

AUCKLAND CITY COUNCIL – ISTHMUS DISTRICT PLAN REVIEW 2007/08
EUM/METROWATER TECHNICAL INPUTS

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Issue No	Date	Contributors	Reviewer	Summary of main changes
1	18.6.08	IM, K Bell	RM	General comments on approach and editing
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3. KEYWORDS

Watercourses, wetlands, riparian margins

4. SUMMARY

There are approximately 25 significant watercourses on the Auckland city isthmus. Generally these watercourses are both small and short as a result of a number of factors:

- The relatively small area of the isthmus with topography generally radiating from the centre;
- Significant areas of unconfined basalt aquifers underlying the city (causing rainwater to percolate into the aquifer and flow underground over large parts of the city); and
- Historical piping of water courses and gullies to enable land development.

The watercourses that remain are for the most part highly modified by widening and straightening and the introduction of hard structures such as erosion protection to enable increased stormwater flows to be transported efficiently away from houses and buildings. Notwithstanding the changes that have occurred in the past, streams are an important component of the urban environment, providing important conduits for urban runoff, adding to the city's ecological diversity, and contributing to the amenity and landscape of the city.

Streams continue to be under pressure as a result of on-going development. Increases in impervious surface coverage within the catchment will result in additional stormwater flows. As a consequence, the risk of erosion and other forms of stream degradation will similarly increase.

Wetlands provide another element of ecosystem diversity within the city and wider region. However, within Auckland city, few significant wetland areas remain. On-going development and changes in catchment hydrology represent a risk to the remaining wetlands, although the Waiatarua wetland, which is probably the most significant in the city, has been extensively extended and developed to provide treatment for stormwater flows.

Despite the desire to improve stream environments and aquatic ecology, there needs to be a realistic expectation of what can be achieved. Research undertaken by the ARC as well as internationally indicates that urban streams with greater than 25% imperviousness within the contributing catchment have very limited aquatic species diversity with only robust, tolerant species being able to survive in these environments. Auckland city catchments are typically at impervious levels of at least 40 % but are usually more.

At the same time, however, it is recognised that stream environments have values that are wider than simply ecological. Auckland City Council and Metrowater developed a classification system that considered three main values – aquatic habitat, public amenity and stormwater conveyance. The objective of this system is to reflect some of the other values provided by streams and to understand how this varies across the city.

While the city's streams are highly modified, further loss of streams and stream values should be restricted. However, the responsibility for the management of the beds of lakes and rivers and the diversion of water lies with the ARC. As such, the Proposed Auckland Regional Plan: Air, Land and Water contains extensive provisions regarding the modification of watercourses. It is noted that the ALW Plan provides a relatively "permissive" approach to managing urban watercourses, enabling a wide range of activities and minor modification as permitted activities and providing no restrictions on the modification of intermittent (ephemeral) watercourses.

In respect of enhancement and improved opportunities, it is noted that a large proportion of the city's streams are under public management. These streams are either "public watercourses" or run through publicly owned land. As such, the majority of opportunities to enhance stream environments or to improve stream management lie within the control of the operational arms of Council and can be implemented without the need for District Plan provisions.

Accordingly, District Plan provisions are best targeted at minimising increases in existing effects through the management of factors that contribute to increased stormwater flows (primarily impervious surface) and the protection of important flow paths such as ephemeral stream channels and overland flow paths.

Low Impact Design (LID), which is a technique used to minimise the impacts of stormwater through design elements such as the minimisation of impervious surfaces and the use of natural stormwater drainage features, may be applicable on larger new or re-development.

5. RECOMMENDATIONS FOR CONSIDERATION FOR THE DISTRICT PLAN

As stream management is not a primary regulatory function of Territorial Authorities, only some of the methods to achieve the improved outcomes for the city's watercourses and wetlands have implications for the District Plan. Accordingly, the following matters should be considered further for:

Outcome 1: Maintain stormwater conveyance function

1. Incorporate strategies for managing the development within flood plains, overland flow paths and ephemeral watercourses. This is currently managed through a mixture of District Plan (flood plains) and stormwater bylaw (overland flow paths) controls, but would be better managed entirely through the District Plan through the implementation of rules preventing inappropriate development within these areas.

Outcome 2: Improve stream water and sediment quality – see Stormwater Quality discussion paper.

Outcome 3: Minimise ongoing erosion of watercourses

2. Incorporate provisions to maintain or where possible reduce, the "effective" imperviousness within catchments, particularly those that drain to watercourses that are sensitive to increased stormwater flows. Provisions may include restrictions on impervious surfaces or the application of Low

Impact Design techniques to reduce stormwater volumes and flows. These could be applied on an area basis, depending on the nature and sensitivity of the receiving environment.

3. Consider review of design guidelines for roads and pavements to similarly implement LID measures such as reduced road widths, permeable parking areas and pavement, swales for drainage etc.

Outcome 4: Improve stream habitat and riparian margins

4. Include provisions that enable the acquisition of riparian margins through development contributions.
5. Consider include provisions, such as increased development rights, that provide incentives to encourage improved riparian management on private land.

Outcome 5: Better recognise cultural values

6. Consult with iwi and update the District Plan's schedules of significant features, including cultural areas of significance.

Outcome 6: Protect existing wetlands from further degradation

7. Review schedules of wetlands and update if necessary.
8. Consider opportunities to use development incentives, such as increased development rights, to protect and enhance wetland areas.

A range of other non-statutory measures have also been identified. These relate primarily to Council's role as a land owner or with its statutory responsibility for stream management for certain watercourses.

6. OUTSTANDING MATTERS

#	ITEM	Comment on Work Pending to Address this
1	Update wetland areas, sites of significance	Not known.

7. ISSUES

There are approximately 25 significant watercourses on the Auckland city isthmus. Generally these watercourses are both small and short as a result of a number of factors including:

- the relatively small area of the isthmus with topography generally radiating from the centre;
- significant areas of unconfined basalt aquifers underlying the city (causing rainwater to percolate into the aquifer and flow underground over large parts of the city);
- historical piping of water courses and gullies to enable land development.

In addition, the watercourses that remain are typically highly modified by widening and straightening, and the introduction of hard structures such as erosion protection, to enable increased stormwater flows to be transported efficiently away from houses and buildings.

Notwithstanding the changes that have occurred in the past, streams are an important component of the urban environment providing important conduits for urban runoff, adding to the city's ecological diversity, and contributing to the amenity and landscape of the city.

7.1 Issue 1

Streams will continue to be under pressure from on-going growth and intensification. The main potential effects of growth are the loss and modification of ephemeral and permanent stream lengths through additional piping and other structures and through increased stormwater flows as a result of greater levels of impervious surface.

While the ARC controls activities in the beds of watercourses through its ALW Plan, the Plan provides a relatively permissive approach to managing permanent watercourses and does not seek to control the modification of ephemeral streams (other than controls related to the physical works themselves).

A key question is what role should the District Plan have in respect of:

- Controlling development in ephemeral watercourses, which are not controlled by the ARC's ALW Plan but which are important overland flow paths; and
- Requiring controls on stormwater flows to minimise hydraulic effects on stream channels, particularly those that are more sensitive to such effects.

7.2 Issue 2

Riparian margins play an important role in maintaining and enhancing stream habitat and amenity values, reducing stream water temperatures through shading and protecting stream banks from erosion.

Consideration needs to be given as to the mechanisms that are available to manage riparian margins on private land and potentially enhance such areas. These include District Plan provisions such as the taking of riparian strips or mitigation requirements, but also extend to education initiatives, incentives and assistance. Linkages into Council management of riparian margins on its own land should also be considered to provide greater connectivity between vegetated areas.

7.3 Issue 3

Many sections of the city's streams have been lost through piping at some stage in the past. This has been done to enable land development to occur or to resolve nuisance flooding by putting stormwater underground. In some instances development has occurred above the piped watercourses.

Where streams have not been built over, there is the potential to "daylight" the stream – that is to remove the pipe and reinstate the watercourse. Although not common, this is a technique has been implemented in

Auckland city and elsewhere to help return amenity values and hydraulic benefits that have been lost through the original piping.

Consideration should therefore be given to whether the District Plan has a role in enabling or facilitating stream daylighting to occur.

7.4 Issue 4

Wetland systems are valuable ecological resources that have now got a higher level of recognition than in the past. Managing wetland systems requires a specific planning approach. Mapping wetland systems on GIS, coupled with relevant plan provisions, provides certainty of protection as it provides them with a level of visibility that has not been previously apparent in planning documents.

Controlling the adverse effects of activities and buildings on the wetland systems, particularly with respect to the natural character, ecological and hydrological values by scheduling is an effective tool but needs to be balanced with their function as part of the city's stormwater infrastructure and the need to manage them in an effective way to limit public health and safety risks and to limit the discharge of contaminants from them.

Consideration should given as to whether current District Plan controls can be improved.

8. NARRATIVE

8.1 Background

There are approximately 25 "significant" watercourses on the isthmus and a number of smaller streams and tributaries.

Five of the city's main watercourses are deemed to be "public watercourses" – these are the Oakley, Motions and Meola Creeks and the Newmarket and Remuera Streams. Auckland City Council is responsible for managing these watercourses and maintaining the channel to enable stream flows and minimise erosion. These management responsibilities were transferred to Auckland City Council as a result of the Local Government (Auckland Region) Reorganisation Order 1989 from the (then) Auckland Regional Authority (ARA). While the basis for these streams previously being under the ARA's control is unclear, it is generally considered to be because these watercourses received significant volumes of overflows from the combined sewer system. Today these watercourses are still the most affected by such overflows.

The remainder of the watercourses are considered to be "private", with the landowner having responsibility for their maintenance and management to ensure that water flows can pass relatively unimpeded and to minimise erosion. It is noted, however, that significant lengths of the private watercourses flow through public parks and reserves and therefore are also the direct responsibility of Auckland City Council. In addition, Metrowater, under contract to Auckland City Council, also undertakes significant management of the Whau Creek.

Figure 1 shows the streams in Auckland city including the public watercourses and those stream reaches that pass through public reserves.

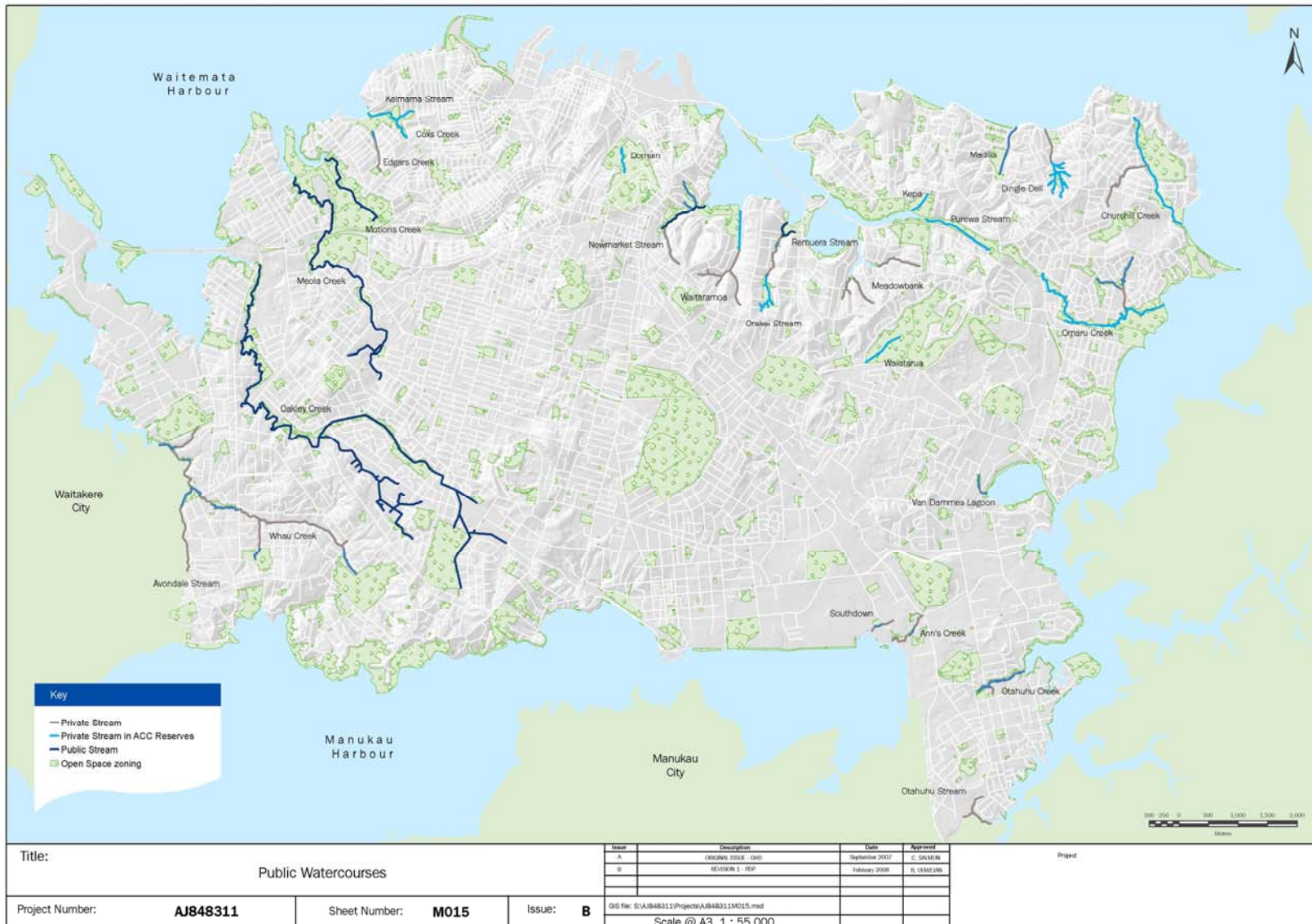


Figure 1: Auckland city streams

The city also has several lakes/ponds and wetland areas of significance. Western Springs lake and wetland, Waiatarua wetland and Captain Springs reserve are the most notable freshwater lakes/wetlands. Significant "inland" mangrove areas are located at Anns Creek and Waitaramoa Reserve at Shore and Portland Roads.

Section 5 of the RMA requires the Council to promote the "sustainable management" of natural and physical resources. This includes freshwater resources for human and non human use and well-being, including habitat, food supplies, spiritual associations, freshwater fisheries, and extraction from and discharge into freshwater bodies.¹

Streams, wetlands and other water courses have landscape values as reflected in the RMA. The RMA identifies the following matters of national importance:

- The preservation of the natural character of the coastal environment, wetlands, and lakes and rivers and their margins from inappropriate subdivision use and development (RMA s6(a));
- The protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development(RMA s6(b)).

While the natural character of streams, rivers and lakes has not been defined in the RMA, it potentially includes:

- Visual elements;
- Water quality;
- Riparian vegetation and its interrelationship with the ecology of the local area;
- Ecological functions;
- hydrological functions; and
- In a significantly modified environment like the isthmus can include non indigenous elements of ecosystems.

At the time of release of Auckland Regional Policy Statement (July 1999), there was a total of 6.3% indigenous vegetation cover left in the Tamaki Ecological District (which covers Auckland city). This total was made up of:

- 1.1% forest cover;
- 5.2% scrublands;and
- 0.03% freshwater wetlands.

Plan Change 88, notified in June 2004 and subject to appeal, introduced provisions in the District Plan to protect significant ecological areas by scheduling them in the Plan and limiting the ability to modify them. The areas identified includes both public and private land and includes stream and wetland features such as Western Springs lake and wetland, Annes Creek stormwater wetland, Waitaramoa Reserve and Martyn Wilson field saline vegetation at Shore Road, Omaru Creek at Pt England Reserve, Waiatarua Wetland at Abbots Way, Van Dammes Lagoon and the wetlands at Captain Springs, Grotto Street and Bycroft Rd.

Despite the limited amount that remains, the streams and wetlands on the isthmus provide aquatic habitat and contribute to the biodiversity of the city. In addition, despite the reduction in naturalness of the remaining streams or wetlands, their presence in the isthmus is highly valued by many in the community. In recent times stormwater wetlands have been developed on the isthmus as stormwater management devices designed to improve water quality and provide flood control (for example the Waiatarua wetland). These wetlands also increasingly have ecological values as habitats and may over time develop a 'natural character' and be a home to more mobile or colonising species.

¹ Handbook of Environmental Law ed.Rob Harris Wellington ,2004

The maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers (s6(d)) is identified in the RMA as a matter of national importance. Formal rights of public access can be provided over private land in the form of marginal strips, esplanade reserve and esplanade strips, as well as easements by way of covenant. Subdivision generally triggers the process for creating esplanade reserves or strips. In the current operative Isthmus Plan, the esplanade reserve can be taken in lieu of a 'reserve contribution'. Public access to public land alongside water bodies is generally unrestricted except in cases such as nature or scientific reserves under the Reserves Act 1977.

The public have legal right to navigate (eg kayak) lakes, tidal rivers, navigable rivers and foreshore.

Streams and wetland systems have important cultural value for iwi as many waahi tapu and other special functions are associated with water. Again, this is identified as an issue of national importance under the RMA. The specific values in relation to the isthmus need to be identified through consultation. As is discussed below, Ngati Whatua o Orakei have shared some of their relationship with the major watercourses on the isthmus.

The values of streams and wetlands in terms of the matters identified above can often conflict with their function as part of the city's stormwater infrastructure which along with man made structures reduce the risk of flooding and risks to public health by transporting stormwater and wastewater.

8.2 Previous Work

There have been many studies undertaken on the city's watercourses, including studies by Auckland City Council and Metrowater to support their resource consent applications for the city's drainage network, the ARC as part of wider regional projects, and other parties. In particular:

- The habitat and instream ecology of representative watercourses have been assessed in Refs 1 and 2;
- Stream water quality has been assessed in Refs 3, 4, 5 and 6;
- A stream classification system and stream management framework based on this system has been developed in Refs 7 and 8.

A brief, high-level summary of the results of these assessments is as follows:

- The city's streams have a high level of modification to cater for the stormwater flows from the developed city. Modifications have been both natural (ie channel smoothing, widening and straightening) as a result of erosion, or through engineered structures such as pipes or channels to facilitate stormwater flows and prevent erosion.
- Ecological values of the city's watercourses are typically low as a result of a number of factors including stormwater hydrology, loss of in-stream habitat and poor water and sediment quality. This is exhibited by a low level of aquatic species diversity and a lack of sensitive species in streams. Those species that are tolerant of poor water quality and high stormwater flows proliferate while those species that are sensitive to these factors have disappeared.
- Water and stream sediment quality is relatively low compared to relevant guidelines, however zinc levels typically exceed the levels at which adverse effects are likely to occur.

It is important to note that these results are typical of an urban environment and the response of the city's watercourses to urban development is consistent with what is expected as an area changes from forest to a city.

At a macro level, there is understood to be a clear relationship between stream health and catchment impervious area. This is demonstrated through the Impervious Cover Model (ICM) (Figure 2), which was developed by the Centre for watershed protection in the 1990's. The ICM is a condensation of numerous sets of stream health data into a simple relationship between stream quality and watershed impervious cover.

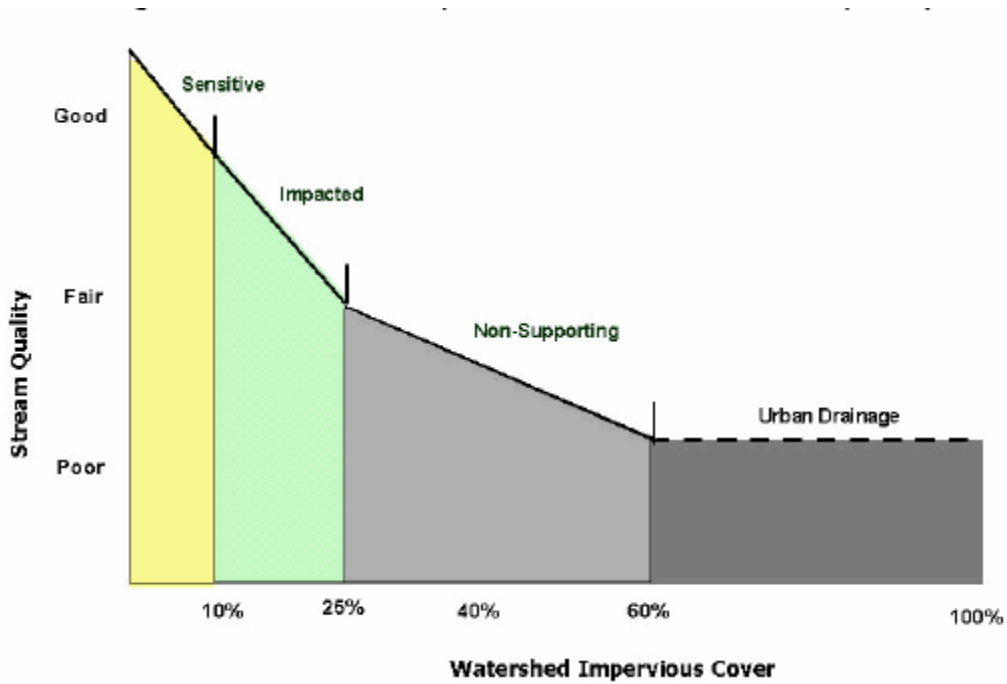


Figure 2: Impervious Cover Model for streams

This model is consistent with research undertaken in Auckland by the ARC [Ref 2]. Figure 3 shows the relationship between EPT Taxa and impervious surface coverage for a range of Auckland Streams - EPT Taxa are a group of sensitive aquatic organisms that are typically found in un-impacted streams.

This research indicates that the process of urbanisation and the establishment of significant areas of impervious surfaces results in a reduction of the species diversity, a typical indicator of stream health/value, in a stream. Thus, urban streams inevitably have lower values than streams that occur in areas with low levels of development.

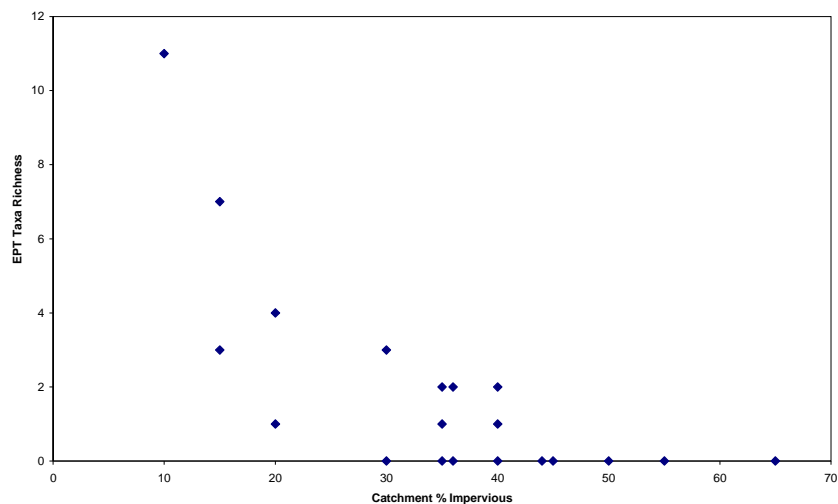


Figure 3: Auckland streams EPT taxa numbers vs Impervious surface coverage

With current impervious coverage for the Isthmus at approximately 45% for residential zones and 70% in business zones, all streams in Auckland city fall into the “non-supporting” classification (see Figure 2). At this level of development intensity, high in-stream values are not anticipated.

8.3 Management Approaches to Watercourses

ARC Classification

In its Regional Plan Air, Land and Water, the ARC has developed a framework for the management of urban streams. As a result of the work discussed above, the system classifies stream reaches (sections of streams with similar characteristics) based primarily on the proportion of impervious surface in the contributing catchment (Table 1).

Table 1: ARC ALW Plan stream classification.

Stream Type	Contributing Catchment Imperviousness	Classification
Type 1	n/a	Stream mouths and tidal reaches
Type 2	< 10 %	High value low disturbance
Type 3	10 % to 25 %	Moderately disturbed
Type 4	> 25 %	Highly disturbed (largely natural channel)
Type 5	> 25 %	Highly disturbed (largely artificial or concrete channel)
Type 6	> 25 %	Highly disturbed (largely piped channel)

Consistent with the research outlined in the discussion above, the ALW Plan classification system is primarily based on catchment imperviousness as this is considered the main determining factor for maintaining stream quality and habitat potential and the nature of the stream channel.

Where catchments have high levels of impervious surface (greater than 20 to 25%), the stream is subject to high stormwater flows and stream bank erosion. As a result, urbanised streams are usually highly modified, either naturally through accelerated erosion or artificially including by straightening stream channels to facilitate stormwater flows and reinforcing of stream channels and banks to protect against and repair erosion. Such streams are considered "highly disturbed" under the ALW Plan classification system.

Auckland City Council has applied the classification to the city's major streams. The majority of the stream reaches within Auckland city are highly disturbed channels (Types 4, 5 and 6) consistent with high levels of catchment imperviousness as a result of historical urban development, and past stream modification.

In respect of these stream types, it is recognised that the highly modified nature of these channels limits the ability to support complex habitats and ecosystems. As such, the management focus is on minimising erosion and seeking to provide linkages between areas of higher values.

Auckland City Council / Metrowater Classification

The ALW Plan classification system using the single, ecologically based impervious surface criteria provides a fairly homogenous assessment of stream values for Auckland City Council because of the relatively high and consistent levels of catchment impervious. However, it is apparent that there are significant differences between the city's urban watercourses, and the single parameter approach promulgated by the ALW Plan does not provide sufficient differentiation between streams that fall into the highly modified category. To address this issue, Auckland City Council and Metrowater engaged NIWA to develop a more detailed classification system.

This system utilises the significant information that exists on the nature and quality of the city's streams to assist in understanding the relative values of the city's streams [Ref 7].

The primary difference between the Auckland City Council/Metrowater system and that of the ALW Plan is that it explicitly recognises the drainage and public amenity values of a watercourse in addition to the more traditional values of ecology/habitat. The classification system ranks each of the three primary values separately, providing a relative measure of each.

The three key values assessed by the classification system are as follows:

- Drainage value – a measure of the importance of the stream for providing stormwater conveyance. This is primarily related to the proportion of impervious surface in the contributing catchment.
- Ecology/habitat value – a measure of the ecological values of the stream comprising a range of information including bank and channel modification, riparian cover, the presence of aquatic plants and fish barriers and water and sediment quality where available.
- Public amenity value – a measure of the value of the stream to the community, defined by a range of factors including accessibility, degree of naturalness, visual amenity and microbiological conditions (particularly sewer overflows).

The classification system was applied to the city's streams as reported in Webster et al (2005) and Kingett Mitchell (2006). The results of the classification system are provided in the following figures. Figures 4 to 6 show the main streams across the city and their drainage, ecological habitat and public amenity scores respectively.

As can be seen from the classification scores the streams within the city, with few exceptions, have high drainage values. That is, the catchments have high proportions of impervious surface and as such the streams play an essential role in the conveyance of stormwater away from properties to the coast. This is consistent with the results of the ALW Plan classification system which assigned almost all of the stream reaches in the city as Types 4, 5 or 6 (highly modified).

Habitat values across the city's stream reaches show a relatively "normal" distribution. That is, the majority of the stream reaches are of moderate habitat values. However, it should be noted that the classification system has been developed specifically for the city's streams and therefore these scores only provide a relative measure of value for urban streams – all of which are modified to some extent.

Public amenity value scores show a similar range and distribution to that of habitat value, but with the median score being slightly lower. This is likely to be a function of good public access (typically through parks) to highly modified urban streams with lower visual and aesthetic amenity and limited riparian vegetation, but poorer access to higher amenity reaches through private land.

Overall, the classification system confirms the importance of the city's streams for stormwater conveyance. While a high degree of stream modification and high stormwater flows are generally incompatible with good aquatic habitat, this is not always the case and the classification scores indicate a number of stream reaches where higher habitat and public amenity values occur despite high levels of catchment imperviousness.

The stream classification system provides a broad brush assessment of stream values. To assist in using this information to guide stream management, Auckland City Council/Metrowater developed a stream management framework (KMA 2005).

The framework uses the identified stream value scores to establish potential management objectives for the various stream reaches. This approach recognises that the same objectives are not relevant for all streams. For example, where a stream has been highly modified and is degraded, the initial objective may be simply to improve the basic amenity of the stream and remove gross pollutants. In contrast, for streams that have a higher level of amenity and habitat, the focus may be on further enhancing these values through riparian planting.

The framework also recognises that stream management is a multi-agency function, which includes Auckland City Council, Metrowater, the ARC, private landowners and other parties. Therefore management actions to work towards the objectives are dependent on a number of factors including ownership and regulatory responsibilities. Figure 7 shows a summary diagram of the management framework.



Figure 4: Auckland City Council/Metrowater Stream Classification – Drainage Value



Figure 5: Auckland City Council/Metrowater Stream Classification – Habitat Value



Figure 6: Auckland City Council/Metrowater Stream Classification – Public Amenity Value

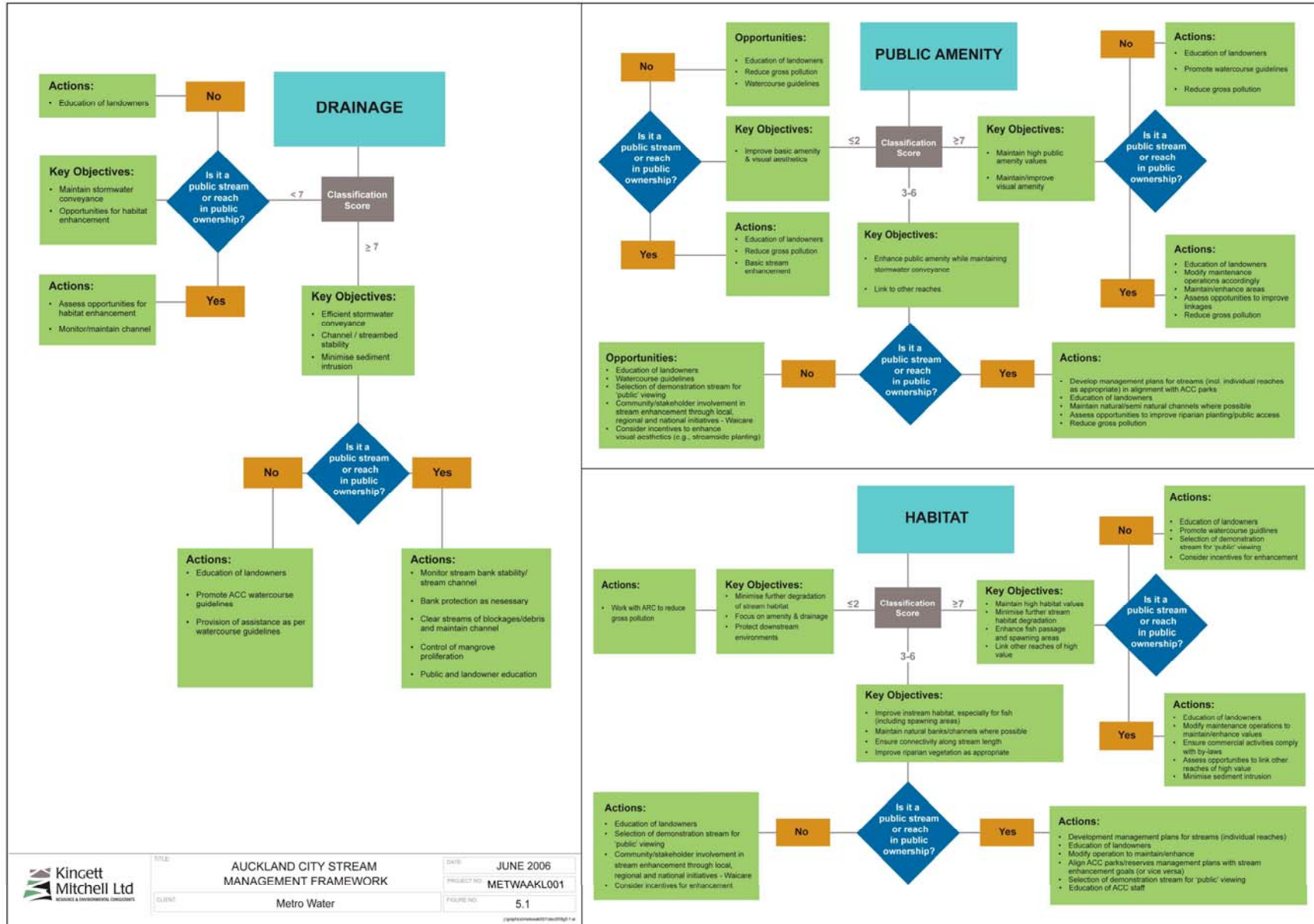


Figure 7: Auckland City Council/Metrowater Stream Classification – Management Framework

Currently, the city's urban stream management framework is being utilised in a number of ways:

- It has highlighted the need for more detailed stream management plans to be prepared for the city's main watercourses. This work is currently being undertaken on behalf of Auckland City Council;
- The classification has assisted in identifying streams that are at greatest risk of increased erosion through ongoing development [PDP 2008];
- It is utilised in respect of streamworks undertaken by Auckland City Council and Metrowater to guide potential work methods and in particular the nature of structures in streams.

Further applications of the management framework included the updating of guidance to landowners, and the targeting of community based stream monitoring and restoration initiatives such as Waicare.

The extensive work undertaken, which is essentially distilled into the classification system and framework, may also provide information to the District Plan in regard to the management of adverse effects of on-going development and opportunity to enhance existing areas.

8.4 Cultural Assessment

An important adjunct to the stream classification and management framework is a cultural assessment of the city's five "public" watercourses undertaken on behalf of Auckland City Council [Ref 9].

This assessment focussed on the history of the streams and their importance to Ngati Whatua and other iwi, the issues relating to the streams, and identified recommended management actions.

These recommendations highlighted Ngati Whatua's desire to see restoration of the streams and associated riparian margins, the better recording and acknowledgement of sites of particular cultural significance, and a range of other outcomes through the development of stream management plans.

As indicated previously, work has commenced on the preparation of stream management plans with a focus on the public watercourses. Initial fieldwork to map specific stream features in the Meola Creek is underway.

8.5 Future Pressures

Growth through intensification, including through specific areas of concentrated growth or through incremental development up to District Plan levels, will continue to put pressure on watercourses. Unless otherwise mitigated, increased areas of impervious surface, unless mitigated, will increase stormwater flows to streams and other receiving environments such as the coast and groundwater.

Increased stormwater flow to streams has the potential to exacerbate existing adverse effects, particularly erosion, and to a lesser extent increased levels of contaminants. It can also result in greater modification of stream channels. It should be noted that the risk of adverse effects is not the same for all streams across the city, but is dependent on a range of factors. These include the extent of increase of impervious surface/stormwater flows within the contributing catchment, the slope of the stream, its streambank and channel substrate and its erodability, and the extent to which the stream has already been stabilised by past activities and armoring structures.

To access the streams likely to be at greatest risk of erosion through future development up to MPD levels (current District Plan), Auckland City Council and Metrowater engaged PDP to develop a risk based methodology and apply it to the city's streams [Ref 10]. The result is a map that highlights the streams that are considered to be at greatest risk of erosion as a result of growth (Figure 8).

As can be seen from this map, the streams identified as having the greatest risk of erosion are a mix of small and larger streams that are primarily in residential areas, but also (surprisingly) in the Southdown industrial area, and are distributed around the isthmus. This latter stream is likely to be incorporated as a result of a relative natural stream channel and relatively significant areas of undeveloped land within the catchment.

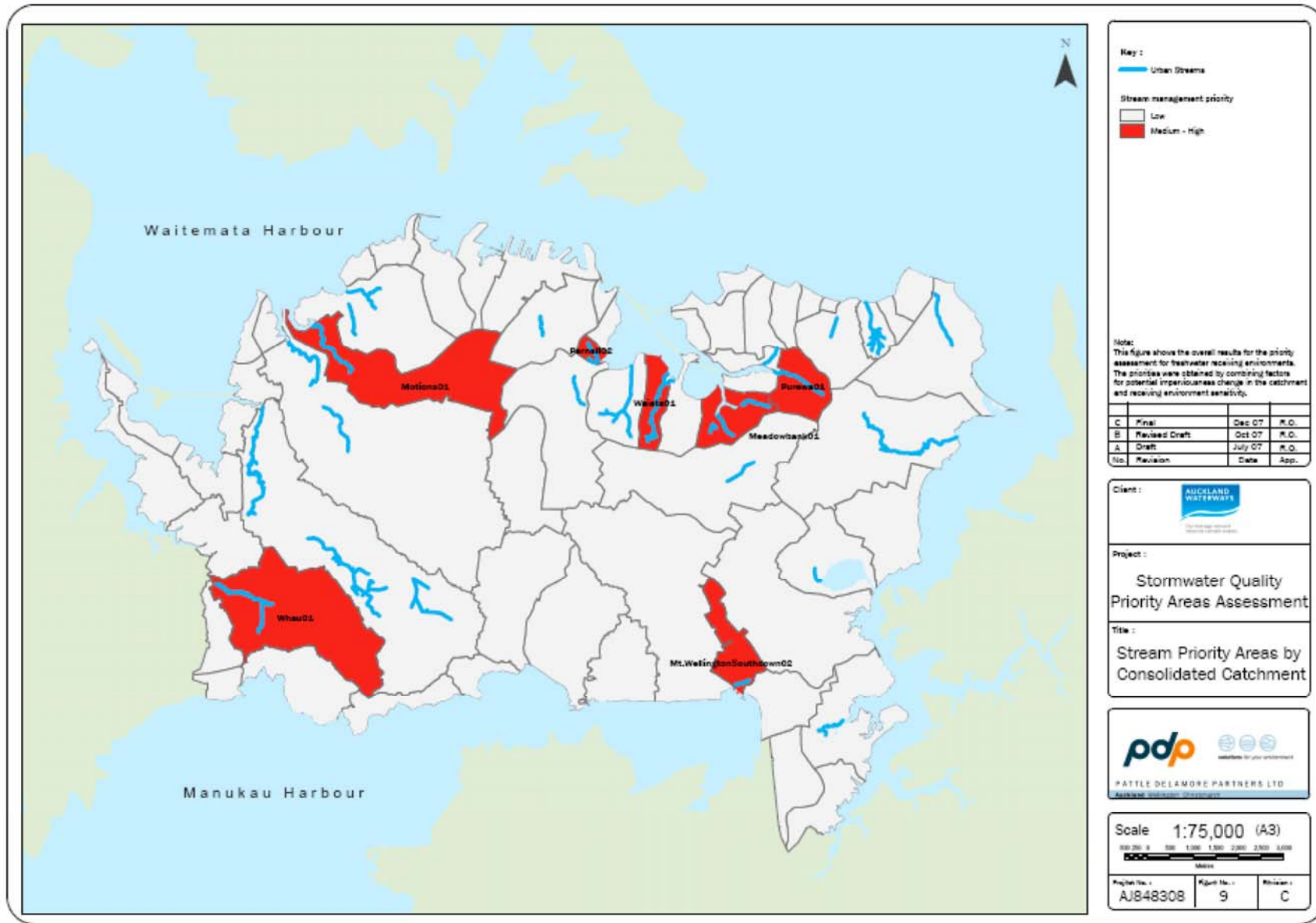


Figure 8: Streams at greatest risk of erosion as a result of growth

8.6 Outcomes sought

As an ideal, the outcomes sought for streams and wetlands are to protect the values of the streams and wetlands that remain in the city and to enhance these values where practicable given the constraints that exist.

In reality, the protection and enhancement of streams and wetlands needs to be considered against the competing stream function of conveying stormwater and the inherent pressures and changes that this function imposes on the ecological and other values of streams and wetlands. The ecological values of streams have been significantly impacted by past development, particularly as a result of impervious surface cover within the catchment, and may be largely irreversible.

However, redevelopment offers an opportunity to reduce “effective” imperviousness through measures such as stormwater detention – essentially detention can be designed to reduce the rate of stormwater flow off a site to be equivalent to that off a lower level of impervious surface. This may be the only way to provide for more intensive development while minimising additional stormwater flows, or even reducing existing flows.

It is noted that streams pass through both public and private property. While Auckland City Council has a statutory obligation for the management of the five public watercourses, this relates primarily to the management of the stream channel. It does not provide Council with the ability to undertake significant enhancement works in the riparian margins as these areas are often on private property.

The stream management framework that was developed for the city to support the network consents provides a guide as to relevant objectives for streams across the city using the stream classification recognising the competing values and the current state of the stream. The emphasis that is placed on particular values is dependant on the current state of the stream.

Objectives for streams and wetlands include the following:

- Maintain the stormwater conveyance function of the city’s streams;
- Improve stream water and sediment quality;
- Reduce on-going erosion of watercourses;
- Improve stream habitat and riparian margins and create linkages between natural areas where possible;
- Better recognise cultural values;
- Protect existing streams and wetlands from further degradation.

9. DISCUSSION

There is a range of opportunities and methods to achieve improved environmental and community outcomes for streams and wetlands. Given the large lengths of streams that are in public management or ownership, particularly in respect of the larger streams, Council has the ability to improve stream management and enhance riparian areas on its own land – essentially leading the way in respect of improving the city’s streams and watercourses.

It should be noted that from an ecological perspective, the benefit of enhancement may be limited. As is discussed in section 8.2, the nature of urbanisation is such that the combination of high levels of impervious surface combined with the anthropogenic contaminants associated with sources such as roofs, roads and industrial areas², inevitably result in ecosystems that are limited in complexity and diversity. Only those species

² See stormwater quality paper

that are tolerant of highly modified habitat and reduced water quality are typically present in watercourses in developed urban areas.

However, the values of watercourses extend beyond simply ecological. Streams, both permanent and ephemeral, play an important role in catchment hydrology and watercourses are important element of the urban environment including providing public amenity and access opportunities.

Essentially there are three potential outcomes in respect of streams: enhance them, maintain them at their current level (or minimise change), or to allow them to continue to degrade. The potential actions associated with each of these outcomes are presented in the table below.

Outcome	Potential Actions
Enhance streams values, access etc	<ul style="list-style-type: none"> Improve riparian margins on public land. Provide education/assistance/incentives for restoration on private land. Improve public access. Improve ecological functioning. Take additional marginal strips where possible. Restore streams - stream daylighting – on public land. Employ pervious surfaces in public infrastructure (roads, footpaths etc). Employ controls to reduce effective imperviousness.
Maintain or minimise change	<ul style="list-style-type: none"> Employ controls to maintain effective imperviousness (impervious surface controls within catchments). Mitigate flows through LID. Manage erosion on public watercourses through inspection and works. Provide education/guidelines/assistance for private works.
Degrade	<ul style="list-style-type: none"> Allow impervious coverage to increase (without mitigation)

Specific outcomes, methods and their applicability are discussed in Table 2.

For the most part, actions to enhance streams lie in the public domain. Auckland City Council is a significant land owner and this provides a significant opportunity to improve and link riparian margins and public access through Council programmes on its parks and reserves. However, it is recognised that this needs to be undertaken in the context of other objectives for public land. The Stream Management Framework that has been prepared provides some guidance as to the objectives that should be sought for the various streams types. In addition, there are opportunities for Council to implement LID measures on its roads and footpaths to reduce stormwater generation and hence discharge effects.

While the Council may desire to protect areas of significant vegetation on private land, a regulatory approach is unlikely to achieve significant enhancement of riparian margins. Incentives, potentially aligned to greater development rights, education and potentially assistance, are likely to be the most appropriate methods of encouraging improved riparian margins and associated environmental outcomes. However, it should be noted that riparian areas fulfil wider functions than ecological/amenity and typically play an important part in flood management – accordingly riparian margins needed to be planted in a way that does not impede the passage of flood flows. Any considerations in respect of riparian areas need to be considered in this context.

For the majority of stream reaches in private land, maintenance of current stream state is the most realistic outcome. For this to be achieved, consideration should be given to minimising increases in effective impervious surface coverage, mitigate the effects of increased coverage through LID techniques and to minimise on-going stream degradation and modification and to protect wetlands of significance from further loss.

Table 2: Possible methods to achieve improved environmental outcomes for streams/wetlands and potential role of District Plan

Outcome	Methods	Applicability		Role of District Plan
		Public	Private	
Maintain stormwater conveyance function of watercourses	Channel maintenance: Manage erosion Manage nuisance vegetation Growth Remove obstructions etc	Channel maintenance is a function of Council within the five public watercourses and those streams that pass through council owned land.	The Council has no ability to maintain channels in private watercourses. The Council will have to either encourage or require channel maintenance of private watercourses. The Council can also provide assistance via watercourse guidelines, grants etc.	The management of watercourses is not a direct function of a territorial authority under the RMA. Activities in permanent watercourses are regulated by the ARC. Maintenance of channels in private watercourses to enable stormwater flows is managed via the stormwater bylaw.
	Manage flood plains to ensure they are retained and kept clear of significant obstructions	Flood plains are required to be appropriately managed to ensure their ongoing functionality for storing and conveying flood flows. This includes managing works that are undertaken within flood plains to ensure that they are not adversely modified (infilled) and to limit the development that can occur within the flood plain.		Flood plains are identified on the Council GIS system. The District Plan should contain provisions that limit or otherwise manage the activities that can be undertaken within flood plains (see Stormwater Quantity discussion paper). This includes managing modification and development within flood plains and managing riparian margins to ensure that such planting does not hinder the passage of flood flows.
	Control development within ephemeral streams.	Ephemeral watercourses and overland flow paths should be identified on public land and appropriate controls established to maintain their functionality.	It is understood that a significant number of overland flow paths lie on private property. These form an important component of managing flooding and should be protected against structures that may block them.	Significant overland flow paths, including ephemeral streams, are mapped on GIS. These should be protected from development by rules in the District Plan. Currently the stormwater bylaw serves this function, but the bylaw is applied retrospectively as an enforcement measure, whereas the Plan rules would be applied as a proactive preventative measure.
Improve stream water and sediment quality	Methods to improve stormwater quality are primarily control of contaminants at or near their source or through stormwater treatment. This includes reducing combined and sewer overflows to watercourses.	Water quality improvements are equally valid for both public and private streams. However, in general, combined system overflows primarily affect public watercourses.		The Council has limited regulatory role in respect of contaminants. See the Stormwater Quality discussion paper for recommendations.

Minimise on-going erosion of watercourses.	Minimising increases in stormwater flows through managing "effective" impervious – either impervious area controls or mitigation through low impact design measures	Increased stormwater flows have the potential to increase instream erosion on both public and private watercourses. The extent of the change in a stream is dependent on a range of factors including the extent of the increase in flow, the stream channel morphology and geology and the existing level of modification. Minimising future increases in stormwater through controls or LID measures will reduce the risk of erosion and limit on-going structural modification of watercourses. LID can be applied to both new private development and Council roads, pavements and other areas of impervious surface.		<p>The issue of reducing stormwater flows is discussed in the stormwater quantity paper.</p> <p>Auckland City Council and Metrowater have undertaken an assessment of the streams at greatest risk of erosion as a result of growth which could allow District Plan provisions to be targeted if desirable.</p>
	Improved management of watercourse erosion and stream bank stability.	Improved management of watercourses, both public and private, will reduce erosion that results from both existing flows and increased stormwater flows as a result on on-going development. However, management needs to be implemented cautiously to minimise the unnecessary introduction of hard structures that further reduce stream habitat quality		<p>There is a limited role for the District Plan in implementing improved stream management. Regulatory requirements in respect of erosion around structures are contained in the ARC's ALW Plan.</p> <p>Auckland City Council has primary responsibility for managing erosion in the 5 public watercourses and those watercourses which pass through council reserve land. It also managed the Whau Creek. In addition, it has a wider responsibility in respect of adverse effects caused by its drainage discharges. As shown in Figure 1, this accounts for a significant proportion of the open stream lengths in Auckland city.</p> <p>Private management of streams can be facilitated by targeted education, advice (Auckland City Council's watercourse guidelines) and in some instances financial assistance through grants. Note that this is also a role of the ARC.</p>
Improve stream habitat and riparian margins and create linkages between natural areas where possible	Restore previously piped or channelised streams to natural channels – daylighting of streams.	May be able to be applied to streams that pass through council reserves to improve amenity and opportunities for instream habitat.	Unlikely to be applicable in either public or private watercourses that pass through privately owned land due to the difficulty in getting approvals and the general reluctance by landowners for streams to be restored that may result in flooding or erosion problems.	<p>Opportunities to "daylight" streams and restore more natural stream channels are rare in the urban area. The streams have typically been piped or channelised to facilitate stream flow or to reduce erosion and flows are unlikely to be reduced.</p> <p>The main opportunities for stream daylighting will occur on public land, rather than private land. As these are in the control of Council, there is unlikely to be a requirement for District Plan provisions to enable them to occur.</p>

Improve stream habitat and riparian margins and create linkages between natural areas where possible (cont)	Encourage/require the establishment and management of riparian margins.	Given the large lengths of stream that are within public land, this represents the best option for providing improved environmental outcomes.	Improvements to riparian margins on private land can also result in improved environmental outcomes – although other considerations such as the effect on floodplains also need to be taken into account.	There is no requirement to manage riparian margins on public land through the District Plan. Riparian improvements can be implemented as necessary through reserve plans and associated works. The Stream Management Framework and detailed stream management plans being prepared will provide a guide as to opportunities and priorities. In respect of private land, the RMA enables Council to secure esplanade reserves or esplanade strips along the edges of rivers and streams (subject to criteria). Esplanade reserves and esplanade strips have the effect of conserving and enhancing the environment, separating activities from the streams and achieving public access and recreational use. Provisions for taking esplanade reserves should be included in the District Plan. However, it is likely that there are limited opportunities to secure additional esplanade reserves/strips, Therefore the District Plan may need to contemplate alternative mechanisms to encourage/facilitate enhancement of margins and the appropriateness of controls on development within these areas.
	Utilise “soft” engineering solutions to minimise on-going modification and degradation	On-going stream management can adopt “soft” engineering techniques to reduce the extent of additional hard structures within watercourses.		The District Plan has a limited role in the management of structures in watercourses – this function is administered by the ARC under its functions and regional plan. Council can implement low impact techniques in its management of the public watercourses and those private watercourses in parks and reserves. Education and guidance can be provided to private landowners to encourage/facilitate a lower impact approach.
Better recognise cultural values;	Ensure sites of cultural significance associated with watercourses are indicated on planning maps.	The location of sites of cultural significance is relevant for all watercourses.		Sites of archaeological and cultural significant are already scheduled within the District Plan and subject to relevant provisions. Additional sites may be present, but obtaining information on the presence and location of these sites may be difficult. Consideration should be given to Ref [9] and additional consultation with iwi undertaken to extend the scheduled sites.
	Work with iwi to provide for greater recognition of stream cultural values.	Ngata Whatua has indicated a desire to .be involved in projects to provide greater cultural linkages with streams and stream projects. This is likely to be more appropriate on publicly owned streams.	This is not likely to be applicable on private watercourses under private control.	This is not considered to be a matter for control through the District Plan and is best achieved through stream management and parks programmes.

Protect existing wetlands from further degradation.	Map and schedule wetlands and provide rules to manage future activities that may affect them.	A number of scheduled wetlands are located on public land and are currently subject to a range of controls (subject to zoning).	Wetlands may also occur on private land, but are likely to be less significant.	A number of wetlands are already scheduled and are subject to a range of statutory controls under the Isthmus Plan (and the Regional Plan Air, Land and Water). The schedule and the relevant plan provisions should be reviewed and extended where new information exists. However, consideration should be given to the important stormwater quality function of wetlands. General provisions may also be applied to smaller wetland areas.
	Provide incentives for enhancing wetlands on private land.	N/A	May be an appropriate way of encouraging and facilitating on-going protection of smaller wetland areas.	Consider the use of development incentives, possibly in conjunction with a low impact design approach, to encourage retention of wetlands for stormwater and bio-diversity benefits.

In respect of minimising ongoing stream modification, the statutory responsibility for managing streams primarily lies with the ARC in respect of the beds of lakes, rivers and streams (and wetlands) and with the Council for riparian margins that are outside of the stream channel/banks. Therefore the role of the District Plan is limited in what it can achieve in respect of stream channels and should primarily be focussed on reducing the adverse effects of growth and associated stormwater discharges through measures such as impervious area controls and low impact design to minimise increases in stormwater flows/stormwater quality issues. It is noted that stormwater discharges occur to a range of receiving environments, only some of which are sensitive to increased flows.

Accordingly, it is appropriate for impervious surface controls, or flow rate mitigation, to be applied differentially across the city depending on the nature of the receiving environment. That is, different rules in areas that discharge to "at risk" watercourses or consistent criteria for when a resource consent is required coupled with a policy framework that affords greater protection for sensitive receiving environments.

Outside of the stream channel, the management of ephemeral stream channels/overland flow paths is an important function for the Council to ensure that in flood events stormwater can discharge with a minimum of nuisance and risk to the public and property. Currently overland flow paths are managed by way of the stormwater bylaw. However, it is considered that this is best achieved through the District Plan rules rather than the stormwater bylaw, which is the current practice. The stormwater bylaw is used as a reactive tool that provides Council with the ability to rectify problems. District Plan rules to protect flow paths are a more proactive measure to minimise problems occurring. In this regard it is noted that significant overland flow paths (defined by a flow depth/velocity relationship) are mapped on the council flood hazard maps contained on Council's GIS.

In respect of items of specific significance (wetlands, archaeological sites and sites of cultural significance), these are currently managed/protected through the District Plan. These should be updated with any new information that is available.

However, it is noted that wetlands such as the Waiatarua wetland have been developed for stormwater management purposes and while the public amenity and potentially ecological value of the wetland will likely increase over time, it is important to continue to recognise and enable the fundamental purpose for which it has been developed including the need for ongoing maintenance.

10. RECOMMENDATIONS FOR FURTHER CONSIDERATION IN DISTRICT PLAN

Table 2 outlines a range of outcomes and potential actions for improved management of streams and wetlands. As stream management is not a primary regulatory function of Territorial Authorities³, only some of the methods to achieve the outcomes have implications for the District Plan. Accordingly, the following matters should be considered further for:

Outcome 1: Maintain stormwater conveyance function

1. Incorporate strategies for managing the development within flood plains, overland flow paths and ephemeral watercourses. This is currently managed through a mixture of District Plan (flood plains) and stormwater bylaw (overland flow paths) controls, but would be better managed entirely through the District Plan through the implementation of rules preventing inappropriate development within these areas.

Outcome 2: Improve stream water and sediment quality – see Stormwater Quality discussion paper.

Outcome 3: Minimise ongoing erosion of watercourses

³ As indicated in the paper, TAs have a significant role in stream management as a landowner

2. Incorporate provisions to maintain or where possible reduce, the "effective" imperviousness within catchments, particularly those that drain to watercourses that are sensitive to increased stormwater flows. Provisions may include restrictions on impervious surfaces or the application of Low Impact Design techniques to reduce stormwater volumes and flows. These could be applied on an area basis, depending on the nature and sensitivity of the receiving environment.
3. Consider review of design guidelines for roads and pavements to similarly implement LID measures such as reduced road widths, permeable parking areas and pavement, swales for drainage etc.

Outcome 4: Improve stream habitat and riparian margins

4. Include provisions that enable the acquisition of riparian margins through development contributions.
5. Consider include provisions, such as increased development rights, that provide incentives to encourage improved riparian management on private land.

Outcome 5: Better recognise cultural values

6. Consult with iwi and update the District Plan's schedules of significant features, including cultural areas of significance.

Outcome 6: Protect existing wetlands from further degradation

7. Review schedules of wetlands and update if necessary.
8. Consider opportunities to use development incentives, such as increased development rights, to protect and enhance wetland areas.

A range of other non-statutory measures have also been identified. These relate primarily to Council's role as a land owner or with its statutory responsibility for stream management for certain watercourses.

11. REFERENCES

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