



# Sustainable subdivision development - An Environment Waikato perspective



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# 1 Introduction

The Waikato is a dynamic region where growth and development is rigorous, bringing prosperity and expanded lifestyle choice to the region's population. This has resulted in the rapid development of urban, rural and coastal subdivisions in some parts of the region. While there are many benefits of such development, the downside is the decline in environmental and amenity values which unfortunately all too often accompanies such development.

Environment Waikato is taking an increasing interest in the environmental effects of subdivision development. There are many references in our Regional Policy Statement, regional Plans, Regional Land Transport Strategy and Regional Pest Management Strategy which collectively represent a regional perspective on sustainable subdivision development. The aim of this document and other documents is to distil a vision for sustainable subdivision development from these policies, plans and strategies and to suggest ways in which we can make this vision a reality. Adopting such ideas will help to achieve both sustainable subdivision development and the environmental objectives expressed by the regional community.

We hope this document will be useful to territorial authorities carrying out their land use planning functions, developers designing new subdivisions and contractors physically developing the subdivision sites. Although the document is best read in full, certain chapters are more relevant to particular agencies.

This document is not intended to be directive. It is a collection of ideas for consideration and discussion. It is intended to stimulate those involved with subdivision planning, design and construction in the Waikato region into implementing ideas that will help us to create sustainable subdivisions which we can all be proud of.

This process is not always an easy one and there will be many hard decisions to be made. There will be mindsets that need to be changed. There will be costs involved – some of which will have immediate payoffs, and others not so immediate. Property buyers will be happy to pay some costs while others will need to be spread over the wider population. Some sustainable solutions will be appropriate in some cases but not in others. Sometimes there will be tradeoffs to be made between competing needs and objectives.

Environment Waikato is a signatory to the New Zealand Urban Design Protocol. The Protocol's underlying vision is "Making New Zealand towns and cities more successful through quality urban design". The development of this document is partly as a result of one of our commitments as a signatory to the Protocol.

**It should be noted that this document is an Environment Waikato staff interpretation of regional council policy. It has not been through a formal public process and has not been subject to official council approval. The contents should therefore be considered as informational and advisory rather than as official council policy.**



## 1.1 Subdivision development in the Waikato region - some preliminary observations

Development pressures in the Waikato region are generally highest on our most productive land, and often in our most sensitive landscapes. In the last 20 years, the Hamilton population has grown by about 27 per cent (Forgie, 2002) and this has resulted in increasing areas of prime dairy land being taken out of production.

Lifestyle subdivisions are rapidly spreading along the banks of the Waikato River, around Lake Taupo and in many other areas of high visual amenity. Many coastal areas, such as parts of the Coromandel Peninsula and Raglan, are experiencing extreme pressure for development, with consequent social change, loss of natural character, diminishing landscape values and damage to ecological resources.

Today, approximately 86 per cent of New Zealanders live in urban areas. We are largely an urban population. In 'Creating our Future - Sustainable Development for New Zealand' the comment was made that "the concept of sustainable urban development is largely being ignored in New Zealand" (PCE, 2002, p47). The importance of this issue has been reaffirmed by the inclusion of 'Sustainable Cities' as one of the four key areas addressed in the government's 'Sustainable Development for New Zealand Programme of Action' (Department of Prime Minister and Cabinet, 2003). This document reports that:

*The environmental degradation that has accompanied urbanisation has had direct impacts on health and wellbeing, and adverse effects on wealth creation and the competitiveness of cities. Further growth need not cause further degradation. In sustainable cities, the growth process is not tied to continuing environmental harm; rather, the two processes are 'decoupled' (p21).*

As our only city, Hamilton is the region's most significant centre of commercial, cultural and social activity. The importance of the city to the Waikato region cannot be overstated (as indeed the importance of the region to the city). An economically thriving, culturally and socially vibrant, attractive Hamilton City can only enhance the success of the rest of the region.

Although much of the dialogue about sustainable urban development has been centred around cities, we need to create our own dialogue that fits the particular character of the Waikato region. The Waikato is a region of many small towns, pockets of lifestyle blocks, extensive coastlines, rich agricultural landscapes, forest-clad mountain ranges, cold deserts and geothermal features. We are rich in water resources, with many wetlands, lakes and rivers. Subdivision development is increasingly spreading within and over this landscape. In the Waikato, as well as Hamilton City, we need to focus the concept of sustainable urban development on the character of our rural and coastal towns and their surrounding environments.



The Standards New Zealand handbook: Subdivision for People and the Environment (SNZ HB 44:2001) states: "Traditional approaches that view land development as a series of disjointed technical solutions to infrastructure, and which pay little attention to community and the environment, are not sustainable" (Standards New Zealand, 2001, pg 175). These guidelines provide a regional council perspective on subdivision development. However, if we are to achieve subdivision development that is truly sustainable, Environment Waikato, territorial authorities, developers and contractors must work together and maintain an open dialogue, so that our respective objectives for subdivision development can be met.





## 1.2 Content of document

Chapter 2 develops a broad vision for subdivision development in the Waikato region, based primarily on the objectives and policies in the Waikato Regional Policy Statement (RPS).

Chapter 3 describes how territorial authority planning for subdivision development can help to achieve regional objectives. It provides a Waikato context by discussing key planning matters particular to Waikato towns and rural-residential subdivisions. Guidance is given on how particular territorial authority planning documents can help to achieve our objectives, including a discussion of the key forward planning subdivision matters that should be considered.

Chapter 4 describes how subdivision design can help to achieve regional objectives. This chapter will be particularly useful for developers and their consultants.

Chapter 5 describes how developers and contractors can ensure that earthworks and construction activities achieve regional objectives.

Chapter 6 describes technical requirements and recommendations for subdivision development. The chapter discusses:

- regional consent requirements for subdivision development
- the role of Environment Waikato's Erosion and Sediment Control Guidelines
- how Auckland Regional Council's Stormwater Management Devices Design Guidelines (TP10) should be used in the Waikato region
- how Auckland Regional Council's Low Impact Design Guidelines (TP 124) should be used in the Waikato region.

Appendix 1 lists additional informational resources available at Environment Waikato which are relevant to subdivision development.

Appendix 2 provides more detail on objectives and policies in the Waikato Regional Policy Statement that relate to subdivision development.

Appendix 3 provides a brief summary of the ideas promoted in the Standards New Zealand Handbook: *Subdivision for People and the Environment* (SNZ HB 44:2001). Although some of these ideas are beyond the scope of the Waikato Regional Policy Statement, they nevertheless represent helpful advice with respect to sustainable urban development.

# 2 A Regional vision for subdivision development

In general terms, Environment Waikato's role is to manage those aspects of the environment that are best dealt with on a regional scale, which the regional community considers to be important for their current and future well-being. Part of this is about looking after the natural environment, ensuring that it will be able to provide for our well-being into the future, and part of it is about looking after the people by managing natural hazards, contamination pathways and so on. There are also some less tangible things such as natural character, amenity values and cultural and spiritual values which need to be managed in order to maintain our sense of well-being.

The Regional Policy Statement represents the Regional community's views with respect to environmental management. It sets out key issues, objectives and policies for managing these issues. This chapter describes how subdivision development can impact on many of these matters, and by doing so, develops a broad vision for sustainable subdivision development in the Waikato region.

## 2.1 Water bodies

The Regional Policy Statement has objectives and policies for the management of water bodies including wetlands. The particular aspects of water bodies to be managed are stability of river and lake beds, water quality, aquatic flora, fauna and habitats, the range of uses of water bodies, public access, special characteristics of outstanding water bodies and the quantity and quality of wetlands. A key theme is that water quality should at least be maintained, if not enhanced, as a consequence of human activity.

Subdivision development can affect water quality, the physical structure and hydraulic characteristics of the water body, and the health of aquatic plants and animals. Many urban streams have suffered from sediment inputs during subdivision development. These streams now carry much less water when it's not raining and much more water when it is. There is less available aquatic habitat (and often poorer habitat because of higher temperatures among other things), and this habitat is regularly scoured during storm events. The change in flows can cause erosion of streambanks, leading to sediment build up downstream and reduced capacity of the stream to handle the next flood flow.

Some water bodies are collection points for urban contaminants. This is a particular problem in urban lakes which cannot flush out contaminants, unlike streams and open coastal environments. Many urban water bodies suffer from loss of vegetation on shores and banks (riparian vegetation). This increases water temperature, reduces in-stream food supply, and reduces important habitat and attachment surfaces that fallen branches provide.

Gullies and flood plains have often been filled in, restricting their important hydraulic and habitat purposes. Structures such as culverts sometimes cause flow restrictions and can prevent fish migration and spawning. Subdivision development can effectively cut access to the water body by allowing private allotments down to, and along, the water edge.



Urban development can also impact on the quantity of water in surface and ground water reservoirs and systems available for our use. Urban development in the Thames-Coromandel District has put particular pressure on water resources. The problem is particularly serious during summer times when stream water flow is at its lowest and water demand due to the holiday influx is at its highest.



## 2.2 Soil and mineral resources

The Regional Policy Statement has objectives and policies for the management of soil erosion, soil contamination, and maintenance of soil health, versatility and productive capacity. There are also policies for managing the ability to extract mineral resources.

Subdivision development can make land unavailable for productive uses. Although urban areas only cover about one per cent of our total land area, urban development generally competes for the most productive land. Fragmentation of farmland by the development of lifestyle blocks also takes land out of production, or at least reduces farming options.

Reverse sensitivity is becoming a real issue in the Waikato. This occurs where urban development and rural/residential development spreads into areas used for intensive farming (such as piggeries and chicken sheds), resulting in increased complaints about the effects of intensive farming activities. In highly erodible country, such as on Taupo pumice soils, subdivision development can cause land erosion if stormwater is not properly controlled or subdivision design does not take slope stability into consideration. Some activities associated with urban development, such as landfills and some industrial and commercial operations, can also cause soil contamination problems. This in turn can create future problems for subdivision development, with the subdivision of land previously used for orchards a recent high profile issue.



The Waikato has significant mineral resources such as coal, aggregate (including rock, sand, limestone and gravels), gold and silver. Some of the conflicts between food production and urban development also apply to mineral extraction, such as covering over the resource and reverse sensitivity issues.

## 2.3 Plants and animals

The Regional Policy Statement states that:

*New Zealand's indigenous ecosystems are unlike those of any other part of the world and are greatly valued for their intrinsic values, scientific interest and cultural importance. In addition they provide many benefits to humans by: providing clean air and water; removing toxins; trapping the sun's energy through photosynthesis and making it available in the form of plant biomass; converting carbon dioxide to oxygen; providing a storehouse for genetic diversity; and offering a retreat, essential to our quality of life.*



The Regional Policy Statement also points out that Maori regard all plant and animal life as significant, each with a particular purpose, and that people increasingly want indigenous ecosystems to be protected for their own sake. For such reasons, the Regional Policy Statement has objectives and policies for the management of significant indigenous habitats and flora and fauna (aquatic and terrestrial), biodiversity and natural heritage.

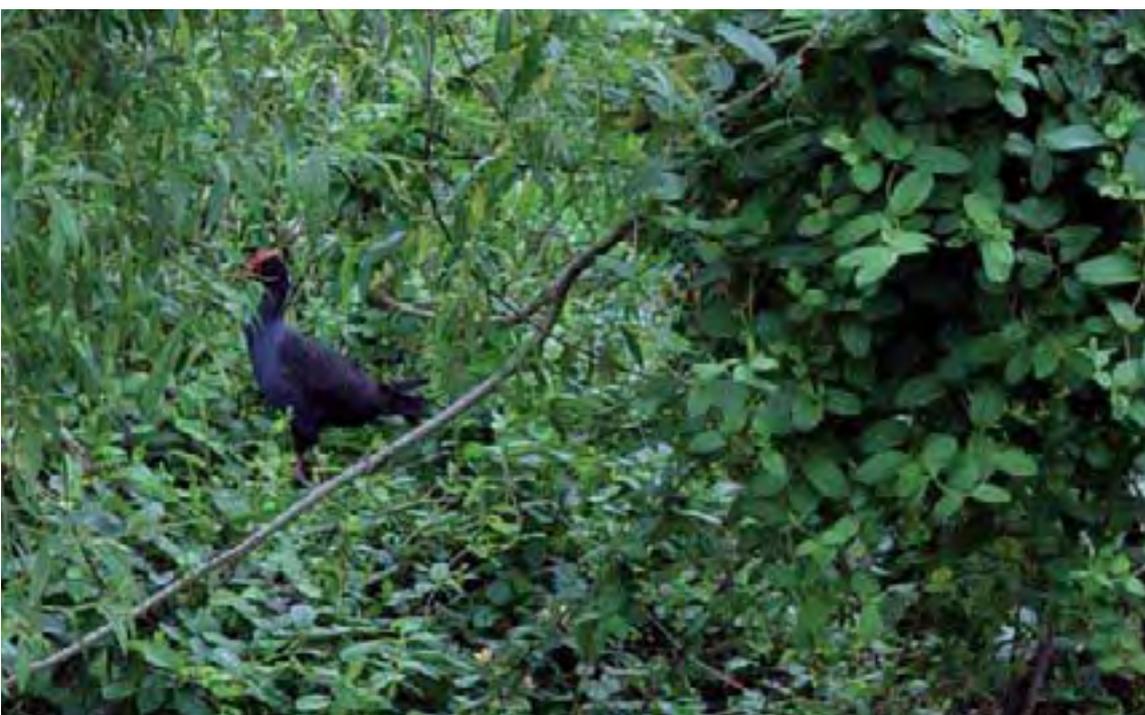
People, plants and animals all need the same things to sustain life, such as available clean water, clean soil and clean air. Plants and animals are affected by urban development vegetation clearance, building structures, smothering them with sediment or dust during construction, introducing 'predators' such as cats and dogs, allowing weed invasions, drainage (which can dry out wetlands), setting up contamination pathways and providing contaminant sources (such as hazardous substances), construction of barriers to migration (terrestrial, air and water), allowing increased recreational use of sensitive areas and use of herbicides and pesticides.



Isolation and fragmentation of habitat can leave insufficient habitat for key ecosystem processes such as sufficient food or mates, suitable germination sites for seed establishment and so on. There are probably a variety of other influences that we don't know about. The variety of life under the ground is greater than that above ground, although we have a very poor understanding of soil as an ecosystem. We don't yet know how much soil removal, compaction or covering can change our life supporting systems.

The Regional Policy Statement identifies a number of areas that are important because of the plant and animal communities they contain, and there are many other smaller areas which also have significant plant and animal communities. Special care must therefore be taken with urban development in these areas. The special areas are:

- Lower Waikato wetlands
- peat lakes
- Hauraki-Kopuatai Peat Dome
- Firth of Thames
- Coromandel Peninsula (particularly the Moehau ecological area)
- Mercury, Alderman, Cuvier Islands, and the Ohinau and Clarke Island groups
- Pureora Forest Park
- Lake Taupo and Waikato River (and associated wetlands)
- Mounts Tongariro, Ruapehu and Ngauruhoe, and the Kaimanawa and Tongariro Forest Parks
- geothermal systems
- Western King Country Forests (including the Tawarau State Forest)
- King Country caves and karst landscapes
- Whaingaroa (Raglan), Aotea and Kawhia harbours, and Mokau, Marakopa and Waikato River estuaries
- Gannet Island and Albatross Point (south of Kawhia) for seal breeding sites
- Pirongia Forest Park and Hakarimata Scenic Reserve.





## 2.4 Air quality

The Regional Policy Statement has objectives and policy for the management of air quality, and for the management of greenhouse gases and ozone depleting chemicals.

There is a lot more to air than meets the eye! Air quality is not just about how 'clear' the air is. It is also about odour, noise, and contaminants that you can't see but which can affect the health of people, plants and animals. It may even be about temperature.

Poor air quality can disrupt people's daily lives, reduce their sense of well-being, and cause health problems including emotional tension and sleep disturbance. It can contaminate water supplies, impact on the amenity of an area, soil or damage property or materials (such as via corrosion), and be detrimental to the health of plants and animals.

Urban development can affect air quality by increasing the concentration of activities that produce air borne contaminants, noise and odour. This is particularly through industrial activities, vehicle use and houses and other buildings that use wood or coal fires. Urban development can also impact on two other important air issues: climate change and ozone depletion. Air discharges from home heating systems (particularly gas, coal and wood fires), vehicles, landfills and sewage plants, and certain industrial processes can contribute to climate change (global warming). Urban areas are also centres of more concentrated use of ozone depleting chemicals.

## 2.5 Special areas and features

The Regional Policy Statement identifies some special areas in the Waikato Region that require particular management, including geothermal areas, coastal areas and areas with particular heritage importance.

People value geothermal areas very highly. Such areas are internationally rare and of much scientific interest. They are also extremely fragile and almost impossible to restore once damaged. They are valued as an energy resource, tourist/scenic attraction, a source of minerals such as silica, lithium, boron, and sulphur, a source of micro-organisms for industrial processes, and a rare habitat with specialised plant and animal species. Maori also particularly value geothermal areas for their traditional use and spiritual values. For these reasons, subdivision development in the vicinity of geothermal areas needs to be carefully managed. Other reasons for care with development near geothermal areas are the potential for subsidence and property damage, as well as safety hazards associated with geothermal activity.

Coastal areas are also highly valued. Many (and most accessible) Waikato coastal areas have already been severely modified by human use and development. The consequences of urban development in many cases have been loss of natural character, interruption of natural processes, damage to coastal landforms, ecosystems and habitats, erosion effects due to exposing unstable sandy soils, decline in coastal water quality, reduced accessibility in some areas,



decline in amenity and aesthetics due to coastal structures and buildings, noise effects, litter, depletion of coastal biota by over-harvesting, and effects on spiritual and cultural values. Often the very features that attract people to coastal areas are damaged by the people going there. Coastal areas can also be prone to land instability and floods which pose a threat to coastal urban communities. Subdivision development can also create conflicts with commercial operations such as marine farming and mining of iron sand.

The Regional Policy Statement defines heritage as the natural, physical and cultural environments, inherited from the past, which define the present and will be handed on to future generations. Natural heritage includes indigenous flora and fauna, ecosystems and habitats, landscapes, landforms, soils and the natural character of the coastline. Cultural heritage includes sites, places, place names, waahi tapu, historic structures and artefacts, natural features of cultural or historical significance, people and institutions. Subdivision development, if not appropriately managed, can impact negatively on heritage features and places that we value.





## 2.6 Issues of significance to Maori

The Regional Policy Statement has objectives and policy for managing effects on mauri of water, disturbance of sites of cultural/historical importance, effects on the relationship of tangata whenua with ancestral lands, water, sites, waahi tapu and other taonga, and effects on tangata whenua's ability to express kaitiakitanga (guardianship).

Subdivision development can adversely affect sites of significance to Maori, such as historic pa sites, sites where particular historic events occurred, burial sites, and other sites of spiritual significance. Subdivision can also affect particular natural values and resources that are important to Maori such as indigenous vegetation, traditional food sources and water quality. The effects may also be of a spiritual nature such as effects on the mauri or life force of water.

The issue is not just about where development occurs, and how this might affect important cultural sites, features and values. It is also about how development occurs and about the processes a developer or council uses to make decisions about subdivision development. Maori consider that how development occurs can affect their relationship with their traditional lands, water bodies, resources as well as their relationships with spiritual entities. This can in turn affect their spiritual and physical health and well-being.

It is important that local Maori are involved in decisions about subdivision development. This will help guard against such effects (as noted) and take into account the principles of the Treaty of Waitangi by ensure tangata whenua have the opportunity to carry out their kaitiakitanga (caretaker) responsibilities.



## 2.7 People

There are a number of issues that affect people which can either be influenced by, or have effects on, urban development. These include natural hazards, waste production, energy, transport systems and other regionally important infrastructure.

Natural hazard situations exist when people and their property are located in areas where destructive natural events occur or have the potential to occur. Many natural hazards can therefore be avoided by locating development away from high risk areas such as flood plains, exposed coastlines, geothermal areas or by other methods such as building design. It is important that new development occurs in a way that does not increase the risk to existing development from natural events (for example increasing flood risk on adjacent properties due to poor stormwater management).

Environment Waikato's Regional Land Transport Strategy aims to ensure that the Waikato region has a sustainable land transport system. The Strategy's objectives are to ensure the transport system is economically efficient, safe, environmentally sustainable and accessible. Poorly planned development can place limitations on these objectives, such as making travel distances unnecessarily long, making roads unsafe for cycling/walking and preventing access by public buses.

Regionally significant infrastructure includes transport networks and facilities (roads, rail, airport), hydro-electric dams (which not only provide electricity, but are also important elements of flood control in the region), flood protection and land drainage schemes, gas pipelines and power and telephone infrastructure. It is important that subdivision development does not compromise the functioning of these networks and structures.





Historically, the volume of waste produced by our communities has been increasing faster than the rate of population increase. Solid waste disposal uses up valuable land and can cause groundwater or soil contamination by leaching of pollutants, odour and dust problems, and release greenhouse gases and ozone depleting substances. Discharges of liquid waste, particularly stormwater and wastewater, can have significant effects on receiving environments. Both have impacts on amenity. When planning for urban growth and development, it is important that planning for liquid and solid waste management occurs at the same time.

Energy production uses resources such as water, geothermal heat and coal. Inefficient energy production and transport therefore uses non-renewable energy resources and does not represent sustainable management. Forty three per cent of New Zealand's energy comes from oil, and most of this is used in transport. The way that urban areas are designed can influence energy demand and efficiency of energy use, particularly in terms of transport energy use and household heating requirements.

## 2.8 The vision for subdivision development

The previous discussion has identified the things that concern Environment Waikato and the ways that subdivision development can affect them. From this, we can say that we support subdivision development that has the following outcomes:

- Healthy, stable water bodies (including wetlands) and aquatic habitats, where their values, characteristics and uses are maintained or enhanced, including where appropriate, public access.
- Stable, clean soils where productive capacity of high quality soils and availability of mineral resources is not unduly compromised.
- Biodiversity maintained or enhanced. Indigenous vegetation and habitats of indigenous fauna protected.
- High air quality (including noise and odour), where discharges do not adversely affect human health and the health of flora and fauna, and where emissions of greenhouse gases and ozone depleting chemicals are minimised.
- Special areas/features (including geothermal areas, coastal areas and areas of particular heritage importance) and their valued characteristics are protected.
- Sites of importance to Maori and the ability of Maori to exercise kaitiakitanga are protected.
- People and property are protected from natural events such as floods, the functioning of regionally significant infrastructure is maintained, waste production and disposal is minimised, and energy is used efficiently.

# 3 Local authority planning and sustainable subdivision development

The key to sustainable development is intelligent forward planning. For the last 20 years in New Zealand, market economics through the mechanism of supply and demand, has been the primary determinant of the nature and extent of development. We now know that subdivision development, if it is to produce desirable and sustainable outcomes, must be well planned in advance by the communities it will impact on.

This chapter is in three parts:

- Section 3.1 makes some observations about the challenges and opportunities of planning for subdivision development in small Waikato towns and rural-residential developments.
- Section 3.2 discusses how territorial authority planning mechanisms such as district plans, structure plans and catchment management plans can be used to encourage sustainable subdivision development.
- Section 3.3 lists some specific matters which could be addressed by territorial authorities during their land use planning activities, to help achieve sustainable subdivision development.

## 3.1 Subdivision planning in the Waikato context

It is useful to think about what planning for sustainable subdivisions might mean in the Waikato context. There is now a lot of literature available about sustainable cities, and much of this would apply with respect to Hamilton. However, there is very little written about what sustainability may mean in the context of small towns and rural subdivisions. Yet, we are a region of small towns and intensively used rural and coastal landscapes. Following are some thoughts about planning for subdivision development in these contexts.

### 3.1.1 Subdivision planning and the small Waikato town

There are some characteristics of small towns which need to be acknowledged during planning for subdivision development:

- It is easier to manage the character of small towns than larger urban areas. A small town that is attractive, distinct and unique in character can have a significant competitive advantage compared to other small towns.
- It is sometimes more difficult to separate potentially conflicting urban and peri-urban land uses in small towns, such as commercial, residential and industrial areas. Planning for provisions such as screen planting can sometimes help in this respect.
- Small towns generally have one main street, which is often the main transport route for through traffic, including heavy transport. There is therefore potentially more conflict between vehicle and foot traffic, and greater vehicle amenity issues to deal with.
- There is often pressure for small towns to use 'marginal' land, increasing hazard risks for communities based on floodplains and their margins, steep slopes, in coastal zones and near swamps.



- There is a much smaller rating base to provide for environmental protection and, as a result, such protection is often lacking in small towns. Small rural towns in the Waikato region often lack attractive natural areas accessible to the urban population, such as areas of native bush. However, the value of land is often lower around small towns compared to cities, so it may be easier to provide green belts, larger riparian zones, parks and land retirement areas. Low maintenance environmental protection and enhancement schemes should be encouraged.
- The smaller distances within small towns encourage walking and cycling to work, school, shops and so on. This potential can be reduced by allowing ribbon style urban development which increases distances within the town. It can be encouraged by purpose built cycleways and walkways, and avoiding ribbon development.
- Smaller traffic flows in and around residential areas can mean that low impact design practices (such as narrower paved surfaces) can be more easily adopted.
- Small towns can be difficult places for younger people due to lack of suitable venues for entertainment and socialising – as a result, petty crime can be a problem. Small towns may therefore need to think about ways to counter this problem, such as appropriate street lighting and encouraging a mix of public and private places (so that public spaces are also 'lived in' spaces).
- Small town semi-rural character can be easily diminished by subdivision development, due to increased traffic volume and speeds, reduced rural views, modern building styles, smaller property sizes, large shopping centres and so on. If such changes are to occur, they should be managed so effects are acceptable to the local community.



- Small towns often lack well designed open public spaces in the commercial centre - the footpath is often the only public space in a small town urban centre.
- Small towns often (and increasingly in some parts of the Waikato region) struggle to attract new businesses. Planning can help in this respect by ensuring suitable and attractive land is kept available for this purpose.
- Small towns (particularly in coastal areas) are often located adjacent to waterways where water availability and assimilative capacity for wastes are limited. Growth needs to be considered in the context of this limited resource and increasingly high expectations of water quality and availability.
- There is particular potential for environmental conflicts in the vicinity of coastal settlements due to the sensitive nature of coastal environments and the large demand for new coastal subdivisions. Often the features which make these areas attractive are the very features most at risk from subdivision development.

### 3.1.2 Subdivision planning and rural-residential development

As with small towns, there is little written guidance about what sustainable subdivision development may mean with respect to rural-residential subdivisions. Such development presents a distinct set of issues that should be considered and planned for. Such issues may include the following:

- Rural-residential properties are desired by people who wish to live in a rural environment. Such development often destroys the very features that these people have come to the rural environment for, such as privacy, open 'natural' surroundings and quiet.
- Large areas of homogeneous rural-residential blocks will often radically alter the rural landscape, sometimes causing the landscape to take on more of an 'urban' character than a rural one. If the local community does not want this to occur, such change needs to be managed by appropriate planning. Small compact hamlets surrounded by open farm land may better preserve the rural character if this is an issue. However, the design of such hamlets would still need to be informed by accurate assessments of landform and visual impact.
- Farm parks or similar concepts can provide for rural-residential living spaces while keeping farming activities intact and having only minor effects on rural character.
- Rural-residential areas on the fringes of towns can infill to become the urban areas of tomorrow unless appropriate planning mechanisms are in place. If such infill is intended for the future, appropriate design is necessary so as not to preclude this. There are examples in the Waikato region where recently developed lifestyle blocks, complete with sprawling houses and extensive landscaped gardens, are right in the path of a spreading urban area.
- Fragmentation of farmland effectively limits future production choices for the land.



- Often rural-residential development occurs in the most attractive and sensitive landscapes, such as adjacent to water bodies and native bush. Special landscape and ecological protections may need to be planned for in these areas, such as pet-free subdivisions in the Coromandel.
- Definite decisions about servicing for rural-residential subdivisions need to be made by territorial authorities. If such subdivisions are to be allowed, matters such as water supply, wastewater disposal and rubbish disposal need to be considered to avoid unplanned service problems. For example, if on-site wastewater systems are to be used, are there site limitations, such as high ground water levels, that could cause difficulties? If each household is to have water supplied by private bores, is there potential to adversely affect stream flows or wetland areas?
- In water short areas, consideration should be made to include water conservation requirements for new subdivisions, such as household water tanks for non potable uses.
- Rural-residential areas usually do not cater for bicycle and walking traffic. Walking along country roads can be very dangerous due to narrow roads, lack of road shoulders, and open road traffic speeds. Consideration could be made to provide for pedestrians and cyclists during planning for rural-residential subdivisions.
- Additional traffic from rural-residential subdivision development on unsealed roads can create dust problems.
- Rural-residential development can offer a great opportunity to help rebuild lost biodiversity by encouraging riparian plantings and establishment of natural areas.
- Rural-residential development can create drainage problems due to such things as increased impervious surfaces, lack of drain maintenance (which previously may have been carried out by the farmer), additional culverting of waterways, draining of traditional soakage and water storage areas.





- Rural-residential development has very great potential for creating problems of reverse sensitivity with traditional rural activities.
- Weed and pest control can be a problem in rural-residential areas. Where this task is a regular part of farm maintenance, new lifestyle residents may not have the knowledge, equipment or time to carry out the task effectively.
- Rural-residential subdivision in areas protected by flood control schemes, coastal erosion works or other engineered hazard management systems, greatly increases the potential damage (and associated cost to the region) and human risk factors in the event that these systems fail or are overwhelmed. Because there is always a residual risk that the scheme does not provide protection from a false impression of security can be created.
- One of the problems with rural-residential development is that it can create gradual creeping, cumulative effects due to its slow sporadic nature. A property subdivided into two properties here, a small subdivision over there, another just up the road, and before you know it the nature of the area has changed significantly. In this way, a number of the adverse effects of rural-residential subdivision can develop from minor risks to major problems. For example, we may accept the risk of one or two houses flooding due to their marginal locations, or affecting the rural character of an area, but perhaps not ten or twenty. Creeping demand for services such as rubbish collection or public water supply can also occur in the same way. Rural amenity is perhaps most at risk from such creeping rural-residential development.

## 3.2 Territorial authority planning mechanisms

Territorial authorities have a range of forward planning mechanisms that can be used to manage subdivision practices. This section briefly discusses how such mechanisms can support the regional objectives with respect to subdivision development and therefore help to achieve sustainable subdivisions.

### 3.2.1 District plans

District plans control of the effects of subdivision, development and use of land on the environment. Recent changes to the Resource Management Act signal that, in future, district plans will need to 'give effect' to the Regional Policy Statement (as opposed to the previous requirement to have regard to the Regional Policy Statement).

Currently, there are many objectives in the Waikato Regional Policy Statement and our regional plans which can be supported by provisions in district plans. These are discussed in Section 3.3 of these guidelines.

It is important to realise that district plans and other territorial authority planning mechanisms can sometimes be a hindrance to good subdivision design. We are starting to see a move toward more environmentally friendly urban development via concepts such as low impact stormwater design and sustainable urban development. Rules regarding density of housing, yards and setbacks, building coverage, parking, road and access way dimensions can actually limit the potential for a developer to incorporate low impact and sustainable design concepts. It is therefore important that forward planning mechanisms are flexible enough to allow such concepts and innovations to be realised.



District plans need to support other non-statutory territorial planning mechanisms. For example, key recommendations in structure plans and catchment management plans should be given legal rigor by incorporating them in district plans. If a structure plan determines that certain types of development are appropriate for particular parts of the district, this should be backed up by appropriate district plan requirements.

### **3.2.2 Long-term council community plans**

The long-term council community plan (LTCCP) required by the recent amendment to the Local Government Act (LGA) is a very exciting initiative with respect to planning for development. Councils are now required to go out and ask people what outcomes they would like to see for their communities. The message from government, in making such a change to the LGA, is that we need to take more control of development to ensure that it is sustainable, and that it achieves the outcomes our communities say they want. The outcomes derived from the LTCCP process should inform the development of other planning mechanisms such as district plans and structure plans.

### **3.2.3 Technical manuals (such as codes of compliance for urban development)**

Territorial authorities should ensure that their technical manuals are flexible enough to allow innovative means of achieving sustainable subdivision development (such as through the use of low impact design methods). Such manuals should reflect regional as well as district objectives for subdivision design.

### **3.2.4 Structure plans**

Structure plans have traditionally been used by territorial authorities to plan infrastructure requirements (such as water supply and wastewater pipework) for developing areas. However structure plans are being increasingly used to guide the total development package for a particular area and to ensure that development achieves the outcomes desired by the local community. Structure plans are therefore now covering a much wider range of topics, including landscape character, social services (such as schools and commercial centres), heritage issues, indigenous flora and fauna, biodiversity and neighbourhood design.

Structure plans are seen by Environment Waikato staff as being increasingly important to manage the changes in the region being brought about by subdivision development. There has recently been increased concern about changing rural and coastal landscapes in the Waikato region due to subdivision development (refer for example to Peart, 2004). Sustainable development is becoming a very important concept in New Zealand through recent government initiatives such as the Local Government Amendment Act (2002) and the New Zealand Sustainable Development Plan of Action. To achieve sustainable development, regional councils and territorial authorities need to become much more proactive in terms of development planning. Structure plans can be a very useful tool in this respect.

A very helpful guide to structure planning is the Auckland Regional Council document 'Structure Planning - Regional Practice and Resource Guide 2000'. Although this document is written to be used within the context of the Auckland Growth Strategy, it nevertheless provides good guidance on the process and matters that should be considered during structure plan development.



Source: Draft Rotokauri structure plan, provided by Hamilton City Council, May 2005

### 3.2.5 Catchment management plans

The primary purpose of catchment management plans is to determine potential adverse environmental effects of subdivision development within a particular stormwater catchment, and then set key stormwater parameters which need to be satisfied in order to avoid undesirable effects.

A good model for catchment management plans is presented in Hart and Giffney (2004), a joint Hamilton City Council/Environment Waikato paper presented to the 2004 New Zealand Water and Wastewater Conference. This paper recommends that a catchment management plan incorporates the following catchment studies:

- riparian vegetation
- investigation of fish habitat and populations
- stream bank stability and susceptibility to erosion (through increased frequency of high flows occurring as a result of urban development)
- cultural issues, historic occupations and wahi tapu in flood prone areas
- structure plan and proposed land uses within the catchment
- catchment hydrology (rainfall-runoff relationship)
- catchment flood routing taking into account detention storage, water course geometry, and so on.

The Hart and Giffney paper then states that from these considerations, stormwater management regimes for such matters as stormwater quality and runoff rate will be determined. Finally, prescriptive requirements for the type of stormwater infrastructure needed to achieve desired environmental outcomes will be developed.



Environment Waikato staff encourage the development of catchment management plans for development areas, particularly where catchments are likely to be developed in a piece-meal fashion, such that unplanned and unforeseen cumulative stormwater impacts of development may arise. Such catchment management plans will support many of the objectives in the Regional Policy Statement.

### 3.2.6 Stormwater management plans

Section 3.5.11.3 of the proposed Waikato Regional Plan has the following method to support stormwater objectives and policy (note this method is under reference and may yet be altered):

*Promote the development of stormwater management plans which detail measures by which adverse effects of existing stormwater discharges will be mitigated.*

Stormwater management plans describe how a territorial authority will manage stormwater in a particular area (such as catchment, town or city). Such plans are required by the comprehensive stormwater discharge consents that have been granted for many of the urban stormwater discharges in the Waikato region. The consents describe in detail the information that should be covered by the stormwater management plans.

## 3.3 Planning matters to be considered

To achieve sustainable subdivision development, there are many matters which should be recognised and managed by territorial authorities before developers begin designing subdivisions. Many of these can be addressed during the development of territorial authority planning mechanisms. Others can be addressed by territorial authorities as they consider subdivision applications. The issues that we would like to see addressed through territorial authority planning mechanisms are described in this section.

### 3.3.1 Locational aspects

These are some of the locational aspects of subdivision development which need to be managed via forward planning:

- Development may need to avoid particularly sensitive and high value environments such as wetlands, areas of significant natural character, coastal margins, estuaries, lakes and small streams. These environments may not be able to remain intact, particularly if there is intensive subdivision nearby. Effects such as predation by cats and dogs may not be manageable. It may not be possible to control stormwater volume or sediment levels sufficiently to protect the environments.
- Landscape change is probably the single greatest impact of new subdivision development in the Waikato region. This often has significant effects on rural and coastal character and amenity. In many cases, the change is occurring without conscious decisions about whether this is desirable. If we are to avoid undesirable landscape change, we need to conduct formal and informed decision making processes which will protect those landscapes which local communities agree should not be changed.



- The viability of some regionally significant infrastructure may become compromised if development is allowed to get too close. For example, unplanned urban development in some cases has restricted the potential to expand key transport services. Also, if housing development becomes more intensive around major transport routes, issues of reverse sensitivity can arise.
- Planning for location of future subdivision should provide for the protection of significant heritage and cultural features, including areas of high natural character and valued landscapes and views.
- Forward planning for urban development should consider protection of public access to water bodies and coastal margins.
- Locations of land uses that can release contaminants to the environment (both accidentally and intentionally) such as landfills and industrial areas need to be planned.
- Where possible, the ongoing use and development of high quality soils and minerals should be protected (issues of covering up, reverse sensitivity and fragmentation as discussed earlier).
- In some cases, locating development in certain areas may compromise important wildlife migration paths and fragment important habitat.
- Development in some areas can result in air quality problems, particularly where temperature inversions and still air conditions are common.
- Development should be designed so as to avoid the creation of natural hazard situations and the need for protection works.

### 3.3.2 Urban form aspects

In most cases, the eventual form of urban development is a design issue. However, there are some larger urban form issues that need to be planned prior to design occurring. The main regional issues that are important at this level are related to transportation. As identified earlier, transport is a major energy user and producer of gases that contribute to global warming and ozone depletion.

- To avoid traffic congestion, access to key locations such as schools, commercial areas and arterial transport junctions should be kept short, direct and free flowing.
- Urban form should consider provision for public transport services, walking and cycling. Transport problems can be greatly reduced when shopping areas and schools are accessible on foot. Cul-de-sacs, narrow main streets and tight corners can prevent bus access.
- Territorial authorities need to take a very long term view in terms of the management of urban form, to allow for future needs for infrastructure expansion. There are many examples in the region where future expansion of transport infrastructure has not been provided for, and for which we are now paying the price.



- Planning should also signal desired community outcomes in terms of urban form, so that developers are given some guidance about how they should be designing their subdivisions. Many of these matters will be discussed in detail later, but there are many principles of sustainable urban development, low impact design and so on, that can be promoted via territorial authority planning mechanisms. For example, signals should be put out about the importance of urban form which augments natural features, protects important heritage features, cultural locations, ecological processes and hydrological processes and promotes the wellbeing of residents.

### 3.3.3 Management of natural hazards

There has been increasing discussion in New Zealand about mitigation of natural hazards. The reasons for this include recent new requirements for risk management in the Civil Defence and Emergency Management Act 2002, increasing community expectations for hazard protection, increasing demand for development of risk prone land, potential climate change impacts on hazard risk levels and the extent of damage from some recent major flood events, such as those in the Manawatu and Bay of Plenty regions.

In response, the government has initiated a national flood risk management review. The review is likely to result in changes to the way local authorities manage flood risks (and perhaps risks from other natural hazards). This will result in a national protocol for flood risk management which is likely to focus on the following key directions and outcomes:

- Understanding of natural systems and adaptive management.
- Context-based decision making and appropriate forms and levels of protection.
- Increased community awareness and engagement.
- Treatment of residual risks.
- Planning and development controls to avoid development in hazardous areas.





When planning for subdivision development, the following should be considered:

- Direct development away from areas such as flood zones, areas subject to subsidence (such as from past mining or geothermal activities), areas subject to coastal erosion - this avoids the hazard being created in the first place.
- Provide for hazard buffer zones. For example, flood plains and overland flow paths could be buffered from development by designating them as parks or sports fields. By identifying and costing such open space requirements prior to development of a new area, the cost can be distributed across the particular area of interest via developer contributions.
- Hazard management is best achieved by planning a multi-layered approach to risk avoidance. This may involve actions such as, avoiding high risk areas, reducing flow restrictions (such as increasing bridge heights or culvert sizes), controlling building design in lower risk areas (such as increasing floor levels above the standard 50 year design, or ensuring fence design that does not impede overland flood flows), limiting vegetation removal (or preventing vegetation damage from livestock or animal pests), minimising impermeable surfaces, minimising erosion and sedimentation of streams, providing physical hazard protection structures or relocating existing development out of the situation of risk.
- Take a precautionary approach with respect to the potential effects of climate change on sea level rise and increasing rain storm intensities. Currently Environment Waikato is working with NIWA and IAG in an attempt to firm up expectations of climate change effects. We will officially release our position on this as soon as possible. Further information can be obtained by contacting Environment Waikato's regional hazards staff.
- Recognise the dynamic nature of coastal areas. For example, a coastline may experience accretion for a number of decades so that the coastal land appears to be very stable. However, a period of attrition may then begin, causing the coastline to erode back. Estuaries and river mouths are also very dynamic. River mouths can move rapidly during flood events as meanders move downriver and open to the coast or lake edge. If such impermanent lands are to be developed, the development needs to be a type that can easily change with the changing landscape (such as recreation reserves or camp grounds with portable facilities).

#### **3.3.4 Management of construction**

Environment Waikato manages construction effects from stormwater and earthworks through permitted activity rules or the resource consent process. Management of such effects is relatively straightforward while the developer is in control of the site. However, significant construction effects often arise after sections are sold, and when building works and individual property landscape works begin.

Once major site shaping is completed, earthwork stormwater controls are often dismantled and stormwater is directed to piped systems and eventually to natural water bodies. Yet during house building and landscaping, sites often become very messy, resulting in stormwater quality problems during heavy rains. Often sand is placed along curbing to allow vehicle access to sites. During rainstorms, this sand washes down stormwater systems to the receiving water.



These adverse effects can usually be avoided by the adoption of simple precautions and minor changes to construction practices, such as the use of solid curb mounting structures made of wood, metal, rubber or some such material. Builders and contractors need to be educated about the effects of their current practices, and encouraged to make changes to the way they carry out their tasks. Territorial authorities could consider using district plan provisions and controls through building consents to prevent such problems occurring.



### 3.3.5 Services

Many urban services impact on matters of regional importance. It is important that territorial authority planning mechanisms ensure the demand for key services is managed so that they do not outgrow the resources they depend on. For example, there are a number of urban areas in the region where the upgrade and expansions of water and wastewater services has not kept pace with development. This has resulted in streams regularly being sucked dry during peak summer water demand periods and overloaded treatment plants discharging poorly treated wastewater to the environment. These problems can only be avoided by planning for service needs well in advance.



### 3.3.6 Cumulative effects

Potential cumulative effects of piece-meal development can only be effectively managed by forward planning. Forward planning must assess the various aspects of our environment, so that we can make knowledgeable decisions about how much good land we can give to urban development, how much the base flow of our streams can be lowered, how much of the wetland can be drained and so on.

Catchment level stormwater management is important for this reason. It is very easy to say that a little more water being added to a stream during storm events is no big deal, that just a few more square metres of gully or floodplain being filled in or a few more trees being removed will make no difference in the greater scheme of things. However, most of our environmental problems have come about by small increments of 'damage' which collectively threaten the viability of our natural systems and processes that we depend on for our well-being.

# 4 Sustainable subdivision design

There are many elements of sustainable subdivision that need to be addressed at the design stage. Addressing these elements will help to achieve sustainable subdivision, while ensuring that subdivisions are developed in a way that supports the objectives of our Regional Policy Statement and regional plans. Consideration should therefore be given to the following:

## **Biodiversity and ecological protection**

- Enhancement of biodiversity. In the Waikato region, we have already lost much of our biodiversity. Protection of what we have left is no longer sufficient - we should be thinking about rebuilding some of what we have lost. Wildlife corridors and habitat linkages should be protected and enhanced where possible (such as along streams and in green belts). Where damage to a natural area is unavoidable, re-creation or enhancement of another similar natural area should be undertaken.
- Important natural areas should be kept in or transferred to public ownership and control. Privately owned areas should be protected by other means such as covenants.
- Riparian margins and vegetative buffers around water bodies (including wetlands) should be protected or created. Particularly sensitive natural areas should be protected through buffer zones, pest proof fences, domestic pet controls and exclusion of grazing stock. Further information about identifying and protecting sensitive natural areas is available from Environment Waikato's Resource Information Group.
- Use of indigenous plant species for amenity plantings.





### Natural character, landscape, amenity and public use

- Natural areas such as water bodies and coastal margins should be showcased as integral parts of the subdivision. They should be visible and accessible where appropriate, so their amenity values are available for everyone. This helps to ensure the natural areas are not turned into rubbish dumps. They are seen to add value to the subdivision, and improve residents' sense of well-being.
- The natural character of water bodies and coastal margins should be maintained.
- Design for 'soft' engineering or non-engineered solutions. Setbacks from steep land or coastal margins are better than physical erosion protection structures. Structures to be placed in or near water bodies or other natural areas should blend into the visual landscape as much as possible, using a combination of appropriate form, size, colour and appropriate screen planting. Where possible, avoid structures in highly visible areas such as beaches or ridge lines.
- Public use values of water bodies, such as visual amenity, fishing, swimming and boating should be protected.
- Consider providing for a variety of lot densities to satisfy the range of public housing tastes and needs, while at the same time allowing greater flexibility for 'fitting' into the existing environment. For example, small concentrated clustered neighbourhoods adjacent to open/natural areas can reduce impervious surfaces, retain more open space, and use up less productive land.

### Protection of streams

- Minimise stream crossings. If structures in, on or over stream beds are necessary, they should be as unobtrusive as possible. They should have minimal effects on stream velocity and capacity, and should not affect bank stability, aquatic habitats, riparian stream cover, and upstream or downstream fish migration. Where crossings of water bodies cannot be avoided, bridges are preferred to culverts. Fords are the least preferred option.





- Reliance on surface and groundwater resources for water supply should be minimised in water short areas. In such cases, roof water and storage should be considered for subdivision (particularly rural-residential subdivision), if only for non-potable uses. Decisions about water supply solutions will also be influenced by requirements such as the New Zealand Fire Code and Department of Health requirements.
- Buffer zones should be incorporated along streams. These will help provide public access, act as a filter for water quality protection, allow for fluctuation of the stream banks and natural flood events, act as a wildlife corridor and increase amenity.

### **Hazardous substances and contaminated sites**

- Potentially hazardous land uses such as high use roads, industrial areas, commercial areas and landfills should be sited away from sensitive natural areas and residential areas.
- Ensure the design phase identifies and investigates contaminated sites, and either avoids residential development in these areas or provides for remediation of such sites. The Ministry for the Environment's website has guidelines for contaminated sites management.



## Natural hazards

- Subdivision designs must include an assessment of all potential natural hazards that pose either an existing or future threat to the area. For more guidance on such assessments, contact Environment Waikato's regional hazards staff.
- Subdivision developers and designers need to be aware of protocols for hazard management being developed in New Zealand and in the Waikato region. As discussed in Section 3.3.3 of these guidelines, hazard management is a developing field which needs to occur through a multilayered approach.
- Avoid hazard zones such as unstable land and flood zones. Where there is potential for such hazards, it is advisable to obtain site assessments from appropriately qualified hydrological and/or geotechnical engineers.
- Flood protection schemes only provide protection to a certain flood level. There should be consideration of how to minimise property damage and risk to people when events occur which exceed the protection level. This may be particularly important in areas where rainfall is often locally intense, where catchments are small and/or steep, or where large and/or high density subdivisions are to be developed. The same can be said for coastal erosion works - such works will only provide a degree of protection. For this reason, coastal erosion works should not be used to justify additional development of vulnerable locations.
- Where applicable, access to stream/river banks should be provided for to allow for maintenance of flood protection works. An easement may be needed to secure such access.

## Stormwater management

- Design of stormwater management systems which manage stormwater quality and quantity characteristics should be carried out at the same time as design of the subdivision itself. The subdivision should not be designed until there is a catchment management plan in place, or at least hydrological information for the catchment is available.
- Consideration should be given to the use of low impact design stormwater management. In New Zealand, there is increasing evidence that, in some situations, low impact design stormwater management system costs can be comparable to those of conventional systems. Some comparative costings are suggested in Auckland Regional Council's Low Impact Design Manual (TP124). Landcare and Auckland Regional Council are currently developing costing approaches and investigating how whole of life and lifestyle costings compare for conventional and low impact design approaches. One recent outcome of this research is the report "The Economics of Low Impact Stormwater Management in Practice - Glencourt Place" (Vesely, E., Heijs, J., Stumbles, C. and Kettle, D., 2005). Landcare are also looking at the environmental benefits of low impact design approaches.



- Treatment devices to manage the quality of stormwater should be located as close to the likely sources of contamination as possible. Additional stormwater protections may need to be considered for industrial subdivisions. This may involve protective bunding to prevent stormwater discharges in emergencies (such as chemical spills) and perhaps provision for diversion of first flush stormwater to trade waste systems. Land-based disposal of potentially contaminated stormwater is preferred to water-based disposal. Disposal to well flushed water bodies is preferred to poorly flushed water bodies. Stormwater treatment devices that provide multiple benefits should be considered, such as systems that control stormwater quality and quantity, but also have habitat and amenity values.
- When designing stormwater management systems, it is important to be clear about what they are meant to achieve. Devices may be designed to prevent flooding, stream erosion or contamination of receiving waters. They may be designed for maintenance of wetlands, to prevent shrinkage in peat soils, to protect aquatic values or to create amenity water bodies. Devices that achieve one particular objective, may not achieve another equally desired objective. Traditional stormwater infrastructure is often very good at getting water away quickly and thereby minimising the risk of flooding, but often wreaks havoc on aquatic stream values by significantly reducing base flows and increasing downstream habitat scouring during rainstorm events. Further guidance on stormwater design for particular objectives is provided in Section 6.3.



- To prevent problems from stormwater discharge, we encourage the precautionary approach of designing stormwater systems that maintain predevelopment characteristics of the hydrological cycle and hydrological processes. Hydrological capacities and functions of streams, overland flow paths and soakage areas, should preferably be maintained in the greenfield state (refer further comments in Section 6.3). Land profiles should be maintained where possible.
- Impervious surfaces should be minimised. This is particularly important in catchments of small streams, or sensitive water bodies such as lakes where ground infiltration of stormwater helps to remove contaminants. Where impervious surfaces are unavoidable, the effect should be mitigated as close to the impervious surface as possible (such as ground soakage on individual house lots). In saying this, we recognise that such decisions need to be made on a location by location basis. Ground soakage in Taupo soils for example is relatively easy (although in such conditions, the creation of tomos from stormwater discharge to ground needs to be guarded against). In areas of less permeable soil, where ground soakage is more problematic, other solutions may be needed to protect vulnerable water bodies (such as a constructed wetland to hold back and slowly release stormwater). Very good guidance is given for stormwater management in Auckland Regional Council's 'Stormwater Management Devices: Design Guidelines Manual, Technical Publication 10' and their 'Low Impact Design Manual for the Auckland region, Technical Publication 124'. These documents are discussed in more detail in Sections 6.3 and 6.4.

### Soil stability and land use limitations

- There may be some parts of the site where, due to steepness and erosive soils (such as Taupo pumice soils), disturbance should be avoided.
- In more difficult landscapes such as steep or swampy areas, building platforms and locations of disposal fields should be identified at the design stage.

### Energy efficiency

- The street pattern should be designed for energy efficient transport with provision for walking, cycling and public transport. Interconnecting roads allow for more efficient travel patterns. If cul-de-sacs are to be used, their length should be minimised to no more than easy walking distance to interconnecting roads. Separate walkways could be provided to provide this connectivity. Easy access to key features such as CBD, industrial areas, schools, and key shopping centres is important for an energy efficient transport system. Street patterns should allow for maximum use of passive solar house heating. Consider use of energy efficient street lighting.

### Regionally significant infrastructure

- Design should ensure the subdivision does not impact on the operation of regionally significant infrastructure. Conflicts with key transport services, use of hydro dams, functioning of flood protection works and drainage schemes should be minimised.



### Heritage and Maori issues

- Design should protect important natural and cultural heritage features. Such heritage resources can even be augmented by improving public access to them and making them a feature of the subdivision. Note that there are also obligations with respect to heritage under the Historic Places Act.
- Tangata whenua should be consulted at the design phase. This will ensure that their concerns and issues are considered and addressed, and allow them the opportunity to be actively involved in how the land is developed. In particular, tangata whenua should be asked to identify waahi tapu or taonga within the vicinity of the development, or other sites of particular significance to them.

# 5 Good practice for construction activities

Contractors involved in site development must make sure that they are very familiar with Environment Waikato's "Erosion and Sediment Control Guidelines for Soil Disturbing Activities" (Environment Waikato Technical Report 2002/01). This document should be the basis for erosion and sediment control mechanisms employed on site (see also Section 6.2).

Many subdivision construction works will require consents. It is very important that these consents are sought well before construction works begin. Where works do not require consents, they will need to satisfy conditions in permitted activity rules. For example, the permitted activity rule for soil disturbance, roading, tracking and vegetation clearance (rule 5.1.4.11) has conditions for erosion and sediment controls, placement of organic material (such as from vegetation clearance), specific effects that must be avoided, management of air discharges, discovery of Maori artefacts and other matters. See Section 6.1 for further discussion about consents and permitted activities

There are a number of important principles that should be followed during subdivision development earthworks and construction activities. The Erosion and Sediment Control Guidelines provide a good list of sediment and erosion control measures. These are important enough to warrant restating here (they are more fully described in the guidelines). The '10 commandments' of erosion and sediment control are:

1. minimise site disturbance
2. stage construction - try to minimise the area of land disturbed or open at any particular time
3. protect steep slopes
4. protect watercourses
5. stabilise exposed areas rapidly
6. install perimeter controls to keep clean stormwater out of the construction site
7. employ detention devices to capture runoff and allow sediment to settle
8. ensure appropriately experienced and trained staff are responsible for erosion and sediment control
9. prepare an Erosion and Sediment Control Plan for the site before works commence - the plan should give clear instructions about how and where to construct erosion and sediment control devices. The plan should be updated as necessary over the course of the project
10. regularly inspect, monitor and maintain control measures.



There are other principles that should also guide the construction phase, to protect the interests of the regional community. These are as follows:

### Be well informed

- Ensure construction site staff are informed about any relevant consent or permitted activity requirements, and about any important features of the site such as sensitive ecological areas, endangered wildlife, historic/cultural features, karst and geothermal features.
- Keep an eye on weather forecasts and ensure site works are appropriate to the weather conditions. Ensure there are contingency plans in place for extreme weather events.

### Soil and dust management

- Minimise compaction of soil by machinery. In some cases, part of the stormwater management strategy for a subdivision may be to rip the soil after reshaping works are completed, to maximise post-development stormwater infiltration.
- Ensuring that a thick top soil layer is established on the site after site shaping is a very good way of minimising stormwater runoff. This can be particularly helpful in the vicinity of small streams, as the water that is held back in the top soil layer will gradually feed back into the stream.
- Ensure dust is controlled, particularly near sensitive areas and neighbouring properties. Where dust is likely to be a problem, it can be minimised by limiting the area of the site opened up at any one time, rehabilitating and planting the site as soon as possible, and by the use of water carts. Hydroseeding and mulching can be a useful solution in dust prone areas. Dust can be a particular problem in Taupo soils and some contractors in this area have at times used novel and effective methods to control the problem. For example, temporary water sprinklers were provided at one subdivision between an existing subdivision and a newly developed site, and property owners along the boundary were encouraged to use the hoses near their houses if dust was becoming a problem. In another case, straw was placed temporarily on exposed areas, which was anchored by a light spray of bitumen.

### Water bodies and other sensitive environments

- Keep machinery out of water bodies as much as possible.
- Stream works may need to be timed to avoid critical fish migration and spawning periods, particularly in streams with high fishery values.
- Ensure lime and runoff from unhardened concrete does not discharge directly to water bodies.
- Maintain buffer strips around particularly sensitive environments.

### Tangata whenua

- Tangata whenua should be kept in the picture. This may involve letting them know when particular works are about to begin, allowing them to conduct ceremonies or talk to contractors about key cultural features of the site and so on. Protocols for dealing with finds of cultural artefacts should have been established well before works commence.



### Temporary works

- Take care with temporary works. Some temporary works can have significant effects, particularly if occurring at the same time as severe weather conditions. For example temporary culverts, coffer dams, and water diversions can cause flooding, scouring or sediment effects during storms. Temporary works can also significantly affect fish passage.

### Site maintenance and rehabilitation

- Environment Waikato is becoming increasingly concerned about the spread of weeds during subdivision development. This concern has been heightened due to the recent establishment of alligator weed in North Hamilton as a result of subdivision and roading development. This has also proved a costly problem for the Hamilton City Council to deal with. Our biosecurity team have recently commissioned a report on 'Biosecurity Risks Associated with Subdivision Development Activities'. It is likely that changes will be made to the Waikato Regional Pest Management Strategy that signal a more hard line approach when dealing with contractors who allow the establishment of new populations of our most noxious weeds.



- Weeds can be spread by earthworks which strip grass cover and disturb soil seed banks, moving soil from one location to another, transporting seed and plant fragments on trucks and machinery, green-waste disposal and so on. The risk of spreading weeds can be minimised by ensuring soil is not imported from sites known to have noxious weed populations, recording weed species present at a site before construction begins so that comparisons can be made at a later date, washing trucks and machinery before transporting them to a new work site, use of herbicides to control weed outbreaks (during and following earthworks), covering or grassing temporary topsoil dumps and around sediment control measures,



remediating earthwork sites as soon as possible (and before existing weeds flower and seed where at all possible), using stormwater control methods that minimise the risk of seed transport into water bodies and disposing of green-waste to refuse transfer stations or municipal organic waste facilities. Environment Waikato will be providing more detailed guidance on weed management during subdivision development in the near future. Further information about identification and control of noxious weeds can be obtained from our biosecurity staff.

- Rehabilitation planting should make use of locally sourced indigenous species. In general, established trees should be protected, particularly if these are well established valued species or indigenous species. If in doubt, seek the advice of a suitably qualified arborist.

### Wastewater and waste issues

- Efforts should be made to minimise waste production during site works, and to dispose of waste appropriately (such as temporary castings, demolition material and so on).
- Provide temporary ablution facilities on the construction site with appropriate wastewater collection and disposal arrangements. Ensure contaminants such as waste oil are appropriately disposed of.
- Establish designated refuelling and machinery maintenance areas, and ensure there are protections in place (such as bunds, oil booms and absorbent materials) so that any spills of oil/diesel or other contaminants can be contained and quickly cleaned up.

### Building contractors

- Section 3.3.4 noted that often after developers have left the site and house construction begins, building contractors create site disturbances that allow very muddy stormwater to discharge through stormwater systems and into the receiving waters. When a number of sections are being developed at one time, this can cause the discharge of large quantities of sediment to our streams and lakes. This is not something that developers can do much about, but we can all find ourselves in forums at times when we can push home the message to building contractors that they must take a more environmentally responsible approach to their construction works.

# 6 Technical requirements and recommendations for subdivision development

The Waikato Regional Plan has a number of rules for activities which may occur as a result of subdivision development. The Waikato Regional Coastal Plan also has rules for activities that may occur in the Coastal Marine Area (the area from mean high water springs to the 12 nautical mile limit). These rules describe when consents are required for activities. A summary of activities that may require consents is provided in Section 6.1.

Many consents and permitted activities (activities that do not need consents) require earthworks to be undertaken in accordance with our document 'Erosion and Sediment Control - Guidelines for Soil Disturbing Activities'. The use of these guidelines is discussed in Section 6.2

Environment Waikato generally endorses the Auckland Regional Council's document 'Stormwater Management Devices: Design Guidelines Manual, Technical Publication 10'. Section 6.3 describes how these guidelines should be used in the Waikato region, and in particular how calculations for stormwater devices in the guidelines should reflect Waikato conditions.

Environment Waikato also generally endorses the Auckland Regional Council's document 'Low Impact Design Manual for the Auckland region, Technical Publication No 124'. Section 6.4 describes how this document should be used in the Waikato region.

## 6.1 Consents and permitted activities

Activities which may alter the environment are controlled through the Resource Management Act and regional plans. Some of these activities can be undertaken without any formal permission (resource consent) from Environment Waikato. For others, a consent is required from Environment Waikato before the activity can commence. Specific information about consents and consent requirements can be found on our website.

The following activities associated with subdivision development may require consent:

- Water takes from surface or groundwater (such as for dewatering activities and dust control).
- Stormwater discharges, both during earthworks and after works are completed.
- Wastewater discharges (such as sewage and industrial discharges).
- Discharge of pumped drainage water.
- Discharges from remediation of contaminated land.
- Air discharges (such as from abrasive blasting and water blasting, dust, sprays, smoke, odour).
- Other discharges (such as dust, sprays, solid waste, drilling fluids, some fertilizers, dust suppressants).
- Cleanfill and overburden disposal.
- Greenwaste composting.
- Drilling, and well and aquifer testing.
- Damming and diversion of water (including stopbanks).
- Structures in or near water bodies (such as water level and erosion control structures, culverts, bridges, fords, boat ramps, jetties, discharge and intake structures, pipelines).
- Drainage activities.



- River or lake bed disturbance (including excavation, drilling, aggregate extraction, vegetation clearance).
- Soil disturbance, roading, tracking and vegetation clearance.
- Activities in geothermal areas.

Refer to the Waikato Regional Plan or the Waikato Regional Coastal Plan for specific requirements, or contact the Resource Use Group at Environment Waikato.

## 6.2 Environment Waikato's Erosion and Sediment Control Guidelines

Environment Waikato's 'Erosion and Sediment Control - Guidelines for Soil Disturbing Activities' outlines the principles of erosion and sediment control, and provides a range of erosion and sediment control practices for soil disturbing activities. These guidelines can be downloaded or ordered from our website.

The choice of relevant practices and control structures depend on many factors, such as catchment size, slope, soil type and hydrological conditions. Some practices are specifically designed for erosion control while others are more for sediment control. The guidelines provide advice on the best practices for any particular situation.

It is important an Erosion and Sediment Control Plan is drafted for the works before subdivision earthworks begin. This ensures that appropriate controls are already in place, rather than trying to solve an erosion or sediment problem once the works have begun.

Most Environment Waikato consents for earthwork activities require that sediment and erosion control works are carried out in accordance with our guidelines. The permitted activity rule for earthworks in the Waikato Regional Plan (Rule 5.1.4.11) requires erosion and sediment controls to be installed and maintained on all earthworks. If such controls are implemented in accordance with Environment Waikato's guidelines, this condition of the rule will be considered to be satisfied.

## 6.3 Design of stormwater management devices - How to apply Auckland Regional Council's guidelines in the Waikato context

The Auckland Regional Council's 'Stormwater Management Devices: Design Guidelines Manual, Technical Publication 10' (TP10) is used in the Auckland region to guide the choice and design of stormwater management devices. Although different rules apply in the Waikato region, TP10 is considered to be a useful guide. In fact, all the comprehensive consents that have been granted for discharges of stormwater from urban areas in the Waikato have conditions referring to the use of TP10. However, it is important to realize that TP10 was written for the Auckland region, and there are some provisos with respect to its use in the Waikato region.



TP10 describes design criteria for stormwater management devices for each of the three following objectives:

- To prevent problems such as flooding and erosion from large stormwater volumes (water quantity objectives).
- To ensure stormwater does not add unacceptable quantities of contaminants to receiving waters (water quality objectives).
- To protect aquatic ecosystems.

Stormwater devices that prevent flooding may not prevent unacceptable quantities of sediment or other contaminants from entering small streams. Devices that prevent sedimentation of streams may not prevent damage to aquatic ecosystems. When designing stormwater devices and management systems, it is most important that the management requirements for the receiving waters are clear, and that these management requirements guide the choice of management system.

Below is a description of the guidance given in TP10 and a brief comment on how this might apply in the Waikato region. It should be noted that, although the following discussion provides general rules of thumb for stormwater management, the objective is to avoid unacceptable effects from stormwater management, and there may be a range of other ways of doing this.

When designing new subdivisions, a careful analysis of potential stormwater effects for the site and the design of stormwater management devices appropriate to the particular management objectives for that site is preferable to blindly following rules of thumb. In some cases these rules will prove to be overly conservative, and in others, not conservative enough.

## 1) Management of water quantity

- a) The primary water quantity objective for treatment devices in TP10 is to match the pre-development and post-development peak flow rates for the 50 per cent, 10 per cent and 1 per cent AEP rainfall events. In practice, apart from where there are downstream flooding issues (see below), the most important events to match are the 50 and 10 per cent storms.
- b) Environment Waikato agrees that the safest way to approach stormwater quantity issues is to try and match post-development hydrological conditions with pre-development conditions. This is particularly important for discharges to streams or ephemeral gully systems. Subdivision development can not only increase peak flood flows in streams due to increased impervious area, but can reduce dry weather stream flows when little water is stored in the soil and aquifers for recharging streams during this time. For this reason, in addition to matching pre and post development hydrological conditions, low impact design methods are recommended that minimize impervious areas, encourage stormwater discharge as close to the source as possible, and so on. This is also encouraged in TP10.
- c) Where there are downstream flooding issues, peak discharge rates for the one per cent AEP storm event may need to be managed to prevent any increase in downstream flood levels. This should be determined through catchment hydrology analysis. Where there is no such information, the post development peak discharge rate for the one per cent AEP storm event should be limited to 80 per cent of the pre-development one per cent AEP event. Studies have shown that this approach will reduce downstream flood increase concerns in most cases and is consistent with the TP10 guidelines.



## 2) Management of water quality

- a) Water quality in the Waikato region is managed by rules and other methods in the regional plan. Stormwater discharges from subdivision developments are managed principally through the rules in Section 3.5.11 of the Plan. Where the discharge requires a consent, the conditions of consent will specify requirements with respect to stormwater quality. Where a consent is not required, the stormwater discharge will need to meet the requirements of the permitted activity rules for stormwater (Rules 3.5.11.4 and 3.5.11.5). In particular, the suspended solids standards in section 3.2.4.5 of the Plan need to be satisfied.
- b) The primary water quality objective in TP10 is for treatment devices to remove 75 per cent of total suspended solids on a long term average basis. The assumption is that this represents a reasonable and practicable expectation of stormwater treatment systems, which will generally protect receiving waters from significant sedimentation. It is also assumed that such systems will also remove other stormwater contaminants to a reasonable degree. In general, designing urban stormwater treatment devices to meet the 75 per cent suspended solids removal target is also considered a reasonable and practicable practice by Environment Waikato. However this does not override other requirements for stormwater quality in the regional plan or stormwater discharge consents.

## 3) Aquatic resource protection

- a) Environment Waikato's requirements with respect to aquatic resource protection are also specified in the Waikato Regional Plan stormwater rules. Again, requirements may be specified by permitted activity rules or stormwater consent conditions.
- b) TP10 defines aquatic resource protection as maintaining the physical structure of the receiving system while promoting practices that provide habitat conditions conducive to a healthy receiving environment.
- c) TP10 recommends that structures such as detention ponds should be designed so that the first 34.5mm of rainfall is stored and released over a 24 hour period. The expectation is that this will ensure peak flow volumes and velocities do not cause significant disturbance (such as scour) to receiving water habitat and stream life. Environment Waikato has not undertaken sufficient research to validate the effectiveness of such storage and release in the Waikato region. However, in the absence of other information, it is considered to be reasonable guidance to follow. It should be noted that 34.5mm of rainfall is just over half of the rainfall expected during a 2 year 24 hour storm in Hamilton. By storing and releasing this volume over 24 hours, the effects of increased impervious area can be mitigated for relatively commonly occurring storms in the Waikato region.
- d) TP10 does not require specific levels of ground recharge (ground soakage) of stormwater but does encourage applicants to maximise recharge as much as practicable. This approach is supported by Environment Waikato. If there is a choice between ground soakage and pond storage, the former is preferred.



- e) It should be noted that on its own, storage of the first 34.5mm of rainfall will not necessarily protect streams with high aquatic values or small streams in high rainfall areas. In such cases, stormwater management should be designed to specifically fit the site characteristics. This may involve methods such as maintenance of riparian buffer zones and methods to maintain stream base flows.
- f) In a recent article on stormwater management for stream protection, it was stated that "TP10 should be seen as a minimum standard and is not necessarily adequate to protect sensitive stream environments" (Heijs, J., Stumbles, C.J. and Hodges, J., 2005, page 29). The article notes research showing a direct relationship between increasing imperviousness in a catchment and declining stream health. It states that significant effects on stream health commonly occur as imperviousness increases beyond about 10 per cent. The article therefore recommends that, if sensitive streams are to be protected, catchment stormwater management in built up areas should aim to emulate hydrological characteristics as if no more than 10 per cent of the catchment is impervious.

#### 4) Stormwater runoff calculations

Assessing stormwater calculations is often more of an art than a science. It certainly needs to be carried out by appropriately qualified engineers. Territorial authority engineers generally have a great deal of experience with stormwater calculations and we recommend that this experience be drawn on when developers are designing stormwater systems for new subdivisions. These engineers often have a good feel for relevant coefficients and calculation methods which best reflect local conditions. When providing information to Environment Waikato about stormwater calculations, it is important that the calculations and assumptions are clearly set out so that our engineers can understand how conclusions about stormwater effects have been reached.

In most cases, Environment Waikato uses the rational method to compare pre and post development stormwater flows in small catchments or parts of catchments. The Ministry of Works Technical Memorandum No 61 (TM61) is also used at times. These methods seem to be appropriate in most parts of the region, particularly in rural catchments. It is important that appropriate coefficients are used. It is helpful if the methods chosen for modelling stormwater flows are compared to actual stream gauging in order to validate coefficients.

TP 10 recommends the use of the Auckland Regional Council Technical Publication 108 (TP108) "Guidelines for stormwater runoff modelling in the Auckland region" for determining runoff flows for subdivisions. Environment Waikato does not have sufficient information to comment on how well TP108 methods will model stormwater flows in the Waikato region. If other models are used, they will need to be accompanied by comment on their applicability for Waikato conditions.



## 6.4 Auckland Regional Council's Low Impact Design Guidelines

This section describes how the Auckland Regional Council's 'Low Impact Design Manual for the Auckland region, Technical Publication No 124 (TP124)' should be used in the Waikato region.

Low impact design is defined in TP124 as a design approach or site development that protects and incorporates natural site features into erosion and sediment control and stormwater management plans. Typical features of low impact design include:

- minimising earthworks and landform change
- maintaining established treed areas
- minimising impervious surfaces, such as by limiting road widths and use of pervious paving
- use of biofiltration practices such as swales and buffer strips
- creating natural areas to manage stormwater quantity and quality, as well as adding amenity
- cluster development - higher density housing with more shared open space
- weed and pest control
- providing wildlife linkages
- maintaining natural hydrological conditions, such as by maintaining wet areas and soakage areas
- avoiding soil compaction.

There is a very good check list for low impact design features and considerations on page 5-3 of TP124.

Low impact design methods support many environmental objectives in our Regional Policy Statement and would certainly help to achieve the creation of sustainable subdivisions. Low impact design can minimise erosion, protect aquatic habitats, protect and enhance biodiversity and natural character of water bodies, protect significant indigenous habitats, flora and fauna, maintain wetland areas, protect public access to water bodies and so on. For these reasons, Environment Waikato supports the low impact design approach.

Environment Waikato staff encourage developers to implement low impact design practices where possible. It is important that such practices become a fundamental part of the design approach for new subdivisions. Low impact design will not work as an add-on once the major design decisions have been made.

The comprehensive stormwater discharge consents granted in the Waikato region for the discharge of urban stormwater encourage the use of low impact design methods. Territorial authorities are encouraged to discuss low impact design with developers during application processes for subdivision consents. Territorial authorities should also ensure that their development manuals do not unnecessarily restrict the use of low impact design methods in their districts.



## Bibliography

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# Appendix 1 -

## Where to go for further information

Environment Waikato staff can provide advice on a number of aspects of subdivision design and development. The following is a guide to the expertise available and the parts of the organisation to approach for advice.

- Resource consents and requirements of permitted activities - Resource Use Group
- Policy guidance - Policy and Strategy Group
- Transport issues - Land Transport - Finance/Regional Services
- Natural Hazards - Natural hazards staff in the River and Catchment Services Group
- Navigation issues - Navigation Safety - Finance/Regional Services Group
- Flood Control - Technical Services - River and Catchment Services Group
- Drainage Issues - Operations - River and Catchment Services Group
- Biosecurity (Weed and animal pests) - Biosecurity Group
- Scientific advice on biodiversity, aquatic ecology, water quality, water allocation, wetlands, soils, contaminated sites - Resource Information Group

The following documents will also be useful (many of these can be downloaded directly from the Environment Waikato website):

### Policies, plans and strategies

- Waikato Regional Policy Statement - contains issues, objectives, policies and methods for the management of natural and physical resources across the Waikato Region.
- Proposed Waikato Regional Plan - contains objectives, policies and methods (including requirements for permitted activities and consents) to implement the Regional Policy Statement.
- Regional Coastal Plan - contains objectives, policies and methods relating to activities in the Coastal Marine Area.
- Long-Term Council Community Plan 2004 - 2014 : Delivering a Sustainable Future.
- Regional Land Transport Strategy - identifies the future land transport needs of the Waikato Region for the ten year period from 2002 to 2012, and outlines ways of achieving those needs.
- Regional Pest Management Strategy - details which plants and animals are declared pests in the Waikato Region and outlines how each pest will be managed over a five year period.
- Risk Mitigation Plans - define the role of Environment Waikato, territorial authorities, and the community in managing the effects of natural hazards and outline methods to reduce the effects of natural hazards. Specific risk mitigation plans are available for floods, earthquakes, coastal erosion, coastal flooding, volcanism and water shortage.

### Other useful reports and brochures

- Waikato Regional Socio-Economic Summary - information about Waikato Region's population, economic structure, labour market, income distribution, retail trade, building and property, tourism, agriculture and forestry, manufacturing, mining, energy, research, education and health.
- Clean Streams guideline booklet - practical suggestions for stream protection, focussing on farm streams.
- Environment Waikato Coastal Hazards and Development Setback Recommendations Summary Report May 2002 - information and recommendations for coastal development setbacks.



- Tsunami Hazard for the Bay of Plenty and Eastern Coromandel Peninsula : Stage 1.
- Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region : Guidelines to Apply Regional Criteria and Determine Level of Significance .
- Erosion and Sediment Control Guidelines for Soil Disturbing Activities, Environment Waikato Technical Report 2002/01, May, 2003.
- Forest Fragment Management factsheets - guidelines for protecting and managing forest fragments.
- Trees on Farms: a guide with local experience of growing trees in the Waikato Region - guide to the selection, establishment and care of trees on farms.
- Resource Use Group biodiversity practice note - guidance for consents staff about how to identify when biodiversity may be an issue, and how to manage it through the consent process, also useful to others managing subdivisions in sensitive areas.
- Environment Waikato has a range of brochures and publications about plant pests such as 'Plant Me Instead' a booklet for ideas on what plants you can use to replace plant pests, the poster 'Plant Pests in the Waikato Region' and 'Aliens in the Waikato' - a guide to Waikato's pest management future.

Environment Waikato's website also has a range of resources on relevant topics such as restoring wetlands, fencing and riparian management for streams and rivers, animal pest control, soil conservation, culverts and Maori perspectives on resource management. There is a range of regularly updated environmental information which could be useful to contractors, such as rainfall and river levels, and links to weather forecasts and tide times. Consent application forms and advice about the consent process can also be found on the website.



# Appendix 2 -

## Summary of relevant objectives and policy from the Waikato Regional Policy Statement

### Tangata whenua values (Section 2.1)

1. Cultural values such as effects on mauri of water, disturbance of sites of cultural/historical importance, effects on the relationship of tangata whenua with ancestral lands, water, sites, waahi tapu and other taonga, effects on tangata whenua and their ability to express kaitiakitanga.
2. Principles of the Treaty of Waitangi and ability of tangata whenua to be actively involved in decision making.

### Soil (Section 3.3)

3. Erosion effects such as loss of soil productivity, capability and versatility, sedimentation effects on water quality, aquatic ecosystems, water supplies and flood potential, and effects on aesthetic, scientific or cultural values associated with land.
4. Contamination of soils which can affect the range of existing and foreseeable uses of the soil resource.
5. Maintenance of soil health, versatility and productive capacity of the Region's soil resources.

### Rivers, lakes and wetlands (Section 3.4)

6. Stable river and lake beds.
7. Water quality.
8. Aquatic habitats and ecology.
9. The range of uses of water bodies (such as amenity and landscape value, fishing, boating, swimming and other recreational activities, water supply, food source, electricity generation, flood control, habitat for flora and fauna).
10. Significant indigenous habitats, flora and fauna (aquatic and terrestrial).
11. Characteristics of outstanding water bodies (eg wild and scenic character).
12. Quantity and quality of wetlands.
13. Public access to and along lakes, rivers, wetlands and coastal waters.

### Coastal areas (Section 3.5)

14. Outstanding landforms and landscapes, significant areas, features, physical and ecological processes, and the range and diversity of species and their habitats in the coastal environment.
15. Natural character and dynamic stability of the coastal environment.
16. Amenity, cultural, recreational and commercial values of coast.



### **Air (Section 3.6)**

17. High air quality.
18. Air discharges that don't adversely affect human health, flora and fauna.
19. Management of greenhouse gases and ozone depleting chemicals.

### **Geothermal (Section 3.7)**

20. Variety of characteristics of geothermal resources.
21. Natural geothermal characteristics of protected geothermal systems.

### **Natural hazards (Section 3.8)**

22. Safety of communities and property in the event of natural hazards.

### **Waste (Section 3.9)**

23. Reduction in quantities of waste requiring disposal.
24. Adverse effects of waste generation and disposal minimised.

### **Hazardous substances (RPS Section 3.10)**

25. No significant adverse environmental and human health effects from existing contaminated sites or from storage, transport, use and disposal of hazardous substances.

### **Biodiversity (Section 3.11)**

26. Maintain or enhance biodiversity by protecting and managing indigenous vegetation and habitats of indigenous fauna.

### **Energy (Section 3.12)**

27. Energy efficiency and conservation to minimize use of resources for energy production.

### **Structures (Section 3.13)**

28. Continued operation of regionally significant infrastructure (flood protection works, transport network, hydro dams).

### **Mineral resources (Section 3.14)**

29. Ability to extract mineral resources such as coal, aggregates, gold, sand and limestone (subdivisions can cover such resources or cause problems of reverse sensitivity).

### **Heritage (Section 3.15)**

30. Heritage resources (the natural, physical and cultural environment, inherited from the past, which define the present and which will be passed onto future generations) such as flora and fauna, ecosystems and habitats, landscapes, landforms, geological and geomorphic features, soils, the natural character of the coastline, cultural sites, places and place names, historic sites, buildings and structures, waahi tapu sites, people and institutions.



# Appendix 3 -

## Sustainable subdivision development - Summary of guidelines in Standards New Zealand Handbook: Subdivision for People and the Environment (SNZ HB 44:2001)

The recently released Standards New Zealand Handbook: Subdivision for People and the Environment (SNZ HB 44:2001) describes a process of subdivision design that integrates the biophysical, social and structural elements of the site. An outcome is achieved that is environmentally responsive, where resources are used efficiently, and which produces a subdivision with a strong sense of community.

There is a high degree of congruency between the Regional Policy Statement's desired outcomes and the outcomes being sought in the Standards New Zealand handbook. The following is a list of ideas taken from the handbook that could be considered in the design of a sustainable subdivision. The handbook should be consulted if these ideas are to be used, as the list below is indicative only and needs to be viewed in the correct context.

### Positive utilisation of the landscape

- Identify and protect vulnerable areas.
- Look beyond the immediate site.
- Seek the participation of tangata whenua in the landscape assessment and analysis process.
- Let the landform and landcover suggest the design solution.
- Protect special places for future use.
- Recognise historical features and associations.

### Integrating people and places with the landscape

- Develop a vision for the landscape.
- Protect visual amenity values.
- Build on and incorporate existing landscape features, patterns and processes.
- Integrate landscape features into public and common areas.
- Restoration and preservation of mauri.
- Landscape for multiple use.
- Productive landscaping.
- Plant to control climate effects.
- Design for diversity.

### Allotment and building sites

- Leave greenbelt/buffer areas between neighbourhoods.
- Provide for common land within a development.
- Plan neighbourhoods as residential parks.
- Cluster allotments and building sites.
- Design building sites for maximum solar gain.
- Include traffic free neighbourhoods.
- Think of design in terms of multiple use opportunities.
- Think about security.
- Locate allotments, and particularly building sites, on areas of low soil quality.



- Consider the needs of people in terms of privacy and community, and the relationship of allotments and building sites to open space.
- Consider the needs of the neighbourhood in terms of waste management.

### Mixed use development and intensification

- Design for clustering of housing and building types and uses.
- Design short or multi-use blocks to increase potential interaction and activities.
- Design for continuity but not conformity.
- Group social infrastructure to provide a social focus to the community.
- Provide for mixed uses (retail, office, light industrial etc) within residential areas, and for residences within mixed business areas.
- Encourage a range of economic opportunities within developments, including home workplaces.
- Provide for and safeguard recreational, cultural, social and heritage spaces within the development.
- Design for the possibility of urban food growing/urban agriculture.
- Design for retention of significant natural features.

### Circulation

- Consider the purpose of roading and design accordingly.
- Design to minimise the extent of roading.
- Make the best use of the road.
- Incorporate green streets where possible.
- Design for the pedestrian.
- Provide for cycleways.
- Integrate local roads as open space areas.
- Identify the entrance to the development.

### Earthworks

- Design elements that require earthworks around natural features.
- Justify the extent of earthworks in economic and environmental terms.
- Plan land development in harmony with the natural run-off patterns and the contours of the site.
- Consult with local iwi prior to undertaking earthworks.
- Earthworks in mobile ecosystems such as dune/coastal edges are best avoided.

### Stormwater as a resource - treatment and use

- Assess and monitor the site's freshwater regime.
- Minimise site disturbance.
- Design for cluster development.
- Ensure tikanga and kaitiaki responsibilities can be maintained.
- Use vegetation to minimise erosion and flooding.
- Reduce impervious surfaces (roads, footpaths, parking, driveways).
- Reduce building setbacks where appropriate to reduce areas of impervious paving.
- Use of stormwater through collection for household supply.
- Centralised stormwater collection, treatment and use.
- Retain and slow water flow to aid infiltration through construction devices such as swales, check dams, detention basins, and rain gardens.
- Retain natural drainage patterns.
- Use natural mechanisms such as sheet flow and percolation.
- Enhance the character of constructed waterways through flowforms.



- Improve water quality and ecology through wetland treatment systems.
- Use natural water courses and systems.
- Protect downstream resources.

### **Wastewater management**

- Consider alternative wastewater systems that allow sensitive assimilation into the environment.

### **Water supply**

- Provide different levels of water quality for different uses.
- Restrict the supply (for example, consider a trickle supply that limits consumption of water and forces residents to use a roof collection for irrigation and other non-consumptive uses).
- Rely on roof collection.
- Use of greywater.
- Water for firefighting purposes.
- Use of on-site water resources.

### **Renewable energy, efficiency and self production**

- Energy efficient design and construction.
- Solar orientation of building sites.
- Promote energy efficient housing.
- Make maximum use of a site's renewable energy resources.
- Consider the options - connection to the grid, solar power, solar water heating, micro-hydro, windpower.

### **Land tenure**

- Consider the options - fee simple, tenancy in common, crosslease, flat owning companies, unit title, Maori land tenure.

### **Covenants, contracts and purchaser information**

- Consider use of such methods to ensure sustainable outcomes.



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