowing for the concurrent lapsing of consent (where not given effect to), in December 2003, or two years from the date of commencement, whichever is the later date.

Assessment of Resource Consent Applications Lodged During the Period of Further Strategy Development

The following actions are proposed for the **entire Kaipara River** catchment.

Options for Mitigation

That where opportunities exist for riparian planting to be implemented to mitigate the effects of taking and damming water, they be taken account of in reaching a decision on consent applications, and in the determination of the condition of consents.

Future Applications Upstream of Wetlands

That, in the consideration of consent applications to take or dam water upstream or in significant wetlands, regard should be had to the potential for the activity to result in adverse effects on wetland ecosystems and should require applicants to demonstrates that adverse effects on wetland functioning will be avoided, remedied or mitigated.

Values of Tangata Whenua

That, in the consideration of consent applications to take and dam water, regard should be had to providing for potential adverse effects on matters of significance for tangata whenua to be avoided, remedied or mitigated by requiring applicants to undertake consultation with tangata whenua to determine relationships with ancestral lands, water, sites, waahi tapu and other taonga and so that regard may be had to kaitiakitanga.

Amenity Values

That regard is had for amenity values, including recreational and landscape values, in the assessment of resource consent applications to take and dam water.

12.2.3 Other Actions

Permitted Activity Dams

That the water allocation strategy provides for the construction of small low risk dams as Permitted Activities in accordance with rule 7 of the Transitional Regional Plan. That the ARC ensures that, in all cases, all conditions of this rule are fully complied with.

Monitoring

Flow Measurement

That the ARC continues to monitor flow at the Waimauku, Old North Rd and Maddrens flow recorder sites.

That the ARC continues to undertake an annual program of summer low flow gauging in the catchment, in line with the recommendations in ARC (1999b).

Water Quality Monitoring

That the ARC continues to monitor baseline water quality at the Kumeu River monitoring site and investigate new opportunities for additional monitoring.

Riparian Management

Voluntary Action

That the ARC takes opportunities to encourage voluntary riparian planting and maintenance, for instance through the establishment of community based land and stream care groups.

Advocacy

That the ARC takes statutory opportunities to advocate riparian planting and maintenance, for instance by making submissions on District / Structure Plans and on consent applications notified by Territorial Authorities.

Controls on Discharges

That the ARC continues to implement appropriate controls on discharges to water, for instance implementation of the Regional Plan: Farm Dairy Discharges, consenting other discharges and review of conditions on existing discharge consents.

Water Use Efficiency and Alternative Water Sources

Education

That the ARC promotes the efficient use of water through non-statutory means, for instance education (dissemination of results of research into crop water demand, irrigation efficiency, industrial water use audits).

Rainwater Use

That the ARC promotes rainwater capture and use, for instance in new glass house developments by making submissions on relevant applications to Territorial Authorities.

Water Storage

That the ARC takes statutory opportunities to advocate alternatives to the damming of watercourses, for instance through submissions on District / Structure plans and on consent applications notified by territorial authorities. Appropriate alternatives may include off stream storage, providing that any adverse effects (including cumulative effects) associated with the construction of storage dams are avoided, remedied or mitigated.

Wastewater Reuse

That the ARC ensures that, when considering consent applications for proposals to discharge wastewater, regard is had for the potential to augment river low flows or provide alternative water supplies for irrigation, whilst ensuring that providing that any adverse effects relating to that proposal are avoided, remedied or mitigated.

Bulk and Municipal Water Supplies

That the ARC continues to require controls on unaccounted for water losses from existing bulk and municipal water supply sources though conditions of consents relating to these sources.

That the ARC continues to advocate improved demand management and reduction in unaccounted for water losses from existing bulk water and municipal supplies, for instance through submissions on Annual Plans.

Land Use Change

That the ARC takes statutory opportunities to ensure that adverse effects on surface water resource quantities resulting from land use change are avoided, remedied or mitigated, for instance through submissions on District / Structure plans and on consent applications notified by territorial authorities.

Development of the Land Air and Water Regional Plan

Financial Contributions

That the ARC considers the requirement for a financial contributions from consent holders for riparian planting and maintenance in the development of the Air, Land and Water Regional Plan.

Wetlands

That the ARC considers prohibiting or other controls on the taking and damming of water upstream of wetlands in the development of the Air, Land and Water Regional Plan.

Dams

That the ARC considers the requirement for dams to provide for fish passage and/or imposing restrictions on the damming of watercourses where significant upstream habitat exists in the development of the Air, Land and Water Regional Plan

That the ARC reviews the Permitted Activity rules relating to small low risk dams in the development of the Air, Land and Water Regional Plan, including consideration of the introduction of controls on damming which reflect catchment management objectives and having regard to the Auckland Region Dam Safety Guidelines.

Land Use Change

That the ARC considers controls on land use activities that have the potential to affect the quantity of water in surface water bodies in the development of the Air, Land and Water Regional Plan.

13 Implications for Consent Holders and Applicants

13.1 Introduction

The previous water allocation and management plan (ARWB, 1989) recommended policies to guide the processing of water right applications. Some of the interim actions recommended in this water allocation strategy represent the continuation of these policies, whilst in other areas there are some significant differences. The implications of the interim measures for holders of and applicants for resource consents to take and dam water are described below in section 13.2.

The water allocation strategy will be reviewed in 2002/03 to take account of further monitoring and investigations and the development of the Air, Land and Water Regional Plan. At that time, it will be appropriate to determine whether or not the management objectives proposed here should be adopted as aims for the longer term management of the catchment's water resources. This will guide the selection of management solutions from those discussed in chapter 11 of this report. It is likely that many of the interim actions will continue beyond the 2002/03 review.

However, it is also possible that additional or alternative measures will be adopted and implemented if these are shown to be necessary to ensure that the management of the catchment's water resources is consistent with the purposes and principles of the Resource Management Act. Certain of these measures, if adopted, will have significant implications for water users. They are discussed in section 13.3 of this chapter.

13.2 Implications of Interim Actions

The following are largely unchanged from the previous plan:

- It is likely to be difficult for applicants for new consents to take water from run-of-stream flow to demonstrate that there is sufficient water available for them to take water during periods of low flow. It is likely to be easier to obtain consent for the taking of water during periods of high flow for offstream storage and use during periods of high demand.

- Consent holders will be required to fit and maintain a water meter and return records of water use. Although previously this has been at the ARCs discretion, most water users have been required to comply with this requirement for several years.

The following reflect changes to the policies of the previous plan:

- Allocations will not only be based on crop water use guidelines, but will take into account individual water use records and other relevant information.

- It is likely to be difficult for applicants for new consents to dam rivers and streams throughout the catchment to demonstrate that the effects of their proposal will be avoided, remedied or mitigated. Previously a 'restriction' was placed on dams only on the main Kaipara River, Kumeu River and Waimauku Stream. It is likely to be easier to obtain consent for offstream dams, providing that adverse effects (including dam safety considerations) are avoided, remedied or mitigated.

- It is likely that holders of consents to dam water in the Ararimu and Tikokopu sub-catchments, Upper Kumeu headwaters and Wharauroa Stream will have to ensure that a residual low flow occurs downstream of the dam. Elsewhere the ARC will impose this requirement at its discretion. In the previous plan, this requirement applied to all irrigation dams throughout the Kaipara River catchment although it has not been widely implemented.

- It islikely that holders of consents to dam water in the Ararimu and Tikokopu sub-catchments, Upper Kumeu headwaters and Wharauroa Stream will have to ensure that provision is made for fish passage. Elsewhere the ARC will impose this requirement at its discretion. Although the previous plan provided for this requirement it has not been widely imposed on consent holders.

The following are new:

- Consent holders will be required to maintain appropriate intake structures which avoid adverse effects on fish and other biota.

- Dams must be designed, constructed, maintained and operated in accordance with the ARC's Dam Safety Guidelines.

- Subject to the imposition of a standard review date, the conditions of consents can be in 2003 and then subsequently at intervals of 5 years. This allows the ARC to re-allocate the available water or to impose changed conditions of consent to reflect new knowledge.

- Subject to the imposition of a standard lapse date, consents which are not given effect to by December 2003 will lapse.

- Consent applicants are required to consult with Tangata Whenua. Although not a policy of the previous plan, applicants for resource consents to take and dam water in the catchment have been required to undertake consultation since the RM Act came into effect in 1991.

The latter two measures reflect the provisions of the RM Act, which has come into effect since the previous plan as adopted.

13.3 Possible Longer Term Measures

13.3.1 Minimum Flows and Abstraction Restrictions

Analysis of the relationship between flow, water quality and instream habitat described in section 6.3 indicates that, during periods of low flow, the life supporting capacity of streams in the Kaipara River catchment is compromised. The taking of water during times of low flow has the potential to exacerbate this effect.

One of the management solutions to which could be implemented to avoid this is to set minimum flows at points in the catchment and prohibit abstractions when flow falls below these (see section 11.2). Based on the analysis reported in section 6.3, it appears likely that if

a minimum flow is applied throughout the year, then abstractions would be restricted during most summers. During the driest summers no abstractions would be allowed for periods of several weeks. Under such circumstances, holders of consents to take water from run-of-stream flow will have to have alternative water sources to cover these periods, for instance. pumping water to storage in off stream dams during periods of higher flow.

The results of further investigations may indicate that it is not necessary to impose a minimum flow throughout the catchment and throughout the year. In places where streams are managed as corridors for fish migration, spring and summer freshes may be of more importance than low flows. In other parts of the catchment, managed as habitat and to provide for waste assimilation, the maintenance of summer low flows is of greater importance.

On the basis of these variations, one future possibility is that minimum flows apply in the Ararimu and Tikokopu sub-catchments based on flows at the Old North Rd recorder site, with other minimum flows applicable in the Upper Kumeu headwaters, Wharauroa Stream and elsewhere as necessary.

13.3.2 Dam Upgrades

Most existing on-stream dams in the catchment do not provide for the maintenance of residual flows or for fish passage. As a result of the proposed interim actions these are likely requirements on dams in the Ararimu and Tikokopu sub-catchments, in the Upper Kumeu headwaters, the Wharauroa Stream and elsewhere as necessary.

These requirements could be required on all on-stream dams throughout the catchment to better provide for fish passage to stream headwaters. This will be dependent on the assessment of the viability of instream habitat in headwaters to be undertaken as part of the programme of further investigations.

Upgrades may also be required where dams fail to meet minimum safety criteria, continuing measures adopted in the interim. The maintenance of existing dams is a key concern.

13.3.3 Riparian Planting and Financial Contributions

Water users may be able to undertake riparian planting to help mitigate the effects of their activities. This may be an option which they can implement as an alternative, or complementary to, the imposition of abstraction restrictions.

The planned survey of riparian habitat will indicate where riparian planting might be best targeted to achieve improvements in the life supporting capacity of streams during periods of low flow. Under the Air, Land and Water Regional Plan, consent holders might be required to make a financial contribution towards targeted riparian planting in these areas.