

ECOLOGICAL CONSTRAINTS TO
DEVELOPMENT IN THE
WESTERN BAY OF PLENTY

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SMARTGROWTH
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TAURANGA



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1. INTRODUCTION

Wildland Consultants Ltd were commissioned to identify constraints posed by natural heritage features for future development in the western Bay of Plenty sub-region. The boundaries of the sub-region are shown in Figure 1.

The natural heritage study is one component of the much larger project, known as SmartGrowth, which is a joint project between Environment BOP, Tauranga District Council (TDC), Western Bay of Plenty District Council, and Tangata Whenua (Tremain 2001). The study area extends from Waihi Beach in the north and to Otamarakau in the east, and inland to include most of the seaward-flowing catchments. It includes all of the Tauranga Ecological District, a large section of the Otanewainuku Ecological District, a significant area of the Te Aroha Ecological District, and a small part of the Waihi Ecological District. Refer to Figure 1.

The purpose of the SmartGrowth study is: “To develop and implement a strategy for the sustainable development of the Western Bay of Plenty sub-region for the period 2000-2050 (Tremain 2001). The identification of ecological constraints is part of Phase 2 of the project, which includes the compilation of an implementation framework by December 2003 (Tremain 2001).

The Western Bay of Plenty is undergoing rapid population growth and could possibly reach 290,000 people by 2050 (Tremain 2001).

There have been previous studies of likely ecological effects of population growth in various parts of the sub-region; e.g. Western Bay of Plenty District (Shaw 1997), and assessments of ecological constraints to urban development at Waihi/Athenree, Katikati, Omokoroa, and Papamoa (e.g. Wildland Consultants Ltd 2000).

This report provides an outline of the methodology used in this part of the SmartGrowth study and identifies areas potentially suitable for future development, based on an assessment of natural heritage values only.

2. PROJECT BRIEF

The client provided a project brief which included the following elements:

- verification of ecological features (based on existing information - the information available for Tauranga District is current and accurate, while the information base for parts of Western Bay of Plenty District is somewhat dated and there is some degree of risk associated with a desktop exercise). Existing information¹ includes that already prepared for TDC by Wildlands, Significant Ecological Features identified in WBOPDC’s District Plan, additional features to

¹ Existing digital information was compiled initially by SmartGrowth staff.

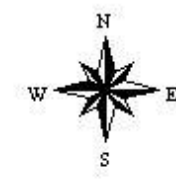
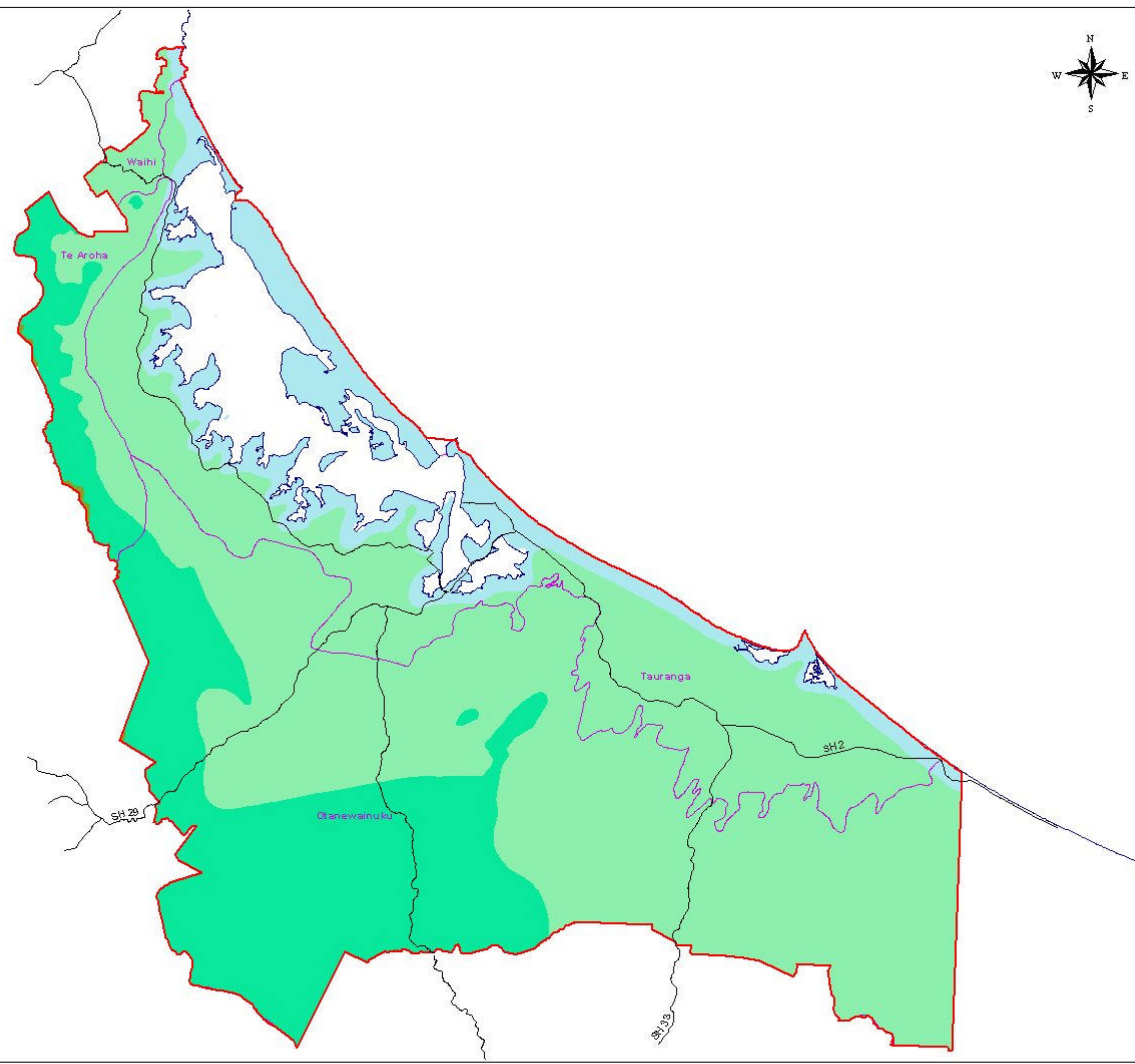


Figure 1

Boundaries of the SmartGrowth Sub-Region, Western Bay of Plenty



KEY

- Study area
- Ecological District boundary
- Main Roads

Bioclimatic Zones

- Coastal
- Semicoastal
- Lowland
- Montane

Ecological District data from DOC revised by Wildland Consultants Ltd 1998

Bioclimatic Zone data from Wildland Consultants Ltd 1998

Scale 1:275,000



be added to WBOPDC's Plan as a consequence of the Environment Court decision, RAP's² from the Otanewainuku PNAP survey recently completed by DOC;

- assess likely direct and indirect effects of urban and rural growth on ecological features;
- identification of areas that have ecological features that may be constraints to future population growth. This will enable SmartGrowth to identify areas that are likely to be more suited for potential population growth within the study area (i.e. have fewer ecological features present that are vulnerable to negative effects from population growth).

The tasks for the natural heritage work from the SmartGrowth Phase 2 Biophysical Brief are to:

- spatially define and rank the degree of constraint using GIS data.

The outcomes are expected to be the application of a 1, 2, 3 constraint ranking to ecological sites with suitable explanation of each constraint layer, the limitations for development/growth in the sub-region, and suggested methods for managing growth in relation to ecological constraints.

SmartGrowth has adopted a 3-tier system for assessing the significance of relevant features, as follows:

Significance	1	2	3
for protection	Highly significant	Moderately significant	Not significant
for development	Highly constrained	Moderately constrained	Not constrained

The client also provided the following data supply standards:

- All geographic data captured for the project should be within the bounds of the SmartGrowth project.
- All geographic data is to be provided in New Zealand Map Grid (NZMG).
- The scale of mapped geographic data shall be at a scale of no smaller than 1:50,000. Larger scale mapping (e.g. 1:10,000) is appropriate and encouraged, provided the GIS data specifications below are met.
- For 1:50,000 mapping the positional accuracy of the geographic data shall be +/- 20 m.
- All text and attributes, as applicable, are to be in Sentence case.

² RAP = Recommended Area for Protection.

3. METHODOLOGY

The following project methodology was used:

- Existing hard copy information was collated and assessed (e.g. see References).
- Meetings were held with relevant staff from Environment BOP and the SmartGrowth project team.
- SmartGrowth collated and supplied relevant digital data from key agencies such as Environment BOP, Tauranga District Council, and Western Bay of Plenty District Council.
- Environment BOP compiled digital maps of shellfish beds, wader bird habitat, wetland vegetation, and marshbird habitats in Tauranga Harbour.
- Wildland Consultants Ltd staff reviewed the digital data provided by SmartGrowth. For the Western Bay of Plenty District, this was found to have some limitations due to lack of coverage (e.g. many areas of indigenous vegetation were not mapped) or, also in many cases, digital boundaries did not accurately reflect the actual boundaries of natural areas. The boundaries of all areas of indigenous vegetation were reviewed, although there are still likely to be inaccuracies due to lack of mapping resolution or errors of aerial photograph interpretation.
- A map of indigenous vegetation and habitats was compiled (refer to Figure 2) using a base map of registered digital black and white aerial photographs (base scales 1:4,000-1:15,000; scanned at 2 m resolution). Colour aerial photographs (unregistered; scales 1:7,500-1:15,000) were used to help with the interpretation of vegetation and habitat pattern, and the following digital data (most supplied by SmartGrowth) was also used:
 - shellfish beds;
 - wader habitat (draft only);
 - marshbird habitat;
 - wetlands;
 - Recommended Areas for Protection in the Otanewainuku Ecological District;
 - natural areas in the proposed Western BOP District Plan;
 - Special Ecological Sites mapped previously in the Tauranga District;
 - sites identified in the Regional Coastal Environment Plan;
 - natural areas identified previously by Wildland Consultants Ltd in ecological assessments of Athenree/Waihi, Katikati, Omokoroa, and Papamoa.





Figure 2

Indigenous Vegetation and Habitats of the SmartGrowth Sub-Region, Western Bay of Plenty

KEY

-  Study area
-  Indigenous Vegetation and Habitats
-  Main Roads

Indigenous vegetation data compiled by Wildland Consultants Ltd September 2002 from information supplied by: Tauranga District Council, Western Bay of Plenty District Council, Environment Bay of Plenty also interpreted from aerial photography and the Land Cover Database

Scale 1:275,000



- A map of protected areas was compiled (refer to Figure 3), including the following:
 - land administered by the Department of Conservation;
 - reserves administered by Councils;
 - QE2 National Trust covenant areas;
 - land protected as a condition of subdivision consent notice (including land protected as a result of a transferable development right);
 - retired land protected under Environment BOP Farm Plans or Environmental Plans (Land Improvement Agreements).
- Ecological districts and bioclimatic zones were selected as evaluation frameworks (refer to Figure 1), and overlain with the map of indigenous vegetation and habitats and protected areas. Mapped areas were also overlain on a satellite image with a ground resolution of 25 m (refer to Figure 2).
- Rankings were applied to indigenous vegetation and habitats (refer to Figure 4).
- A map of ecological constraints was prepared (refer to Figure 5).

4. ECOLOGICAL CONTEXT

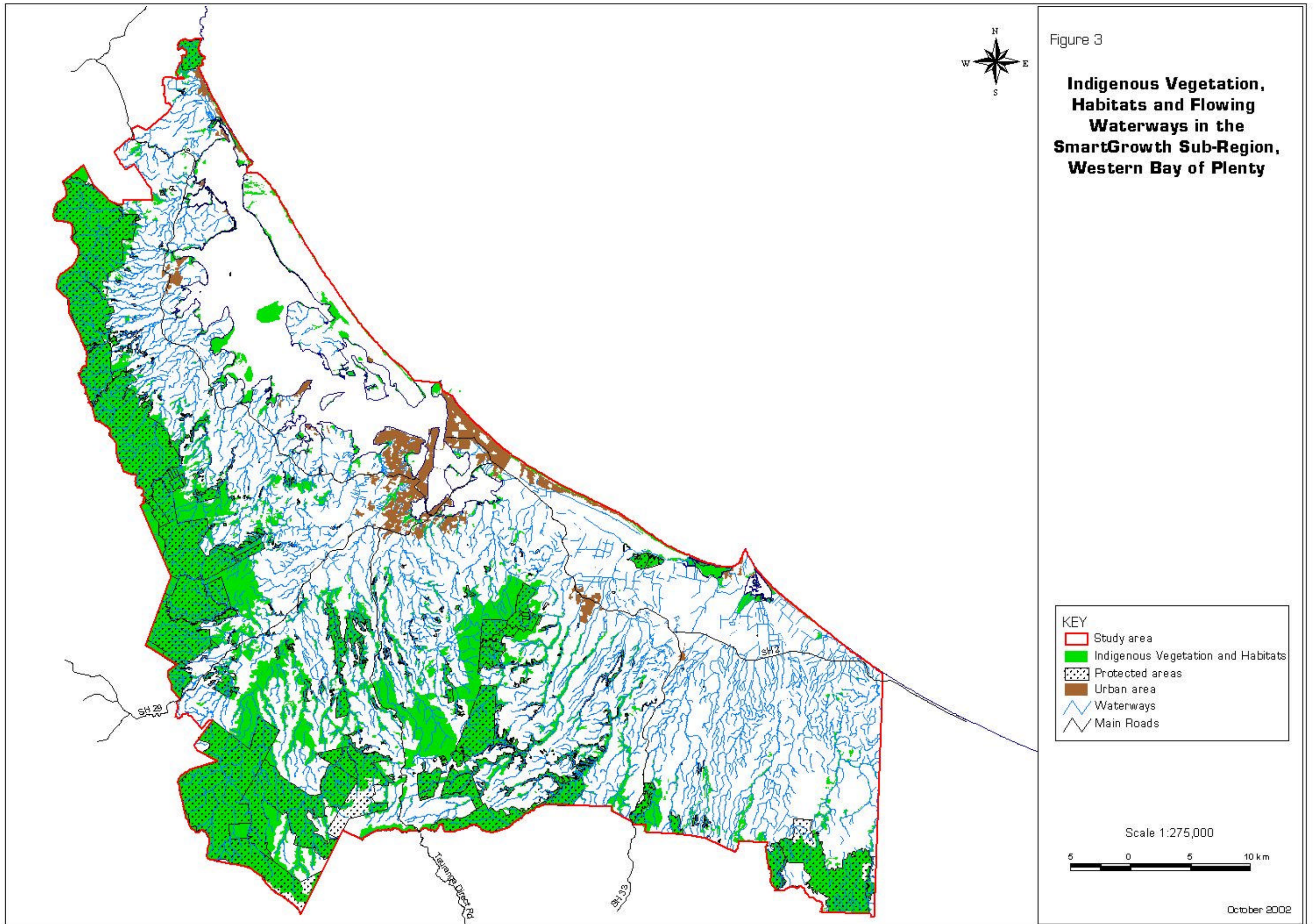
The study area includes all of the Tauranga Ecological District, a large part of the Otanewainuku Ecological District, and sections of the Te Aroha and Waihi Ecological Districts. Brief descriptions of these ecological districts are provided below.

Tauranga Ecological District

Tauranga Ecological District (coastal and semi-coastal bioclimatic zones) is entirely within the SmartGrowth study area. Tauranga Ecological District includes Tauranga Harbour, Maketu Estuary and Little Waihi Estuary, dunelands along the coast between Waihi and Otamarakau, Matakana Island, coastal plains, and the low rounded hills of the Western Bay of Plenty lowlands. The total area of the Ecological District is c.85,000 ha. Much of the original forest cover was destroyed by early Maori, with extensive wetland drainage following European arrival. Relatively little indigenous vegetation remains in the Ecological District except for around the margins of Tauranga Harbour. Both freshwater wetlands and terrestrial ecosystems have been severely depleted. There are very few protected areas, and most are small. Most indigenous remnants left in Tauranga Ecological District, even those of small size, are degraded by weed invasion but are still of ecological significance.

Estuarine wetlands are still relatively extensive around Tauranga Harbour despite considerable human modification by infilling, draining, clearance, and grazing. Freshwater wetlands extend inland of the estuarine wetlands at various locations on harbour margins. Freshwater wetlands have been reduced considerably from their estimated former extent in 1840 of more than 10,000 ha. Only c.7% of these wetlands remain; most of which are small and highly fragmented, with exotic species





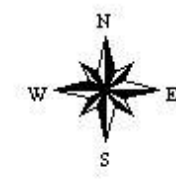
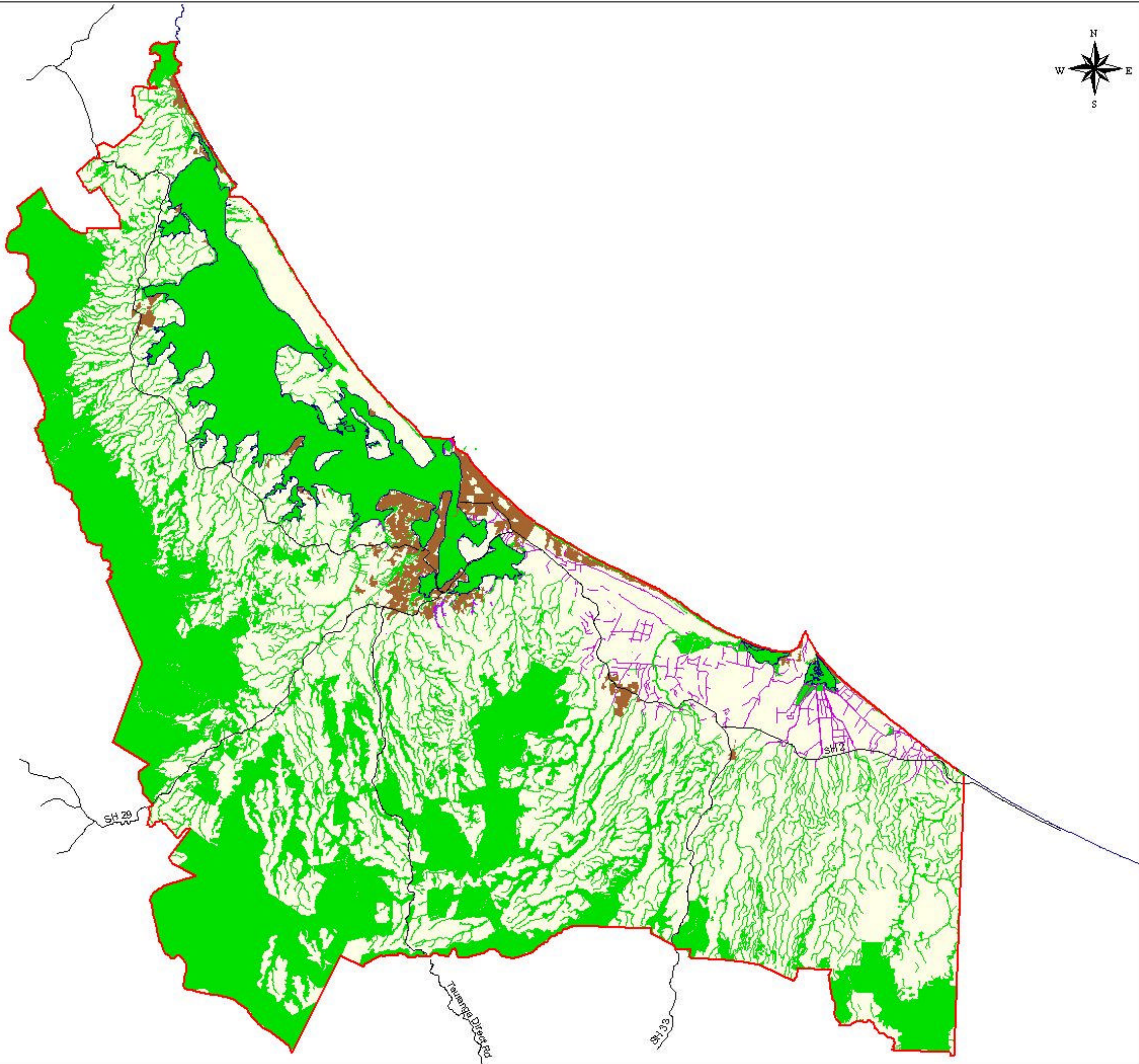


Figure 4

**Indigenous Vegetation,
Habitats and Protected Areas
Ranked for Protection Priority
SmartGrowth Sub-Region,
Western Bay of Plenty**



KEY

- Study area
- Urban areas
- Main Roads

Protection Priority

- 1 High
- 2 Moderate
- 3 Low

Protection Priority determined by
Wildland Consultants Ltd September 2002

Scale 1:275,000



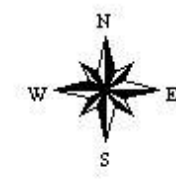
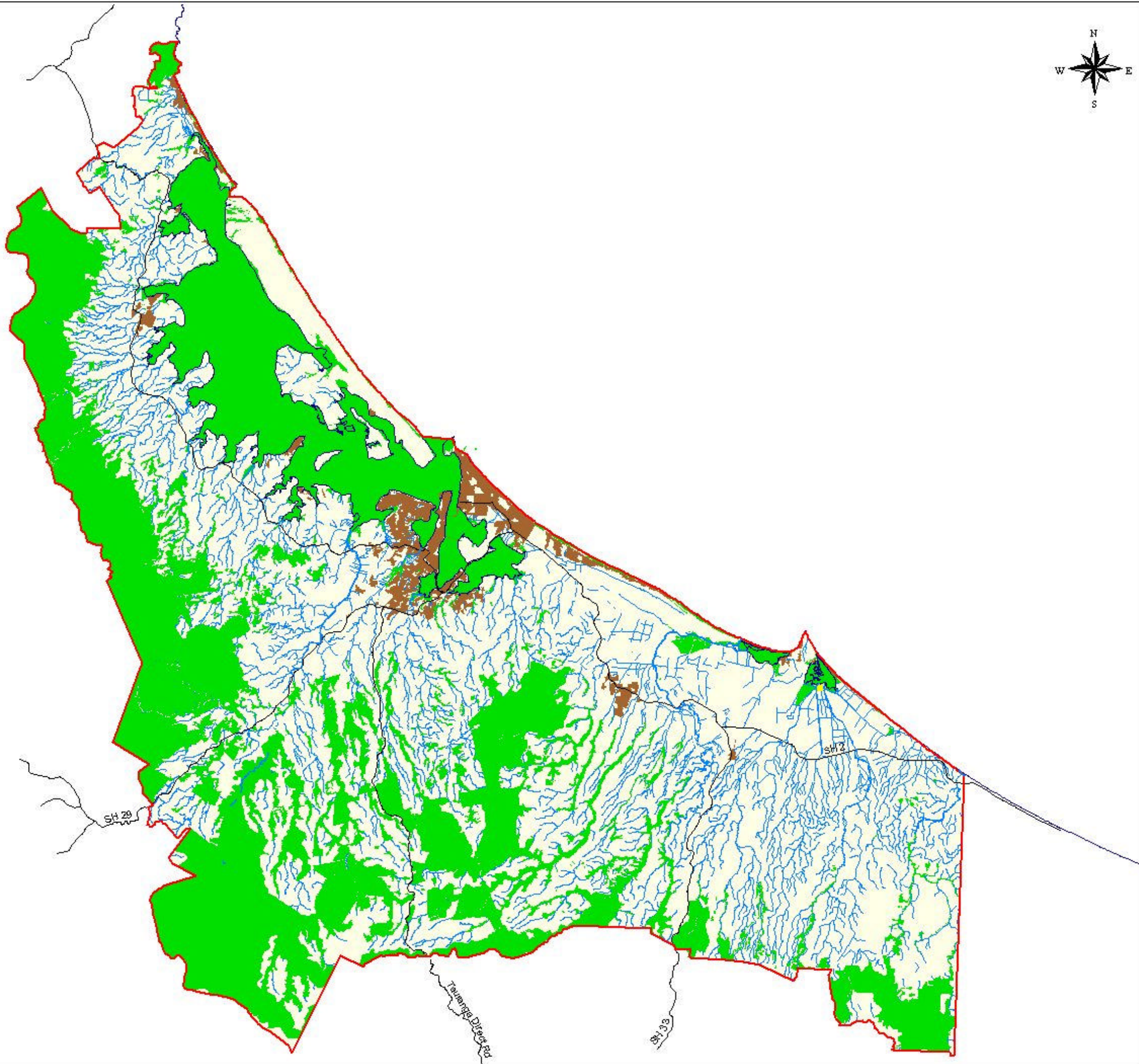


Figure 5

Ecological Constraints to Development in the SmartGrowth Sub-Region, Western Bay of Plenty



KEY

- Study area
- Urban areas
- Main Roads

Ecological Constraints

- High (vegetation and habitats)
- Moderate - streams
- Low/none

Ecological constraints determined by
Wildland Consultants Ltd September 2002

Scale 1:275,000



prominent, particularly willows. Freshwater wetlands covered approximately one-eighth of the Ecological District in 1840, but they now cover less than 2%.

Indigenous sand dune vegetation has also been subject to considerable human modification, although some good quality examples still remain. For example an earlier study in the Tauranga District noted that indigenous vegetation on sand dunes has been reduced to less than 10% of its original extent (Wildland Consultants 2000).

Apart from dunelands and the margins of Tauranga Harbour, relatively little indigenous vegetation remains on flat or low relief land.

Otanewainuku Ecological District

Otanewainuku Ecological District (coastal, semi-coastal, lowland, and montane bioclimatic zones) covers approximately *c.*190,000 ha, of which *c.*127,000 ha (67%) is in the SmartGrowth study area. The main characteristics of the ecological district are the dissected ignimbrite plateaux with incised gorges. The few physiographic variations are due primarily to differing age of ignimbrites, local andesite outcrops, and minor rhyolitic domes.

Protected Natural Areas are relatively extensive, comprising 44,743 ha or 23.4% of the ecological district. However, a relatively large proportion of the protected areas is in the lowland bioclimatic zone, with 46% of the lowland bioclimatic zone in reserves. By comparison, the semi-coastal bioclimatic zone is under-represented in the existing reserve system with only 8.9% protected overall, and this is the area that is particularly relevant to the SmartGrowth study.

Te Aroha Ecological District

In geological terms the Te Aroha Ecological District is part of the Coromandel Range. The climate and biota is mostly semi-coastal and lowland, with a strip of montane forest on the crest of the Kaimai Range. The district covers *c.*35,000 ha, of which *c.*13,000 ha (37%) is in the SmartGrowth study area, in the semi-coastal and lowland bioclimatic zones. A Protected Natural Areas Programme survey carried out by the Department of Conservation in the late 1980s found that most of the vegetation types in the semi-coastal zone of the ecological district (i.e. below 200 m along the fringes of the Kaimai-Mamaku Forest Park) were now present only as minor remnants comprising much less than 10% of their former extent and some are not represented in protected areas at all (Humphreys and Tyler 1990), cf. about 15% of the lowland zone and 30% of the montane zone are currently protected within reserves.

Waihi Ecological District

Waihi Ecological District extends south from Whangamata to Waihi Beach. The district covers *c.*152,000 ha, of which a relatively small part (*c.*3,000 ha) is included in the northern end of the SmartGrowth sub-region, in the coastal and semi-coastal bioclimatic zones. A band of hills form a narrow coastal zone with extensive semi-coastal, lowland and montane bioclimatic zones inland. A Protected Natural Areas Programme survey undertaken in 1987-1989 found that the Orokawa Scenic Reserve



comprises about 10% of the former extent of coastal forest in the Waihi Ecological District, and that elsewhere in the coastal zone only small remnants remain, and that there are only small remnants of semi-coastal forest (Humphreys and Tyler 1990).

5. ECOLOGICAL EFFECTS OF LAND USE INTENSIFICATION

The ecological effects of land use intensification for housing and other ancillary uses depends very much on where and how a particular land use is applied. Potential effects include:

- Vegetation clearance for house sites, roads, accessways, timber and firewood extraction, leading to increased fragmentation of natural areas;
- Increased invasion of natural areas by invasive pest plants and other weedy species originating from residential houses, road margins, and the margins of public open space (where people often dump domestic garden refuse);
- Drainage and infilling of wetlands, and alteration of wetland catchments and hydrology;
- Grazing by domestic stock;
- Nutrient enrichment of wetlands and flowing waterways from increased numbers of septic tanks;
- Water abstraction from rivers, streams, and wetlands;
- Sedimentation of streams, wetlands, and estuaries, particularly during construction phases;
- Increased predation of indigenous fauna (birds, lizards, invertebrates) by domestic pets;
- Disturbance of roosting or nesting avifauna by people and domestic pets;
- Inflows of stormwater and water-borne contaminants to wetlands and streams from roads and other sealed surfaces;
- Increased human visitation and associated recreational activities in adjacent natural areas;
- Collection of indigenous plants from natural areas;
- Encroachment into natural areas for gardens, boundary fences;
- Increased incidence of fires originating from rubbish fires;



- Noise disturbance of avifauna;
- Increased planting of introduced species (e.g. Kermadec pohutukawa) that have the potential to hybridise and to alter the genetic makeup of indigenous species that occur naturally in the study area.

6. INDIGENOUS VEGETATION AND HABITATS

A map of indigenous vegetation and habitats is presented in Figure 2, overlain on a satellite image of the SmartGrowth sub-region.

Rivers and streams, and protected areas, are shown in Figure 3, in addition to indigenous vegetation and other habitats.

7. ECOLOGICAL FEATURES WORTHY OF PROTECTION

The following criteria were used to assess whether indigenous vegetation and habitats of indigenous fauna are worthy of protection:

- representativeness;
- rarity or special features;
- diversity and pattern;
- naturalness;
- viability and sustainability.

(Source: Draft natural heritage criteria for the Bay of Plenty Regional Policy Statement, Western Bay of Plenty District Plan).

The application of some of the criteria set out above (e.g. representativeness) requires analysis of the amount and type of indigenous vegetation and habitats remaining within particular parts of ecological districts and bioclimatic zones, and may even require a further level of analysis of the representation of indigenous vegetation on particular landform units within relevant ecological districts and bioclimatic zones.

The study area encompasses all of the Tauranga Ecological District, a large proportion of the Otanewainuku Ecological District, a significant part of the Te Aroha Ecological District, and a small part of the Waihi Ecological District. Refer to Figure 1 for ecological district boundaries. A summary of the terrestrial indigenous vegetation and habitats remaining in each of the relevant ecological districts is provided in Tables 1 and 2 below:



Table 1: Summary of the area and proportion of terrestrial indigenous vegetation remaining in the Tauranga Ecological District

Ecological District	Bioclimatic Zone				Indigenous Vegetation/Habitats			
	Name	Total Area (ha)	Terrestrial (ha)	Estuarine Harbour (ha)	Terrestrial		Estuarine	
					Area (ha)	%	Area (ha)	%
Tauranga	Coastal	43,409	27,796	20,613	2,185	7.86	1,700	0.08
	Semi-coastal	42,108	42,108	n/a	1,234	2.9	n/a	n/a

Table 2: Indigenous Vegetation and Habitats Protected in the Otanewainuku, Te Aroha, and Waihi Ecological Districts

Ecological District	Bioclimatic Zone	% Protected*
Otanewainuku	Semi-coastal	8%
	Lowland	46%
Te Aroha	Semi-coastal	<1%
	Lowland	15%
	Montane	30%
Waihi	Coastal	<1%
	Semi-coastal	**

* In relevant ecological district.

** Not available; relatively small part of study area.



In the Tauranga Ecological District, relatively little remains in the way of indigenous vegetation and habitats, and much of what remains is highly modified and fragmented. Only c.0.6% of terrestrial land in the coastal bioclimatic zone is protected, and c.1.2% of the semi-coastal bioclimatic zone.

There is a similar pattern in the coastal and semi-coastal bioclimatic zones of the Otanewainuku, Te Aroha, and Waihi Ecological Districts, with highly fragmented habitats and only relatively small areas remaining - refer to Table 2.

Examples of factors that need to be taken into account in the assessment of ecological significance and priorities for protection in the SmartGrowth study area are:

- ecosystem types that are threatened nationally, regionally or locally, e.g. dunelands, indigenous forest on alluvial plains;
- key ecological linkages between the coast and the inland ranges and potential linkages where key connections have been lost, such as riparian corridors along many streams that extend down to the coast/Tauranga Harbour;
- threatened species (e.g. kiwi, indigenous fish, threatened plants);
- migratory species that travel within New Zealand and to other countries (e.g. waders that are resident in Tauranga Harbour on a seasonal basis);
- migratory pathways for freshwater indigenous fish;
- buffers to significant natural areas.

SmartGrowth has adopted a 3-tier system for the assessment of features within the study area. The SmartGrowth criteria for protection (high, moderate, low) are listed below with indigenous vegetation and habitats that meet each level of the criteria.

1. Highly significant for protection

- All remaining terrestrial indigenous vegetation and habitats in the Tauranga Ecological District.
- Significant Ecological Sites identified previously in Tauranga District.
- RAP's identified previously in the Otanewainuku Ecological District.
- Known habitats for threatened terrestrial species (c.f. Molloy and Davis 1994; Hitchmough 2002).
- Duneland vegetation and habitats.
- Estuarine ecosystems (including marshbird habitat, saltmarsh, wader habitat, shellfish beds, other intertidal and subtidal habitat) in Tauranga Harbour, and Maketu and Little Waihi estuaries.
- Natural areas in the coastal and semi-coastal bioclimatic zones of the Otanewainuku, Te Aroha³ and Waihi Ecological Districts.
- Freshwater streams and rivers (including their mouths).
- Protected natural areas (see Section 3 above).
- All freshwater wetlands.

³ Te Aroha Ecological District does not extend to the coast.

- Large inland tracts of indigenous vegetation.
2. Moderately Significant for Protection
- Degraded natural areas, but which have potential for restoration.
 - Naturally established vegetation in the coastal and semi-coastal bioclimatic zone that is a mixture of indigenous and exotic species, where exotics are a prominent component (e.g. wattle-mamaku forest).
 - Degraded drainage systems, which may nevertheless have value as indigenous fish habitat.
3. Not Significant for Protection
- Habitats dominated by pasture, exotic trees, horticulture (outside of buffers adjacent to natural areas).
 - Existing urban, industrial and commercial land.

Site rankings for protection priority are shown in Figure 4.

8. ECOLOGICAL CONSTRAINTS TO DEVELOPMENT

As noted above in Section 2 Project Brief, SmartGrowth supplied three categories of constraints to development. These are tabulated below with definitions used in the constraint mapping undertaken by Wildland Consultants Ltd. A map of ecological constraints is presented in Figure 5.

Table 3: Constraint levels and definitions used in the ecological assessment undertaken for SmartGrowth

Constraint Category	Level	Definition
1	Highly constrained	Indigenous vegetation and habitats - including harbours and protected areas.
2	Moderately constrained	Streams and riparian buffers; sites adjacent to indigenous vegetation and habitats, and harbours (these buffer zones are not shown in Figure 5).
3	Not constrained	Urban, pasture, industrial, commercial, horticulture, plantation forest outside of buffer zones adjacent to indigenous vegetation and habitats, and waterways.

Ecological constraints also exist in buffer zones adjacent to indigenous vegetation and habitats, including streams and harbours. The constraints will depend on the ecological values and issues associated with particular sites; e.g. domestic pets commonly travel 100-500 m, but the risk of unauthorised dumping of garden rubbish is greater within 200 m of natural areas. This is not to imply that no development



should occur adjacent to indigenous vegetation and habitats, rather than there are ecological issues that need to be recognised and addressed for new development areas, such as domestic pets, invasive weeds, and other effects associated with the intensification of land use (refer to Section 5 above).

The SmartGrowth constraint criteria (high, moderate, not constrained) are listed below with a summary of areas relevant to each category.

1. Highly Constrained for Development

The areas most constrained for intensive development are:

- Tauranga Harbour, Maketu Estuary, Little Waihi Estuary.
- Adjacent to Tauranga Harbour.
- Adjacent to other harbours and the coastline.
- Adjacent to natural areas, including highly fragmented indigenous vegetation and habitats.

2. Moderately Constrained for Development

Intensive development adjacent to natural areas will need to address threat-related issues set out above, and this may impose some limitations on the types of activities that should be allowed or encouraged in these areas.

There are areas where it may be feasible to develop for residential housing but ecological issues will need to be addressed, and some examples are listed below:

- Plateaus inland from Te Puke.
- Between Te Puke and SH33.
- Adjacent to and east of the Tauranga Direct Road.

Most flowing waterways should be protected, including riparian buffers. The width of riparian buffers will vary depending on the size of a waterway and associated topography. Small waterways could have riparian buffers 5-20 metres wide, while rivers (e.g. Wairoa) would warrant wider buffers. Waterways have been mapped as a constraint, and they should be addressed when development is being planned.

3. Not Constrained for Development

Large areas with relatively few ecological constraints for development, subject to protection of aquatic habitats, include the following:

- Adjacent to SH29 and between SH29 and SH2, and SH29 and the Pyes Pa area.
- A strip extending from Pyes Pa to Welcome Bay, and Papamoa.
- A strip, of varying width, extending west along SH2 from Bethlehem to Waihi Beach.



- An extensive area at Pongakawa and extending inland and to the east.
- Between SH2 and the coast, east of Papamoa.

ACKNOWLEDGMENTS

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