Pacific Eco-Logic Ltd

Refining the QINCCE methodology for measuring coastal natural character using case studies in Tasman District

Envirolink Project 1009-TSDC80 for Tasman District Council

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Cover photo: Puponga Estuary from the Old Man Range

Executive summary

The overall project objective has been to use the varied coastal environments of Tasman District to test and refine a new methodology developed for measuring the natural character of New Zealand coastal environments. This new methodology is called "QINCCE" (Quantitative indices for measuring the natural character of the coastal environment) (Froude 2011a). The methodology which was originally developed in northern New Zealand, involves the measurement of a set of parameters that are used to calculate four natural character indices. Use of the reference condition *present-potential natural state* facilitates: the comparison of natural character levels between different environment types and locations; and the tracking of changes over time. A consistent framework is used to measure natural character in all types of terrestrial and aquatic[1] coastal environments.

Several key matters that were addressed in the context of refining the methodology for application in central and southern New Zealand included:

- Measuring natural character in coastal environments that are subject to high levels of natural disturbance
- Refining scoring tables used for measuring *progress to present-potential cover*, especially to address different situations to those found in northern New Zealand (e.g. no mangrove scrub & forest in intertidal environments; more pervasive presence of the introduced marram grass and a scarcity of native sand binders in dunelands; the absence of the iconic northern coastal trees pohutukawa and puriri; larger tidal ranges and more limited areas of sheltered subtidal habitats in estuaries).[2]
- Contexts when *present-potential cover* or *present-potential natural state* should be re-set[3]
- Relationships between natural character scores of the QINCCE methodology and the new, but undefined, categories of "high" and "outstanding" natural character specified in the 2010 New Zealand Coastal Policy Statement
- Advice on defining the inland boundary for the coastal environment boundary for Tasman District

Under section 6(a) of the Resource Management Act all those exercising powers and functions under the Act are to recognise and provide for the preservation of the natural character of the coastal environment. This is amplified further in the 2010 New Zealand Coastal Policy Statement, especially, policies 13 and 14. Policy 1 provides guidance on defining the coastal environment. For Council to give effect to the operative New Zealand Coastal Policy Statement it needs to assess the natural character of its coastal environment.

[1] Including out to the seaward boundary of the coastal marine area which is 12 nautical miles offshore from land

[2] The complex geology of Golden Bay created other complexities including those associated with naturally low fertility

[3] The concepts of present-potential natural state (and present-potential cover) have been developed to facilitate comparisons of levels of natural character present in different environment types and contexts. *Present potential state* (PPS) is the state or condition that would be present today had humans, their tools and technology and the introduced species they brought with them not arrived in New Zealand. This can apply to hydrology, geomorphology, and cover (including vegetation and encrusting fauna).

The QINCCE methodology uses indicators (and environment-specific parameters) derived from a comprehensive definition of natural character that is consistent with an analysis of 100 Resource Management Act appeals to the Environment and higher Courts (Froude 2011a). A consistent framework is used for measuring natural character across terrestrial, freshwater and marine coastal environments. The methodology can be applied at a range of scales and for a range of purposes. For each broad class of coastal environment (terrestrial, freshwater and marine) there is a core set of parameters that are used to calculate three sub-indices for each plan-view unit[4]:

- An ecological naturalness index (ENI)
- A hydrological and geomorphological naturalness index (HGNI)
- A freedom from buildings and structures index (FBSI)

These three sub-indices are combined to give an overall natural character index (NCI) for each unit, which can be multiplied by 100 to give a natural character score between 0 and 100.

Several key parameters are measured relative to the reference condition *present-potential natural state*[5] including S*core representing progress towards present-potential cover.* Hydrological and geomorphological naturalness is assessed relative to the equivalent *present-potential natural state.* Standard *s*coring tables and protocols make the application of the methodology robust.

Units were delineated manually on printed aerial imagery at a scale of 1:10,000 for a range of areas in Tasman Bay and Golden Bay. These boundaries were digitised for the following areas with each unit being given a unique identifier:

- Whanganui Inlet and its "coastal catchment"
- Whaririki duneland and associated rock islets and peninsulas
- Western Farewell Spit (part accessible to the public) and Puponga Estuary and its "coastal catchment"
- Ruataniwha Inlet and its "coastal catchment"
- Collingwood to Parapara Estuary
- Marahau, Kaiteriteri and Otuwhero Estuaries
- Motueka-Moutere-Kina Peninsula

The unique unit identifiers shown on the maps can be linked to key information about each mapped unit (in the Appendices).

Given the extensive human-mediated hydrological, geomorphic and ecological changes that have taken place in most New Zealand coastal environments, few areas can be expected to sustain a natural character score of more than 70. Such scores are more likely to occur in areas subject to high levels of natural disturbance as natural disturbance can regularly reset the present-potential cover and humans often avoid attempting development in such areas. Some people may be surprised by what seems to be low natural character scores for some units. This is often because they are unaware of the types and extent of human-mediated changes that have occurred. There can be major differences in perception as to what is natural, particularly with some types of coastal environment (e.g. subtidal rocky reefs, former dune and wetland complexes). In heavily developed

[4] Delineated on the basis of environment type, management regime, cover and relative homogeneity at the scale of mapping

[5] See footnote 3

or exploited areas this can lead people to accept as "natural" quite high levels of anthropogenic modification. This may be appropriate in the context of protecting what is left, but not so helpful for restoration. In this context the lower expectations of naturalness may be the result of the *shifting baselines syndrome*[6]

A series of case studies has been used to compare natural character levels in estuaries, dunelands and the "coastal catchments" surrounding the Ruataniwha and Whanganui Inlets and Puponga estuaries. As part of the latter exercise there was consideration of an appropriate inland coastal environment boundary. The extent of the aerial imagery provided meant that it was not possible to precisely define the entire coastal environment boundary for these case studies. Guidance has been provided on defining an inland coastal environment boundary for the region that addresses policy 1 of the operative New Zealand Coastal Policy Statement, is consistent with case law, and considers what has been done elsewhere.

The report discusses the relationship between the natural character scores obtained using the QINCCE methodology and the thresholds of "high" and "outstanding" natural character in policy 13 of the operative New Zealand Coastal Policy Statement. The "threshold" of high applies only to mapping or otherwise identifying natural character. It is not currently a policy threshold and so the level at which it is set is less critical. In contrast, the threshold for "outstanding" is a policy threshold requiring that adverse effects of activities on natural character be avoided, rather than remedied or mitigated.

The report concludes with a series of recommendations as follows:
For Council to meet the requirements under section 6(a) of the Resource Management Act (for the coastal environment) and policies 1, 13 and 14 of the New Zealand Coastal Policy Statement 2010 it is recommended that:

1. The inland boundary of the coastal environment be manually delineated using a systematic approach based on a variety of information sources as described in this report. This should be defined and digitised before or as part of the process for measuring coastal natural character.
2. The natural character of the terrestrial, freshwater and marine coastal environment (including out to the 12 nautical mile Regional Council boundary) be measured using the QINCCE methodology. There are two alternative approaches that can be used to do this:
    a. All of the coastal environment could be measured using the QINCCE methodology
    b. A set of screening criteria could be used to exclude from assessment those areas that would definitely not reach a threshold of "high". This approach would mean that not all parts of the coastal environment need to be measured using the QINCCE methodology and so it would be a lower cost option. A set of criteria has been developed elsewhere for doing this. To enable the appropriate setting of thresholds these "triaged" areas would still be digitised (so the size of the area can be determined) and the environment type would be identified

[6] As described by Pauly (1995) this is where each generation of fisheries scientist takes conditions at the start of their career as the baseline natural state. Over time this leads to a reduction in the expected baseline

3. To provide a balance between recognising small areas of “high” or “outstanding” natural character and a cost-effective project, it is recommended that natural character be measured at a scale of 1:25,000 using recent aerial or satellite imagery as a base
4. The boundaries of units in which natural character is measured are defined using a set of criteria relating to environment type (generally a unit does not straddle environment types); management regimes (e.g. production land uses versus conservation; different types of marine protection/fisheries management regimes); and relative homogeneity in the levels of natural character present
5. The information used to determine the natural character scores should come from a variety of sources including: various national, regional and local datasets; reports; field- inspections; and aerial and satellite image interpretation. It is not appropriate to rely only upon remote sensing for certain environment types, ecological communities and locations where there has been a lot of recent change or weed invasion
6. Units should not be aggregated before the natural character scores have been assessed against the thresholds of “high” and “outstanding” and then only for the purpose of simplifying the presentation of information to the public or decision-makers. Aggregation of unit data can be appropriate for other reasons such as reporting natural character change over time (for a wider locality, environment type, etc)
7. Standard thresholds (based on natural character scores) should be used for “high” and “outstanding”. For those environment types where there has been a disproportionate loss of natural character (e.g. alluvial plains and possibly dunelands) lower numerical thresholds could be appropriate.
8. Areas and opportunities for the restoration and rehabilitation of natural character[7] can be identified as part of the process of assessing coastal natural character of the Region

Photo 2: Whanganui Inlet

[7] As described in Policy 14 of the operative New Zealand Coastal Policy Statement

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Disclaimer

While every care has been taken in the preparation of this report and the underlying data collection processes, neither Pacific Eco-Logic nor Lincoln University is responsible for decisions or actions taken using the contents of this report.

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Introduction

This Envirolink Project uses the varied coastal environments of Tasman District to test and refine a new methodology developed for measuring the natural character of the coastal environment. This new methodology is called QINCCE (Quantitative indices for measuring the natural character of the coastal environment). The methodology was developed by and described in Froude (2011a). It uses a consistent framework for measuring coastal natural character in terrestrial and aquatic coastal environments.

Policy context

Under section 6(a) of the Resource Management Act all those exercising powers and functions under the Act are to recognise and provide for the preservation of the natural character of the coastal environment. This is amplified further in the 2010 New Zealand Coastal Policy Statement. Here, policies 13 and 14 are of particular relevance. Under policy 13 the adverse effects of activities in areas with outstanding natural character are to be avoided; while significant adverse effects are to be avoided, remedied or mitigated in all other areas. This is to be achieved by

- assessing the natural character of the coastal environment of the region/district, and by mapping or otherwise identifying at least areas of high natural character;
- ensuring that regional policy statements and plans identify areas where preserving the natural character requires objectives, policies and rules, and include those provisions

Policy 14 requires that the natural character of the coastal environment be restored or rehabilitated (using a variety of approaches).

These new policies place additional requirements on Tasman District Council that were not present when the Council prepared its Resource Management Plan for the region. Regional policy statements and Resource Management Act plans are required to give effect to the operative New Zealand Coastal Policy Statement (Resource Management Act s62(3),s67(3)(b) and s75(3)(b)). In addition section 35 of the Act requires councils to monitor the state of the environment within their region/district (to the extent that is appropriate to carry out their functions) and to monitor the effectiveness of their policies, rules and other methods in regional policy statements and plans.

For the Council to give effect to the operative New Zealand Coastal Policy Statement it needs to assess the natural character of its coastal environment. New methodology developed by the primary author and trialled in Northland appeared to provide a mechanism for the Council to do this. There was, however, a need to refine its application especially in the context of South Island sub-regional assessments. This Envirolink project provided the mechanism for doing this for a north-western South Island sub-region.

Tasman District Council is initially interested in Golden Bay. Previous work commissioned by Council identifying coastal landscape areas (Boffa Miskell 2005) stated that Golden Bay area was the most threatened coastal landscape area in the District. In 2010, the Council commissioned an identification of outstanding natural landscapes (Resource Management Act, s6(b) matter of national importance). Being able to quantitatively assess natural character in the coastal environment would complement the landscape identification work and it is hoped by Council that it may provide some synergies.

This project links to a number of other Council projects including:

- a project addressing the identification of outstanding natural features and landscapes (using external landscape specialists)
- *Valuing our waters* – a joint initiative with Council, the Cawthron Institute and Landcare Research looking at 'ideas, thoughts and beliefs' about the freshwater systems of the region
- Ongoing reviews of coastal settlements, particularly where the coast has been subject to more recent development pressures
- Coastal monitoring work undertaken by the Council's Environmental Unit
- New aquaculture initiatives in the Region
- Rural subdivision in remote areas with high natural character

These projects would be better informed if Council had a better way to measure coastal natural character and its change.

A previous Envirolink project (675NLRC95) contributed to the early development of the methodology for measuring natural character change. More recently published material on the methodology (Froude 2011b, c) demonstrates that the methodology has evolved considerably since the early Envirolink project. Ongoing refinement of the methodology for measuring coastal natural character has continued in the North Island, with this project providing a very useful opportunity to refine the methodology for application in the South Island.

Environmental context

There are some important differences between the coastal environments in northern New Zealand and those in Tasman District. These differences need to be considered when applying the QINCCE methodology for measuring coastal natural character, especially in determining baselines or reference conditions against which present (biological) cover is assessed.

Firstly, while mangrove scrub and forest are an important intertidal component in northern New Zealand, mangroves are absent south of Ohiwa Harbour in the east and Aotea Harbour on the west of the North Island. Estuaries in the South Island can therefore, have intertidal habitats that are significantly different to those found in Northland, Auckland, Waikato and Bay of Plenty.

Another important difference is that the native sand binder Spinifex is often the dominant sand binder on foredunes in northern New Zealand. In contrast most dune areas observed in Tasman District were dominated by the introduced sand-binder marram grass. It seems that as marram grass prefers cooler temperatures it is more competitive at southern latitudes, while Spinifex, which reaches its southern distribution limit on the West Coast at Westport (Shannel Courtney, Department of Conservation, pers. comm.), is less competitive. The dynamics of native and introduced sand binders affect ecological natural character and the dynamics of dunes.

Several other matters need to be considered when measuring natural character in Tasman District and especially Golden Bay. One is the complex geology. Some of the underlying geology (e.g. granite and some sandstones) produce soils and marine sediments of low fertility. This affects the biota and therefore requires baselines or reference conditions that recognise this. The pattern of

geology can be complex even at fine scales. This requires assessment to ensure that appropriate baselines are used when measuring some parameters.

Tidal ranges are larger in Golden Bay than those in northern New Zealand. Larger proportions of Golden Bay estuaries or inlets are intertidal and the subtidal is often restricted to just a few channels. Most northern New Zealand inlets and estuaries have a larger amount of sheltered shallow subtidal habitats.

Project purpose

As noted in the Introduction, the overall project objective has been to use the varied coastal environments of Tasman District to test and refine the application of the QINCCE methodology in the north-western sub region of the South Island.

Particular matters that were addressed in the context of refining the methodology application included:

- Optimal unit size and homogeneity of unit content in different types of coastal environment and contexts
- Measuring natural character in coastal environments that are subject to high levels of natural disturbance
- Refinements to scoring tables for assessing *progress to present-potential cover*, especially to address different situations to those found in northern New Zealand (e.g. no mangrove scrub & forest in intertidal environments, more pervasive presence of the introduced marram grass in dunelands, the absence of the iconic northern coastal trees pohutukawa and puriri)
- Contexts when present-potential cover or present-potential natural state should be re-set[8]
- Relationships between natural character scores of the QINCCE methodology and the new, but undefined, categories of "high" and "outstanding" natural character specified in the 2010 New Zealand Coastal Policy Statement
- Advice on where inland boundary of the coastal environment should be located in Tasman District in light of the New Zealand Coastal Policy Statement 2010, case law and experience elsewhere in New Zealand

Methodology

Overview of the project methodology

The methodology used and refined in this project was that developed by and described in Froude (2011a). The next section of this report summarises key features of that methodology.

[8] Froude (2011a) specifies that the present potential cover should be reset after natural disturbance to reflect the new physical conditions and timing of the natural disturbance. Present-potential cover is also reset for areas that are affected by hydrological and geomorphological changes resulting from human activities at another location (e.g. increased sediment in an estuary because of catchment land use activities). In these types of situations the magnitude and impact of each hydrological and geomorphological change is scored.

A series of case studies were selected from Golden Bay and Tasman Bay (mainly Motueka/Moutere) to address particular questions and to refine the methodology for application outside of northern New Zealand. A common theme of the case studies was that they had a focus on coastal environments that can have high rates of natural disturbance, particularly estuaries/"sheltered waters" and dunelands/soft shores. Two of the estuary case studies also included the terrestrial coastal environment surrounding the estuary. In this case the terrestrial coastal environment was that which we considered would be appropriate given the guidance supplied by policy 1 in the 2010 New Zealand Coastal Policy Statement, case law and experience elsewhere in New Zealand. In this context natural character was measured for a broad range of coastal environment types.

Council staff provided electronic and hard copy A3 1:10,000 aerial images of the very near shore and the terrestrial environment close to the shoreline. These aerial images included the 200m inland boundary of the existing Tasman District *Coastal Environment Area*[9] used in the Tasman Resource Management Plan, mean high water springs and the boundaries of Department of Conservation managed areas.

In some locations (e.g. Ruataniwha and Whanganui Inlets) the suggested inland extent of the coastal environment appeared to be inland of the scope of the aerial imagery provided. Natural character for these areas was not able to be measured for that part of the coastal environment not covered by the provided imagery. Aerial imagery at 1:25,000 scale was also provided by the Council for Whanganui, Ruataniwha and Moutere Inlets and their adjoining terrestrial environments as the 1:10,000 scale aerial images excluded parts of these larger inlets.

Overview of the methodology used for measuring coastal natural character

QINCCE uses indicators (and environment-specific parameters) derived from a comprehensive definition of natural character (Froude et al. 2010) that is consistent with an analysis of 100 Resource Management Act appeals to the Environment Court and higher Courts (Froude 2011a). A consistent framework is used for measuring natural character across terrestrial, freshwater and marine coastal environments. The methodology can be applied at a range of scales and for a range of purposes. For each broad class of coastal environment there is a core set of parameters that are used to calculate three sub-indices for each plan-view unit:

- An ecological naturalness index (ENI)
- A hydrological and geomorphological naturalness index (HGNI)
- A freedom from buildings and structures index (FBSI)

These three sub-indices are combined to give an overall natural character index (NCI) for each unit, which can be multiplied by 100 to give a natural character score between 0 and 100. Second tier parameters and alternative measurement perspectives have been developed for those situations where additional detail is required. These second tier parameters and alternative measurement perspectives are not used in regional or sub-regional assessments.

[9] The Coastal Environment Area is a management tool (does not include the coastal marine area) to control setback, height, design and appearance of buildings; provide some protection from natural hazards, and avoid refuse disposal, in a narrow coastal margin (200m from MHWS).

Several key parameters are measured relative to the reference condition *present-potential natural state* including S*core representing progress towards present-potential cover.* P*resent-potential cover* is the terrestrial land and aquatic benthic cover that would be present today had natural processes proceeded without the arrival of humans, the species they introduced and the consequential changes to the environment. Scoring tables for measuring *progress towards present-potential cover* have been developed for Northland (partly in Froude 2011a) and the Waikato Region. Hydrological and geomorphological naturalness is assessed relative to the equivalent *present-potential natural state.*

Protocols for addressing interactions between the hydrological (including hydraulics and water quality), geomorphological (including the characteristics of sediment), and cover parameters have been developed. This includes distinguishing between natural versus human-induced disturbance, and on-site versus off-site sources of disturbance. These protocols are particularly important for assessing natural character in areas such as the Firth of Thames where there has been an especially wide range of human impacts on hydrological, water quality and sediment characteristics that have a major impact on land/benthic cover. Protocols have been developed to avoid double-counting of impacts.

Defining units

Criteria for defining unit boundaries address environment type (generally there is one environment type as specified in Table 1 within a unit), management regime (e.g. management for production versus non-production purposes) and relative natural character homogeneity at the scale of mapping. Units are delineated manually on printed aerial imagery and on bathymetric charts for the marine environment away from the near shore. A scale of 1:10,000 was used for delineating units. Units were subsequently digitised as polygons with geo-referencing. Each geo-referenced unit has a unique identifier that links it electronically to a database containing that unit's description and a variety of parameter data.

The size of units varied depending on the complexity of environment types in an area and the variability in natural character at scales appropriate to the scale of the project. For example, there were large units covering extensive areas of indigenous forest at a similar stage of maturity or extensive areas used for a similar intensity of agriculture. Conversely, small units were used where the environment type was limited in extent in a particular location or a small feature (e.g. quarry, mature forest remnant, marine farm) was significantly different from its surrounding matrix.

"Environment types" are used for assigning the appropriate *present-potential cover*. For some environment types there are different *present-potential cover*s that reflect a gradient in environmental conditions and/or age of formation. For example there would be different present-potential covers for each of the foredune, intermediate and back dunes, and dune swales/wetlands within a broad environment type of dunelands. Table 1 sets out the coastal environment types used at a 1:10,000-1:25,000 scale of terrestrial and near-shore natural character measurement. This typology is applicable throughout New Zealand (although *present-potential cover* will vary to address local bioclimatic and geological differences and species distributions). The classification covers both terrestrial and aquatic coastal environments.

Table 1: Environment types used in assessing natural character in Tasman District

Environment type	Definition	Code
Alluvial	Where sediment has been moved by water. This includes some coastal features (e.g. chenier plains) as well as river features	AL
Aeolian (dunelands and associated features)	Where sediment has generally been moved by wind. While supratidal sediments are usually transported by water, supratidal sediments are included as part of the inland adjoining duneland environment	DU
Erosional	These are surfaces formed by erosional processes.	ER
Erosional steep	A sub-group of "steep" erosional surfaces that includes areas such as coastal cliffs and faces where a different *present-potential cover* is used because of the steepness of the site and skeletal soils	ER-s
Erosional open coast	A further subgroup of "open coast" erosional surfaces includes those directly exposed to the impacts of oceanic swells and open ocean climate and sea conditions (and the associated winds and salt-spray). A different *present-potential cover* is used to recognise the impacts of natural disturbance processes.	ER-o
Erosional steep open coast	Some areas are both steep/have skeletal soils and are subject to the effects of oceanic swells, sea conditions and climatic conditions. *Present-potential cover* is adjusted to recognise these combined impacts. Few of the assessed areas in the Tasman District were in this category	Er-s-o
Island	This is a secondary environment sub-type used in addition to the core environment type (e.g. erosional). Islands on the open coast can be isolated from seed sources and are often exposed to extreme disturbance regimes.	IS
Sheltered waters	These are marine units where the waters are protected from open ocean swells	SW
Marine- near shore	Marine areas less than 30 metres in depth that are not sheltered waters	MN
Marine -offshore	Marine areas deeper than 30 metres out to the Regional Council coastal marine area boundary	MO

Parameters measured

Table 2 sets out the indicators and the measured parameters for each of the three natural character sub-indices. These parameters are measured for each unit. Definitions of key terms used in the indicator and parameter descriptions are in Box 1. The core parameters are based where possible on underlying measured data (e.g. % cover). Those parameters using categorical data are supported by comprehensive scoring tables (e.g. Chapters 6 and 7 in Froude (2011a)). Direct measures improve

the sensitivity of the indices, as does the detailed guidance on scoring for those parameters using categorical data. Most parameters are scored, or direct measures are converted, to fall within the range of 0.01 to 1. Several parameters have less impact on naturalness and so a narrower scoring band is used (e.g. parameters addressing building colour naturalness /reflectivity, building prominence, level of animal pest control (terrestrial) and freedom from human-harvest pressure (marine).

The concepts of *present-potential natural state* (and *present-potential cover*) have been developed to facilitate comparisons of levels of natural character present in different environment types and contexts. *Present potential state* (PPS) is the state or condition that would be present today had humans, their tools and technology and the introduced species they brought with them not arrived in New Zealand. This can apply to hydrology, geomorphology, and cover (including vegetation and encrusting fauna). It can also be used for fauna (e.g. fish and birds). When used for biological components extinct species are not included as the return of extinct species is not possible.

The reason for comparing present day state with the *present-potential natural state* is that this provides a standard reference condition that can be applied to all environment types and contexts. It allows natural character levels in different types of environment to be aggregated or compared as appropriate. In some situations it can be difficult to determine the appropriate *present-potential natural state* (including *present-potential cover*). Examples of such situations include environments subject to frequent natural disturbance (e.g. coastal cliffs, estuarine environments, wetlands and dunes with their associated swales). In these types of situation, determining *present-potential natural state* requires a good understanding of hydrological, geomorphological and ecological processes for the area being assessed.

A special form of *present-potential natural state* is *present-potential cover*. An important ecological parameter is *Progress to present-potential cover*. Scoring tables have initially been developed to assist scoring for some environment types (Froude 2011a). Further comprehensive tables have since been developed for scoring P*rogress to present-potential cover* for different environment types in northern New Zealand. These have been modified as appropriate for this project to address biogeographical differences in species presence and abundance and the effect these difference have on present-potential and actual cover. One of the most significant differences is the absence of mangroves and the associated mangrove forest and scrub communities from intertidal environments in South Island sheltered waters.

Present-potential cover is typically described in relatively general terms as often the precise species composition (especially on land) is the product of the characteristics of the site, broad scale environment patterns and processes (e.g. factors affecting broad-scale distribution patterns for individual species) and stochastic factors (e.g. what coloniser arrived first after a disturbance event).

The steps for determining *progress to present-potential cover* are as follows:

- Describe the current cover or covers in a unit (e.g. low mixed broadleaved scrub, intertidal flats with dense sea grass)
- Determine the *present-potential cover* based on the environment type, known natural processes and location-specific environment conditions

- Use the scoring tables to determine the score for *progress to present-potential cover* for each described cover category in the unit

Tables for scoring progress to present-potential cover are still being refined and are not included in this report. They address wet and dry alluvial flats; erosional surfaces generally and where there are steep slopes, skeletal soils and/or highly exposed sites, dunelands (foredunes, intermediate and back dunes and dune swales); sheltered waters (areas with mangroves and/or saltmarsh, intertidal flats, subtidal reefs and soft-sediment). These tables address the scoring for different levels of alien species invasion in natural areas of any type. They also address the scoring for human-managed biological systems (e.g. plantation forests, pastoral farming).

Table 2: QINCCE methodology: core indicators and parameters arranged by sub-index

Ecological naturalness index (ENI)	
Indicator	**Parameter(s)**
Cover type extent (natural area, natural surface and biological artefact cover)[1]	% unit with cover type *(i)* /100
Impact of alien mammals on native flora and fauna (terrestrial & freshwater)	Score representing the level of pest control
Level of protection/ naturalness mobile biota (marine)	Score representing the level of freedom/protection from human harvesting pressure
Progress to present-potential-cover[1]	Score for *progress to present-potential cover* for each natural cover type
Hydrological and geomorphological naturalness index (HGNI) **HGNI=1-HGIS (Hydrological and Geomorphological Impact Score)**	
Indicator	**Parameter(s)**
Hydrological and geomorphic impacts	• Score representing the magnitude of each human-mediated change to the hydrology, hydraulics, water quality and/or geomorphology compared to the *present-potential natural state* • % area affected by each human-mediated hydrological and/or geomorphological change
Freedom from buildings and structures index (FBSI) **FBSI=1-BSIS (Buildings and Structures Impact Score)**	
Indicator	**Parameters**
Building, structure, paved or surfaced cover	% area/100 buildings % arear/100 structures % cover paved/surfaced areas/100[2]
Building & structure height/volume	Score for maximum height (terrestrial or intertidal) of buildings; structures; paved Score for structure volume (subtidal)
Building colour naturalness, reflectivity and prominence (terrestrial & intertidal and water surface)	Score for colour naturalness and reflectivity of buildings; structures; paved/surfaced areas Score for prominence (from public places) of buildings, structures and paved/surfaced areas
Alien cover on structures (subtidal)	Score representing the level of alien cover on structures only

[1] Descriptions of special purpose terms are in Box 1

[2] Paved or surfaced areas include sealed and unsealed roads as well as hard surfaced areas which may or may not be sealed

Box 1: Special purpose terms used in the QINCCE methodology

Cover type (CT): This includes different types of land and benthic biological cover. It includes natural areas, natural surfaces and biological artefacts

Natural areas (NA) have vegetation or benthic cover (including marine encrusting fauna) and are where natural processes predominate. The species are not necessarily native and may include ecological pest plants and/or encrusting fauna.

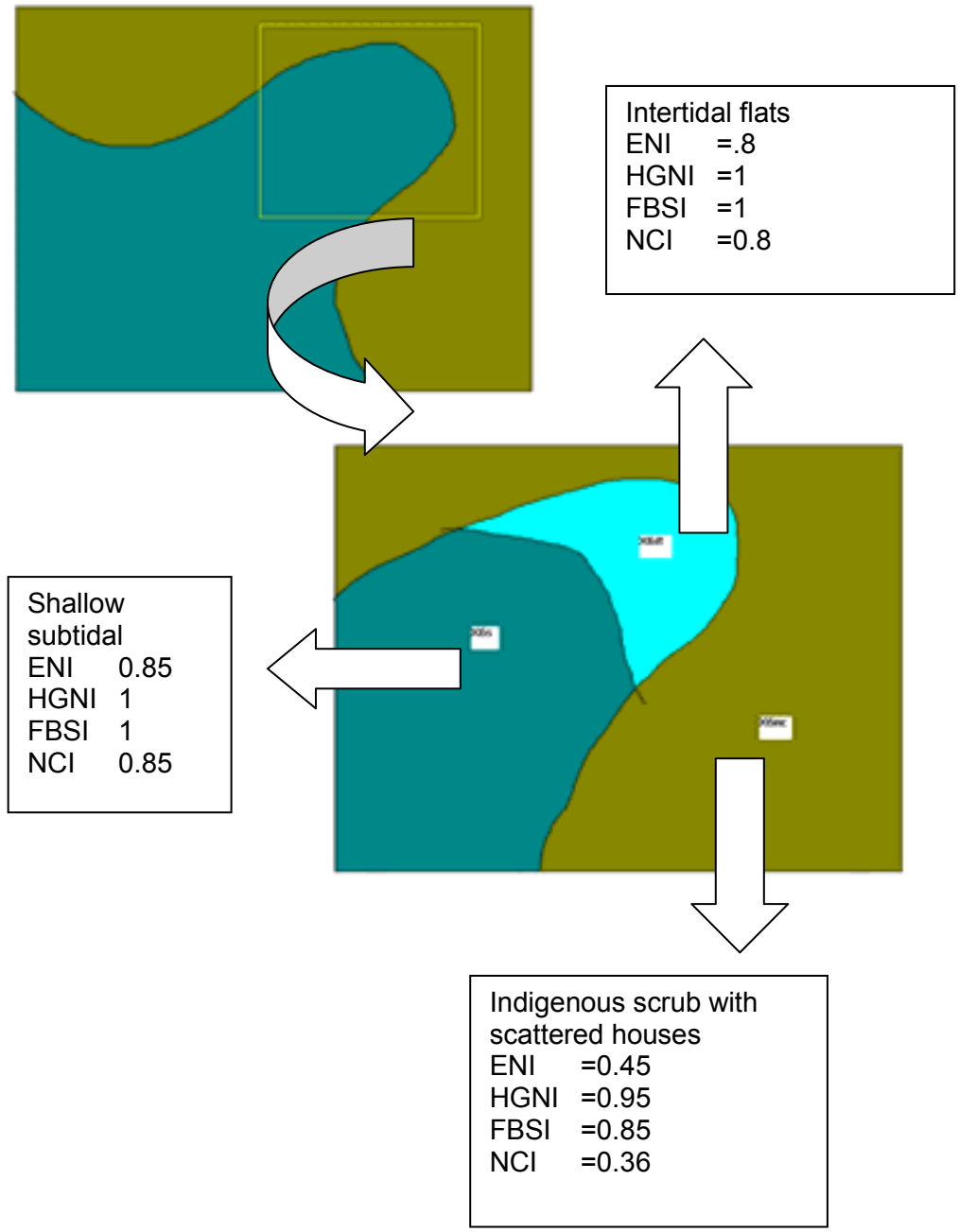
Natural surface areas (NS) do not have a readily visible biotic cover (e.g. very steep cliffs, highly mobile sands) and are where natural processes predominate.

Biological artefacts (BA) are where human management of the biota prevails. This human management is evident in the biological patterns and processes (e.g. agricultural, horticultural and forestry areas, orchards, vineyards, gardens, lawns and other areas of mown grasses).

Present potential state (PPS) is the state or condition that would be present today had humans, their tools and technology and the introduced species they brought with them not arrived in New Zealand. This can apply to hydrology, geomorphology, and cover (including vegetation and encrusting fauna). It can also be used for fauna (e.g. fish and birds). When used for biological components extinct species are not included as the return of such species is not possible.

Present-potential cover (Progress to PPC). Present-potential cover for a site is the cover that would be present had humans and the introduced species they brought with them not arrived in New Zealand. It differs from historical vegetation /cover in that it incorporates the effects of geological, climatic disturbances and other natural changes that have occurred since human arrival and so is not necessarily the "climax" cover, particularly for areas where there are high levels of natural disturbance.

Figure1 (from Froude 2011a) provides a simplified diagrammatic representation of the application of the natural character measurement methodology to three units. It shows only an example of the calculated sub-indices and the natural character index, not the contributing parameter assessments.



1: Diagrammatic representation of the application of the QINCCE methodology

Chapter 7 of Froude (2011a) contains the rationale and assessment protocols for the parameter *Score for progress to present-potential cover.* As previously discussed in this report a more comprehensive set of tables has been developed for scoring *progress to present-potential cover* across a wider range of environment types and contexts.

The rationale and assessment protocols for other core parameters are generally addressed in Chapter 6 of Froude (2011a). This includes the scoring protocols for:

- Magnitude of each hydrological and geomorphological change
- building and structure height (Table 6.5)

- building and structure colour naturalness and reflectivity scores for terrestrial and intertidal environments (Table 6.6)

In subtidal environments the colour naturalness and reflectivity of structures are not especially relevant since structures are rapidly covered by encrusting organisms unless antifouling paints are used and regularly reapplied. A major potential impact of structures in subtidal environments is that they provide a new surface that can be colonised by alien invasive flora and fauna. This specific impact is not addressed in the ENI and is therefore included in the BSIS for subtidal environments. This parameter has not been fully applied at this stage as the scoring for the water surface and subtidal has not been decoupled at this scale of mapping. Information about introduced marine species in the environment generally has been collected and used in the environmental naturalness index scoring. The colour naturalness and reflectivity of the surface components of structures has been included in marine environment scoring.

Froude (2011a) provides the rationale and scoring protocols for the pressure parameters[10]:

- Score for freedom from alien mammalian (terrestrial)/fish (freshwater) species as represented by measured condition and/or pest eradication/control strategy)
- Score representing the level of protection from human harvesting pressure (marine)

Subsequent experience has shown that the scoring protocols used for the first bullet point had too large an impact on the overall scores, especially at the regional or sub-regional assessment scale. The scoring range has been modified to address this problem. The scoring range is now 0.8-1 with the same four options as set out in Table 6.2 in Froude (2011a). For marine environments the score representing the level of protection from human harvest pressure is as set out in Table 6.3 although this table has now been expanded to address different levels of fishing restrictions using information from Froude and Smith (2004) and elsewhere. The scoring range used for this indicator ranges from 0.7-1. As many Golden Bay estuaries are largely dry at low tide, the level of pest control parameter is used instead of the protection from human harvest pressure parameter, except for outer estuaries with subtidal channels.

The original formulae developed in Froude (2011a) separated the scoring for building and structure colour naturalness and reflectivity. It should be emphasised that these matters have relatively little impact on the scoring as there is only a three-point scoring range (0.8-1). These have now been combined into a single parameter and a parameter addressing building and structure prominence has been added. This uses the same scoring range (0.8 when there is a low level of prominence from public places to 1 when prominence is high). Public places include reserves and other public space and the coastal marine area.

The parameters for human-induced hydrological and geomorphological change address the magnitude of impact and the proportion of a unit affected by the impact. Hydraulic changes are also addressed as are aspects of water quality (from the perspective of the environment rather than human health). Table 6.4 in Froude (2011a) contains the scoring system for on-site changes while Table 6.5 addresses the protocols for scoring off-site impacts. Some additional matters have been

[10] **As in the OECD pressure-state-response model for indicators Organisation for Economic Co-operation and Development 1993. OECD core set of indicators for environmental performance reviews. Environmental Monographs No 83. Paris. 39 p.**

added to these tables. The proportion of the unit affected by each change is estimated using ortho-rectified aerial images or marine charts, field inspection as required and other sources of information where these are available.

To avoid inappropriate double counting of impacts caused by off-site human activities, Table 7.1 in Froude (2011a) sets out the protocols for addressing different types of disturbance. This is particularly relevant to aquatic environments where up-catchment activities can result in changes in the types and amounts of sediment and nutrients reaching downstream or down-current aquatic environments. There can be a long period of off-site adjustment following hydrological, hydraulic and geomorphological disturbance at a site that is typically up-stream or up-current. For example, in the Firth of Thames, an area that was previously intertidal sand flat was transformed into mangrove forest by the deposition of millions of cubic metres of mud following catchment deforestation and floodplain isolation. Deforestation largely occurred from the 1850's to the 1920's. Floodplain isolation was developed from the 1920s to the 1970s. Mangrove colonisation began in the 1950's when the surface elevation reached 0.5m above mean sea level. Mangroves now extend 1km seaward of their 1952 seaward boundary and in places more than one metre of fine mud has accumulated on top of former sand flat (Swales & Bentley 2008).

In the context of the QINCCE methodology, the impacts of the changed hydrology and geomorphology resulting from human actions at another location are addressed directly in the hydrological and geomorphological naturalness parameters for the off-site location(s). To avoid double counting the impacts, the *present-potential cover* for the biotic or surface cover is reset to that which is appropriate for the changed hydrology and geomorphology. This reset only applies where the human actions that led to the changes are off-site ones (Table 7.1 in Froude 2011a).

Calculating natural character indices

Froude (2011a) contains a detailed evaluation of the rationale and the approach used to construct the natural character indices. There are three primary sub-indices:

- Ecological naturalness index (ENI)
- Hydrological and geomorphological naturalness index (HGI)
- Freedom from buildings and structures index (FBSI)

The formulae for each of these sub-indices is constructed so that their calculated value lies between 0 and 1, and when multiplied together, the natural character index calculated value also lies between 0 and 1. The overall natural character index (NCI) which can be multiplied by 100 to give a natural character score with a range of 0 to 100.

Results

A series of maps show the boundaries of the assessed units and the unique identifier for each assessed unit. The maps are as follows:

- Maps 1A, 1B, 1C, 1D Whanganui Inlet and its "coastal catchment"
- Map 2 Whahariki duneland and associated rock islets and peninsulas

- Map 3 Western Farewell Spit (part accessible to the public) and Puponga Estuary and its "coastal catchment"
- Map 4 Ruataniwha Inlet and its "coastal catchment"
- Map 5 Collingwood to Parapara Estuary
- Map 6 Marahau, Kaiteriteri and Otuwhero Estuaries
- Map 7 Motueka-Moutere-Kina Peninsula

The unique identifiers shown on Maps 1-7 can be linked to key information about each mapped unit. Appendix 1 contains the summary information for Golden Bay while Appendix 2 contains the summary information for Tasman Bay. This information includes the size (in hectares), natural character indices, the natural character score and summary description for each unit. This information is condensed from a detailed spreadsheet used to calculate the indices and store information about the units. Further information about each of the units is in this spreadsheet as Appendix 3.

Photo 3: Farewell Spit dune swale

Analysis and discussion

Interpretation of natural character scores

Care is needed when interpreting natural character scores. Given the extensive human-mediated hydrological, geomorphic and ecological changes that have taken place in most New Zealand coastal environments, few areas can be expected to sustain a natural character score of more than 70. Such scores are more likely to occur in areas subject to high levels of natural disturbance as this can regularly reset the present-potential cover and humans often avoid attempting development in such areas.

Where humans do undertake development in areas with high natural disturbance levels, the development is usually associated with high levels of modification intended to significantly reduce the risk/effects of natural disturbance. These profound changes typically remove most of the remaining natural character. An example of such profound change is the Hauraki Plains where the original forest has been removed; the rivers have been channelized and stop-banked to prevent flooding of the floodplain; and the land has been drained and is now mostly used for intensive dairying. Natural character scores for these parts of the Hauraki Plains are less than 4 out of 100. A local example is the drained alluvial flats in the catchment of the Ruataniwha Inlet where the original forest has been removed and there is a pasture cover. Here natural character scores are less than 7, reflecting the slightly lower level of human impacts on natural character.

Some people may be surprised by what seems to be low natural character scores for some units. This is usually because they are unaware of the types and extent of human-mediated changes that have occurred. It could also be the result of some people interpreting natural character as primarily being an absence of buildings and structures (Fairweather & Swaffield 1999). Laypersons are not necessarily aware of the variety of components that make up natural character and many lack knowledge about what is natural in a particular environmental context. For example, most people do not necessarily know which organisms are native to an area.

There can be major differences in perception as to what is natural, particularly with some types of coastal environment (e.g. subtidal rocky reefs, former dune and wetland complexes). In heavily developed or exploited areas this can lead people to accept as “natural” quite high levels of anthropogenic modification. This may be appropriate in the context of protecting what is left, but not so helpful for restoration. In this context the lower expectations of naturalness may be a result of the shifting baselines syndrome as described by Pauly (1995) for fisheries scientists (Box 2). The ‘shifting baseline’ syndrome can be observed in many other environments and contexts.

Box 2: Shifting baseline syndrome*

As described by Pauly, shifting baselines occur because each generation of fisheries scientists accepts as a baseline the stock size and species composition that occurred at the start of their careers. This 'baseline' is then used to evaluate changes. Over time this leads to a gradual downward shift of the baseline, an acceptance of losses and the use of inappropriate reference points including rehabilitation targets. Examples of shifting baseline syndrome include dramatic declines in fish and other exploitable organism biomass along the North Atlantic coast of Canada to 10% of that two centuries ago (Pauly 1995), changes in the mean size and abundance of New Zealand snapper over the last 40 years unrecognised by fishers (Parsons et al. 2009), and the lack of recognition of the impacts of artisanal/'small-scale' fishers in many areas including the Caribbean, Indian Ocean, South Pacific and Australia (Pinnegar & Engelhard 2008).

* From Froude 2011a

A scoring range of 0-100 has also been used for older-style national exams where people had scores that tended towards the middle of the 0-100 range and few had scores at the upper and lower extremes. This distribution of scores has a bell curve shape and is known as a normal distribution. In contrast, area-weighted natural character scores do not seem to be normally distributed. Assuming an appropriately defined coastal environment boundary, much of the New Zealand terrestrial and freshwater coastal environment can be expected to score at the lower end of the natural character scoring range. This is because of the extensive human modifications to many terrestrial and freshwater coastal environments resulting from their relative accessibility, productivity and ease of development. Relatively few terrestrial and freshwater coastal environments are likely to have natural character scores at the upper end of the 0-100 range. Regions are likely to vary in their overall area-weighted average natural character scores for the coastal environment. The likely overall trends for marine natural character are less clear and further work will be required.

Scale

Natural character can be measured at a range of scales. Imagery at a scale of 1:10,000 was used for this project. This led to a relatively detailed assessment of natural character, although the QINCCE methodology has some additional tools that can be used for very detailed assessments as might be appropriate for a resource consent investigation (Froude 2011a).

For broad regional-scale assessments a scale of 1:25,000 would generally be appropriate, especially for terrestrial and freshwater components of the coastal environment. Less detailed scales mean that there is a significant risk of missing small important areas of "outstanding" or "high" natural character as may be required to implement the New Zealand Coastal Policy Statement 2010[11]. Where the focus is the identification of areas of "outstanding" and "high" natural character, a scale of 1:25,000 is a good compromise between not missing smaller areas and having a manageable project.

[11] This is addressed in more detail in the next section

Apart from the near-shore marine environment where there have been different amounts and types of human impacts, the majority of the coastal marine area out to the 12 nautical mile territorial sea boundary can be assessed at scales of 1:100,000 or similar using bathymetry or marine charts as the template for boundary identification. Work to refine regional-scale subtidal application of the QINCCE methodology is being undertaken as part of another project.

Using the natural character scores for determining thresholds of "high" and "outstanding" natural character

The New Zealand Coastal Policy Statement 2010 policy 13 identifies a policy threshold of "outstanding" and an identification threshold of "high" natural character. Natural character scores can be used to determine these thresholds. In so doing it is recommended that the following matters be taken into account:

1. "Outstanding" and "high" are comparative rather than absolute concepts and are affected by the context within which they are assessed. This contrasts with the natural character scores which are determined using the QINCCE methodology. The QINCCE methodology uses the same parameter framework and scoring protocols for all areas and for all coastal environments. It may be appropriate to use different QINCCE natural character scores for the thresholds of "outstanding" and "high" natural character in different regional contexts. . This could address the concerns of some (particularly those in urban communities such as Auckland) who may be concerned that few areas would meet national standard thresholds for "outstanding" and "high" natural character. It would allow an area with a relatively high score to qualify as regionally outstanding natural character, although it may not exceed the threshold to qualify as nationally outstanding.
2. Those areas of "outstanding" natural character are the best of what is left. The New Zealand Coastal Policy Statement policy setting is that there should be no further loss of natural character in these areas. This makes the setting of this threshold more critical than that used for "high". The natural character scores can be used to provide a robust basis for setting thresholds especially for "outstanding" natural character".
3. It is suggested that there be standard "high" and "outstanding" natural character score thresholds for a region. Depending on the regional context it may be appropriate to set lower thresholds for those environment types where there have been greater levels of natural character loss in that region and/or nationally. These thresholds would only be confirmed after natural character has been measured for the coastal environment within the region or part of the region being assessed.
4. There have been some questions about the basis for using lower numerical thresholds for those environment types where there has been much greater loss of natural character either regionally or nationally. Alluvial flats are an example of an environment type that has been extensively modified through drainage, stop-banking and vegetation clearance in most parts of New Zealand and very few areas of highly natural alluvial plain remain. Because of this loss, the setting of different thresholds for at least "outstanding" (best of what is left) could be appropriate. Because "outstanding" is a comparative term it is important to compare like with like, and comparing the degree of natural character remaining in fertile alluvial plains with that remaining in the deep ocean is not going to result in much remnant swamp forest scoring as "outstanding" when compared with offshore waters. Lower thresholds may also

be appropriate for dunelands, which are also generally highly modified. There are other types of environment where there have been higher levels of human modification (Walker et al. 2005). Typically these LENZ[12] environments are identified at a more specific level than is being used in the QINCCE natural character measurement methodology. Lower thresholds may also be appropriate in those instances where these critical LENZ environments are within the coastal environment.

5. Given the changes to natural character throughout much of the coastal environment it would be inappropriate to set thresholds for "outstanding" and "high" as might be used for grading the results of exams. The QINCCE methodology can result in lower scores for naturalness than might be expected in some situations. Further work is required to confirm appropriate thresholds for Golden Bay. Work on determining appropriate thresholds elsewhere in New Zealand is under way in several regions.

The "threshold" of high applies only to mapping or otherwise identifying natural character. It is not currently a policy threshold and so the level at which it is set is less critical. In contrast, the threshold for "outstanding" is a policy threshold in the 2010 New Zealand Coastal Policy Statement (requiring that adverse effects of activities on natural character be avoided, rather than remedied or mitigated). As there has not previously been a threshold of "outstanding" for natural character (and there are no thresholds in the primary legislation) there is no specific case law. The case law relating to "outstanding" natural landscapes (s6(b) Resource Management Act) may provide guidance on the interpretation of "outstanding" in the context of natural character. A comprehensive review of this case law is beyond the scope of this project.

Aggregating natural character scores

One of the purposes of this project was to consider optimal unit size and homogeneity of unit content in different types of coastal environment and contexts. As part of the research on this matter, units that had been depicted at the relatively detailed mapping scale of 1:10,000 were aggregated using different criteria for inclusion (i.e. all land in an environment type at that locality, removal of "developed" areas, intertidal areas only, and aggregation of terrestrial and large intertidal areas but without the "developed" areas). To appropriately aggregate different natural character scores it is important to use area-weighted natural character scores. This means that the natural character scores for large units have a proportionally larger influence on the aggregated natural character score than do the scores of smaller units.

Different units can be added or removed from the combined area-weighted natural character scores depending on the purpose of the aggregation. For example it may be that the developed units are excluded so leaving only the areas with a natural cover included in the aggregation. Table 3 shows the effect of different combinations of units for the Farewell Spit dunelands accessible to the public on the area-weighted natural character scores[13].

[12] Land Environments of New Zealand

[13] Map 3 shows the boundaries of the individual units and appendix 1 contains the individual scores

It is very important to determine the purpose of aggregation before any units are aggregated. An appropriate reason may be to report changes in natural character over time for a wider locality, an environment type or areas with certain types of management. Aggregation for this purpose makes it easier for the public or decision-makers to understand the overall extent of changes in coastal natural character.

It is not proposed that units in which natural character has been measured for the purpose of determining areas of "high" or "outstanding" natural character[14] be aggregated as part of the process of determining which areas have "high" or "outstanding" natural character. Protocols have been established for determining unit boundaries to ensure that this step is as robust as possible. Each measured unit is individually assessed as to whether it meets thresholds for high or outstanding natural character.

It is only after each natural character unit has been assigned to one of three categories (less than high, high or outstanding) that it would be appropriate to consider aggregation of units for the purpose of making easy-to-understand maps for the community and decision-makers. It is important to make the rank assignment prior to aggregation to avoid risks of arbitrary aggregation of units which could affect whether areas meet particular thresholds or otherwise. The original units would remain as a layer in Council's GIS system along with links to information about each unit. This detailed information could be used for a variety of purposes.

[14] As in Policy 13 of the 2010 New Zealand Coastal Policy Statement

Table 3: The effect of different combinations of units on the area-weighted natural character scores for the dunelands at Farewell Spit which are accessible to the public

Units aggregated	Size (ha)	Area-weighted NCS	Examples of units with NCS considerably lower than the overall dune area-weighted NCS	Examples of units with NCS considerably higher than the overall dune area-weighted NCS
All terrestrial duneland Farewell Spit area accessible to public	434.21	36.76	FS15 (13.46 for 58.43ha of pasture)	FS11 (58.93 for 11.50ha of extensive dune swale with ponds, native rushland & scrub)
Terrestrial Farewell Spit accessible to public minus units used for production purposes (i.e. pasture/ pines (FS1 & FS15)	344.37	43.07	FS9 (31.5 for 3.82ha of steep dune with marram grass & few native shrubs) FS7 (31.5 for 5.88ha of low fringing foredune with gorse-marram shrubland)	FS11 (58.93 for 11.50ha of extensive dune swale with ponds, native rushland & scrub)
Intertidal protected area at Farewell Spit accessible to public	647.46	88.48	No units have scores that are considerably lower than the overall weighted average	No units have scores that are considerably lower than the overall weighted average
Intertidal & terrestrial duneland at Farewell Spit accessible to public minus units used for production purposes (i.e. pasture/pines)	991.83	72.72	FS9 (31.5 for 3.82ha of steep dune with marram grass & few native shrubs) FS7 (31.5 for 5.88ha of low fringing foredune with gorse-marram shrubland)	FSM2 (90 for 102.34ha of intertidal sand flats in Department of Conservation nature reserve) FS11 (58.93 for 11.50ha of extensive dune swale with ponds, native rushland & scrub)

As can be seen from Table 3 it would be appropriate to separately report changes in natural character over time for those aggregations of units that separate the dunelands managed for production purposes from those managed for conservation purposes. It would also be appropriate

to separately report the terrestrial and intertidal given the relatively large areas in each and the differences in their scores.

Defining the coastal environment

As part of this project Tasman District Council asked for guidance on defining the inland boundary of the coastal environment. The Tasman Resource Management Plan currently contains a "Coastal Environment Area" which applies to the area 200m landward of mean high water springs. This is an overlay which contains controls on setbacks, height, design and appearance of buildings; provides some protection for coastal hazards; and avoids refuse disposal. An important positive aspect of an overlay with its fixed 200m inland boundary is that it is clear where the boundary is and it seems to be accepted by the community (Shelagh Noble, Tasman District Council, pers. comm.).

Defining the inland extent of the coastal environment for the purposes of the Resource Management Act and New Zealand Coastal Policy Statement is a more complex exercise. Policy 1 of the 2010 New Zealand Coastal Policy Statement sets out a number of components that are part of the coastal environment. It lists specific types of coastal environment including:

- The coastal marine area,
- Islands (within the coastal marine area),
- Coastal lakes, lagoons, tidal estuaries, saltmarshes, coastal wetlands and the margins of these (as well as other areas where coastal processes, influences or qualities are significant)

There are also generic coastal environment features

- Coastal vegetation and the habitat of indigenous coastal species including migratory birds
- Areas at risk from coastal hazards
- Inter-related coastal-marine and terrestrial systems

For the avoidance of doubt the coastal environment is also to include:

- Elements and features that contribute to natural character, landscape, visual qualities or amenity values
- Items of cultural or historic heritage in the coastal marine area or on the coast
- Physical resources and built facilities including infrastructure that have modified the coastal environment

There is some case law that discusses the location of the inland coastal environment boundary. This typically focuses on the first (visually) dominant ridge behind the coastline. This criterion is not included in policy 1 of the New Zealand Coastal Policy Statement 2010.

In *Crooks and Sons Ltd v Invercargill City Council and Southland Regional Council (C8/97*) the Environment Court said:

"Cases under [The Town and Country Planning Act]… held that the coastal environment is an environment in which the coast is a significant part or element. What constitutes the coastal environment will vary from place to place and according to the position from which it is viewed. Where there are hills behind the coast it will generally extend up to the dominant ridge behind the coast – see for example Northland Regional Planning Authority v Whangarei County Council (1977) DA 4828…

Counsel did not refer to any cases under the present Act that specifically deal with this issue and we have been unable to find any ourselves. Most of the cases considered under the present Act have been cases where the issue has been whether the coastal environment has a natural character and if so whether the proposed activity will adversely affect it…".

In *S Martin-Weber and S Martin-Weber v Hutt City Council and Jourdan Developments Limited* (WW23/03) the Environment Court discussed whether the proposed subdivision in the hills adjoining Kowhai Street, Eastbourne was in the coastal environment. The Court adopted the Northland Regional Planning Authority v Whangarei County Council (1977) and found that the site "lying between the dominant ridge and the coast, can be considered as being within the coastal environment for the purpose of the Resource Management Act." (para 39, p8). The court also observed that the site did not have a coastal interface and that there was no coastal element in the vicinity of the site.

In Wilkinson v Hurunui 2000 (EnvC C50/00) the Court stated that "it is also obvious that the area at the mouth of the river is part of the coastal environment. The coastal environment is generally accepted as extending to the ridge of the nearest skyline".

The first dominant inland ridge can be quite high in some locations and it can be unclear where the inland coastal environment should be. In *Dudin v Whangarei District Council [2007] A22/07*) the Court found that Mount Manaia and its associated ridge at 400-420 metres elevation was within the coastal environment. Mount Manaia and its associated mountain range rise steeply from developed coastal plains near the coastline within the Whangarei Harbour. The *Dudin v Whangarei District Council* decision indicates that in particular locations it may be appropriate to extend the inland coastal environment to higher elevations than is typically being used elsewhere.

Another complementary approach to determining an inland coastal environment boundary is to use bioclimatic zones. These are based on major climate drivers of vegetation patterns in the natural state. In the Waikato Region, bioclimatic zones have been identified based on a refinement by Leathwick et al (1995) of a generalised national bioclimatic map prepared by Meurk (1984). The coastal zone, as opposed to coastal environment, was defined as land below 300m above sea level and less than 1km inland from the coastal line (http://www.waikatoregion.govt.nz/Environment/Environmental-information/REDI/1086812/). This bioclimatic zone for coastal vegetation was not the only criterion considered when the inland coastal environment boundary was depicted in the proposed Waikato Regional Policy Statement as some areas higher than 300m and some areas more than 3km inland are included within the coastal environment. (http://www.waikatoregion.govt.nz/PageFiles/16962/Proposed_Regional_Policy_Statement_full.pdf).

So how would a fixed distance for the inland coastal environment boundary fit with the requirements in the New Zealand Coastal Policy Statement, guidance from case law and bioclimatic zone research? It would be unlikely that a fixed inland distance would include all components of the coastal environment unless it was a large fixed distance. However, a large fixed distance would

probably include areas considered to be non-coastal and so would not be robust if faced with legal challenges.

We specifically considered the potential location of an inland coastal environment boundary in four areas: the catchment surrounding Whanganui Inlet and a short distance on the open coast north of the Whanganui Inlet entrance; Puponga Estuary catchment; Ruataniwha Inlet catchment and the open coast from Collingwood to Parapara Estuary. Our basic approach was that the coastal environment should include the coastal marine area plus:

- All environment types and features specified by New Zealand Coastal Policy Statement 2010 policy 1 (although we were uncertain about the most appropriate inland distance on low-lying alluvial plains subject to coastal hazards such as flooding resulting from storm surges and tsunamis); and
- In other areas the first dominant ridgeline (using a near-shore "on-the-water" viewing position) except where this ridge is both over 300m in elevation and more than 2km from the nearest coastline.

Because of the limitations in the extent of some the aerial imagery and because we did not have contour lines we were not able define the inland boundary on the first dominant ridge where it was greater than 300m in elevation. This led to our assessment covering the scope of provided tiles rather than the precise coastal environment boundary in places. One result of this was an arbitrary looking eastern boundary on maps 1B and 1D for Whanganui Inlet, and the equivalent for the western boundary on Map 4 for Ruataniwha Inlet. In contrast, the proposed southern coastal environment boundary for the Whanganui Inlet uses the first dominant ridge and because the Maungarakau Swamp does not naturally drain into the Whanganui Inlet, the upper reaches of the Maungaraukau Swamp are not included in the proposed coastal environment even though the distance from the Inlet is less than 1km in places.

Following trials, our assessment was that the coastal environment is best defined (using contours, Land Cover Database 2, and a variety of other information sources) as a draft line prior to the measurement of coastal natural character. This draft line can then be refined following the natural character fieldwork which could identify locations where it could be appropriate to shift the draft boundary (e.g. wetland margins). While further work is required to refine some of the details it is suggested that the coastal environment include the coastal marine area plus:

- All environment types and relevant features specified by the New Zealand Coastal Policy Statement 2010 policy 1. More work is required to determine the appropriate distance inland on low-lying alluvial plains subject to coastal hazards such as flooding resulting from storm surges of previously recorded heights and tsunamis of a scale equivalent those that have occurred over the last 800 years[15]. The vegetation deemed to be coastal[16] should be that within the coastal bioclimatic zone for that region; and
- The area up to the crest of the first visually dominant ridgeline (using a near-shore "on-the-water" viewing position)[17]. Further work is required to confirm the most appropriate altitude limit for Tasman District in situations where this ridge is both over 300m in elevation

[15] McFadgen (2007) describes a number of tsuanamis that have occurred along parts of the New Zealand coast since human settlement about 800 years ago
[16] As in New Zealand Coastal Policy Statement policy 1(2)(e)
[17] Based on guidance from case law as previously discussed

and consistently more than 2km from the nearest coastline. There are some issues to address when the first dominant ridge is some kilometres inland (e.g. inland of the Motueka Plains). Other issues arise where the first dominant ridge is low and there is coastal vegetation inland of it (e.g. Whararikí dunes).

At this stage it seems that human judgement and manual depiction produces fewer anomalies than automated mapping by computer using a series of decision-rules and existing datasets. Our experience elsewhere has also indicated that there can be variety of issues to address in defining the inland coastal environment in some locations (e.g. should the coastal environment extend further inland on the open coast than for upper tidal reaches of estuaries and rivers). The use of a decision-tree is recommended when determining the inland coastal environment boundary.

Photo 4: Whararikí Stream lower reaches

Measuring natural character for dunelands

Dunelands have a high level of natural disturbance, especially for those areas closest to the coast line. This natural disturbance resets present-potential cover (usually to bare sand and native sand binders). In much of northern New Zealand, those parts of dune systems that are subject to regular or recent natural disturbance (typically foredunes, blowouts or inland migrating dunes) the predominant cover is native sand binders and bare sand. The exceptions are areas with high levels of human disturbance (e.g. introduced species such as marram grass and agapanthus originally from deliberate plantings or dumped plant material).

A key difference between dunelands in northern New Zealand (where the methodology was originally developed) and the Tasman District is the relative pervasiveness of the non-native marram grass in Tasman District dunelands, especially on foredunes. In Tasman District the native sand-binders were absent or relatively rare except in those limited areas of recent dune building (e.g. Collingwood open coast near the Ruataniwha Estuary mouth) or current *dunecare* projects (e.g. sand spit at the southern entrance to Parapara Estuary). In the case of the Ruataniwha Estuary mouth, aerial imagery shows a large amount of change in the offshore sand bar system which is the likely reason for the observed recent dune building on the southern sand spit near the Estuary mouth.

Hilton (2006) discusses how active New Zealand dunes (including current foredunes) are naturally sparsely vegetated with only three indigenous sand-colonising foredune species. Today most active dunes bear little resemblance to early botanical descriptions. The area of active dunes in New Zealand has decreased from 129,402ha in the 1950's to 38,949ha in the 1990's- an average decline of 70% in 40 years (Hilton 2006). Tasman District had the second highest rate of regional decline (78%) over these 40 years (from 3007ha to 655ha) although the District had only 2.3% of the national 1950's total (Hilton 2006).

Marram grass is able to disperse and invade active dunes very rapidly. For example Hilton et al. (2005) describe the exponential rate of spread of marram grass at Mason Bay, Stewart Island from 1958 to 1998. Esler (1978) describes how, in the Manawatu, marram grass dunes are nearly always relatively steep eroding dunes with blow-outs. Hilton (2006) found that the cover of marram grass nationally increased significantly from 1985 to 2005 and by 2005 in the South Island only Fiordland and Stewart Island had dune systems that were substantially free of maram grass. At this stage indigenous sand binders predominate in northern New Zealand. The prevalence of marram grass in most South island foredunes may be a consequence of the most common native sand binder (Spinifex) reaching its southern distribution limit at Westport and marram grass preferring cooler temperatures than those found in northern New Zealand (Shannel Courtney, Department of Conservation Nelson, pers. comm.).

The difference in the level of native species generally found on foredunes in northern New Zealand versus Tasman District led to a review of the tables used for scoring progress to present-potential cover in dunelands. These tables had originally been developed for northern New Zealand and addressed different levels of non-native and native species. Separate tables had been developed for foredunes, intermediate dunes and dune swales, and back dunes. In the interests of maintaining national consistency the review determined that the scoring differences between dunes dominated by native versus introduced species should remain. The tables were expanded to more explicitly provide for the contribution of bare sand to the score p*rogress to present-potential cover*. This was particularly relevant for those situations where there were relatively extensive dune blow-outs with

little alien vegetation (marram grass) remaining. Examples of this were found in the Whahariki Beach and Farewell Spit case studies.

In those areas with extensive dune blow-outs it can be difficult to determine what the *present-potential cover* should be. This is because, for a particular site it may be unclear whether the instability is largely the result of natural or human processes. For the purpose of scoring *progress to present-potential cover* in the Farewell Spit dunelands, it was assumed that for the extensive areas of dune blowouts on the Tasman Sea coast both natural processes and human actions were relevant with the latter including burning and extensive grazing from the 1850's to the 1970's. It is also likely the introduced marram grass led to dune steepening and blow-outs.

For Farewell Spit it is likely that the natural (pre-human or pre-European) vegetation on the spit was a mosaic of flax, scrub and low coastal forest (http://www.doc.govt.nz/upload/documents/about-doc/concessions-and-permits/conservation-revealed/farewell-spit-lowres.pdf). Using this context the more established areas of indigenous scrub received higher natural character scores as did the shallow dune lakes and dune swale mosaics. The areas of extensive dune blowouts with limited areas of remnant non-native marram grass received a moderate score (in recognition of the large amount of bare sand and the human impacts on geomorphology and cover). The lowest scores were for currently farmed areas at the base of the Spit.

Table 4 contains combined area-weighted average natural character scores for selected duneland areas in Golden Bay[18]. This table includes the size of the combined area along with examples of mapped units that have area-weighted natural character scores above and below the average for that duneland. For Whahariki Beach and Farewell Spit several combinations were assessed. Not unexpectedly, the scores were higher if the pasture areas were excluded. In addition both areas scored higher when the marine intertidal environment was included. The marine intertidal environment was not measured for the lower scoring smaller dunelands further south in Golden Bay that are included in Table 4.

[18] The individual unit boundaries are on Maps 2 (Whahariki), 3 (Farewell Spit where public access), Map 5 (Collingwood-Parapara). Unit scores are in Appendix 1

Table 4: Combined natural character scores (NCS) for selected assessed dunelands in Tasman District for 2011

Duneland	Size (ha)	Area-weighted NCS	Examples of units with NCS considerably lower than the dune area-weighted NCS	Examples of units with NCS considerably higher than the dune area-weighted NCS
Whahariki Beach[1]	114.82	58.36	WK6 (13.5 for 13.5ha grazed pasture)	WK14 (90 for 35.52ha intertidal sand flats)
Whahariki[1] minus pasture unit WK6	93.22	68.75	WK11 (30.42 for 5.93ha mosaic native & introduced species on dunes including marram grass & gorse)	WK14 (90 for 35.52ha intertidal sand flats) WK7 (72 for 4.95ha with relatively mature native forest on dunes)
Terrestrial Farewell Spit accessible to public minus pasture/ pines (FS1 & FS15)	344.37	43.07	FS9 (31.5 for 3.82ha of steep dune with marram grass & few native shrubs) FS7 (31.5 for 5.88ha of low fringing foredune with gorse-marram shrubland)	FS11 (58.93 for 11.50ha of extensive dune swale with ponds, native rushland & scrub)
Intertidal & terrestrial Farewell Spit accessible to public minus pasture/pines	991.83	72.72	FS9 (31.5 for 3.82ha of steep dune with marram grass & few native shrubs) FS7 (31.5 for 5.88ha of low fringing foredune with gorse-marram shrubland)	FSM2 (90 for 102.34ha of intertidal sand flats in Department of Conservation nature reserve)
Collingwood-Parapara dunelands (terrestrial only)	32.91	29.35	PN10 (16 for 7.25ha for rough pasture with gorse & introduced trees & scattered trees)	PN2 (68 for 5.07ha for freshwater/brackish wetland) PN3 (76.5 for 4.08ha for freshwater/brackish wetland)
Parapara south spit (terrestrial only)	15.66	31.75	PP3 (15.85 for 6.46ha of grazed sandflat with small areas gorse- mixed broadleaved scrub & planted macrocarpa trees)	PP1 (56.1 for 3.68ha for tip of sand spit including dune restoration with native sand binders, some marram grass & small area of gorse & mixed

Duneland	Size (ha)	Area-weighted NCS	Examples of units with NCS considerably lower than the dune area-weighted NCS	Examples of units with NCS considerably higher than the dune area-weighted NCS
				broadleaved scrub)

[1]Excludes units made up of rock islets and peninsulas. The 35.32ha of rocky islets and peninsulas (excluding the area in pasture) has an area-weighted natural character score (NCS) of 68.18

For that part of the sand spit assessed (within the area with free public access which includes units FS1-15 plus FS21 and FS32) the area-weighted average 2011 natural character score was 36.76. If Unit FS15 (grazed pasture on sand flats) and FS1 (pines) is excluded the area-weighted average natural character score is 43.07. The area-weighted natural character score for the intertidal environment associated with the assessed part of the Spit was 88.46. This recognises the relatively unmodified state of the intertidal, including harvest restrictions associated with its protected Nature Reserve status. The area-weighted natural character score for the duneland terrestrial minus the pasture and pines as well as the intertidal was 72.72.

Johnson (1992) contains a botanical/conservation rating of more than 300 South Island dune systems, including Farewell Spit. The assessments were made between 1984 and 1988. Farewell Spit as a whole received a score of 14/20. Past modifications noted included extensive fires and grazing by sheep, farmed and feral cattle. Weed threats such as gorse were reported. The wider spit and associated intertidal area (11, 288ha) forms a Wetland of International Importance under the Ramsar Convention. Its key values relate to the wildlife, including wading birds.

For Whahariki Beach dunelands (excluding the rock islets and peninsulas) the highest natural character scores were for the intertidal sand flats and native ecosystems on older back dunes (e.g. forest and Nikau Lake). The mostly bare relict dunes received a moderately high score while the lowest scores were for grazed back dunes and swales largely without native vegetation. Today marram grass is the dominant plant species on the relict dunes. The area-weighted average for the combined natural character score for the dune part of Whahariki Beach, including the intertidal flats was 58.36. The removal of the developed duneland used for pastoral use increased the area – weighted average natural character score to 68.75.

Johnson (1992) assigned a botanical/conservation rating to Whahariki Spit (Dunes) of 9/20. Modifications noted included destruction of original forest by fire, logging and stock; and dune modification by stock and people. The main threat observed was ongoing cattle use. Today the area is a farm park and stock are excluded from areas not being actively farmed. The boundaries of Johnson's assessment area were not identified but it is assumed that the prominent rocky outcrops and peninsulas were not included. Reasons for the relatively low score included a relatively high degree of weed invasion, and reduced proportion and diversity of native plants.

Measuring natural character for estuaries

Estuaries often have high levels of natural disturbance, particularly in their lower reaches where they can be subject to both disturbance from heavy sea conditions and flood events from the catchment. A wide variety of resources, as well as field inspections at low tide, were used to assess the natural character of a selected set of estuaries within Golden and Tasman Bays. The unusually high number of cut-off estuary arms associated with some of the assessed estuaries meant that the measurement process for those estuaries took longer than anticipated. Most of the cut-offs were the result of road causeways and sometimes resulted in cut-offs with a very different character to the main estuary (e.g. freshwater pond rather than intertidal flats and saltmarsh). Whanganui Inlet and the Moutere Inlet had particularly high numbers of cut-offs.

Natural character scores have been calculated for the individual units for each estuary assessed (Appendix 1)[19] and aggregated to give the area-weighted natural character score for the marine environment (usually below mean high water springs) for each of the assessed estuaries (Table 5). The Estuary with the highest area-weighted overall natural character score was the Whanganui Inlet.

Photo 5: Parapara Estuary north-east arm

[19] The unit boundaries are shown on Maps 1A-D (Whanganui), 3 (Puponga), 4 (Ruataniwha), 5 (Parapara), 6 (Morehau & Otuwhero), 7 (Motueka, Moutere)

Table 5: Combined natural character scores (NCS) for the *marine environment* of selected Tasman District estuaries (below mean high water springs[1])

Estuary	Size (ha)	Area-weighted NCS	Examples of units with NCS considerably lower than the estuary-area-weighted NCS	Examples of units with NCS considerably higher than the estuary-area-weighted NCS
Whanganui Inlet	2655.18	77.12	WM13 (49.46 for 0.47ha-small cut-off inlet outside the marine reserve)	WM1 (90 for 395ha –core part of the marine reserve)
Puponga	44.41	75.71	PE5 (54.56 for 4ha small cut-off wetland by road causeway	PE3 (84.65 for 11.5ha ebb tide delta area within Department of Conservation nature reserve)
Ruataniwha Inlet	1068.9ha	64.27	RU16 (47.2 for 1ha upper inlet cut-off by road causeway)	RU10 (70.97 for 12.7ha Waikato Inlet)
Parapara	192.64	69.44	PP7 (33.46 for 23.16ha for cut-off arm of estuary with undersized culvert & too high an invert level)	PP6 (75.3 for 150ha intertidal flats & channels)
Marahau	29.15	63.87	MA5 (42.5 for 2.84ha of sand spits migrating inland over saltmarsh. Southern spit is weed infested)	MA3 (72.75 for 10.24ha of estuarine inlet with native saltmarsh and salt herbfield, intertidal sand flats with natural sand incursions)
Otuwhero	99.55	59.2	OW1 (33.12 for 5.69ha of sand spit enclosing the estuary. The spit is heavily modified by carpark, vehicle tracking, rock rip-rap and weeds	OW4 (72.09 for 12.29ha of upper intertidal saltmarsh flats where the bridge crossing the stream leaves flows relatively intact
Motueka (Kumeras estuary only)	99.62ha	17.04	MK3 (3.41 for 4.3ha of old river mouth separated from river & bisected by causeways, floodgates and drains)	MK1 (25.5 for 23.1ha for weed infested sand spit bounding Motueka relict estuary)
Moutere Inlet and	1219.2	58.31	MT6 (11.24 for 4.38ha cut-off lagoon that has changed	MT21 (71.95 for 77ha of supratidal sands, dune islands

Estuary	Size (ha)	Area-weighted NCS	Examples of units with NCS considerably lower than the estuary-area-weighted NCS	Examples of units with NCS considerably higher than the estuary-area-weighted NCS
Motueka Sandspit			from intertidal flats to turbid freshwater lagoon)	& intertidal flats. Many waders) MT2 (71.95 for 287ha of the main south-east arm of Moutere Inlet with good marginal saltmarsh and salt herbfield)

[1] The estuary sizes in this table may differ from those published elsewhere because of differences in which areas are included (e.g. parts of sand spits or ebb tide deltas may be included in this table)

As with dunelands we have compared the estuary natural character scores with other assessment frameworks for estuaries. The first framework was developed during 1990-93 by Davidson (Davidson 1990, 1992; Davidson & Moffatt 1992) to compare and value the estuaries and near-shore coastal waters of the newly established Nelson Marlborough Conservancy. This reported overall conservation value as "conservation status" on a 0-100% scale, derived from 11 contributory "criteria". The second was developed by Robertson et al (2002) of the local Cawthron Institute during 2000-2002 to establish a national Estuarine Environmental Assessment and Monitoring Protocol. This reports "condition ratings" for 14 contributory indicators.

Others have been developed for New Zealand wetland condition generally (http://www.landcareresearch.co.nz/research/biocons/restoration/docs/handbook2004.pdf) and for community based monitoring of estuaries in the North Island (http://www.niwa.co.nz/our-science/freshwater/tools/mangrove2).

Each of these measures or makes estimates of different parameters and aggregates these into an assessment of relative condition or value. However none of these frameworks appear to assess this current state relative to the natural state of the specific area being assessed, but rather to an idealised state of a generic area of that type. This can lead to some unhelpful ratings of condition. For example in Robertson and Stevens (2009), Whanganui Inlet has been rated as LOW habitat quality for its (naturally) low abundance of saltmarsh, and the Motueka Delta has been rated as POOR habitat quality for its lack of seagrass, which would never have occurred there naturally.

Comments on particular estuaries follow:

Moutere Inlet:
This is a modified and shallow tidal lagoon type of inlet with two entrances and two layers of barrier sandspits of different ages. It still has significant areas of saltmarsh and saltmeadow herbfields, but these have been halved over the past 60 years (Robertson & Stevens 2009). Only a trivial amount of *Zostera* seagrass has been recorded in recent years, but it may have been extensive prior to forest

clearance and other development of the catchment of the estuary. It still supports extensive shellfish beds and wildlife (especially waders and shorebirds). The catchment development and various discharges of wastewater contribute nutrients to localised areas of enrichment and fine sediments to the more sheltered intertidal flats. Both contaminants are retained primarily in the dozen or so small intertidal lagoons formed from embayments cut off from the main inlet by roading causeways that now intercept most of the sub-catchments of the inlet, including the Moutere River.

Saltmarshes and herbfield salt meadows are most modified within these causewayed lagoons, including through drainage and reclamation. Even though some of these lagoons still contain good quality saltmarsh, herbfields and mid-tidal flats, their natural character has been reduced because the dominant effect of the causeway has been to reduce exposure to wind and waves within the enclosed area through shortened fetch. This minimises wave-induced re-suspension of previously deposited fine sediments (and bound nutrients) and hence their export downstream on outflowing tides.

The accelerated accumulation of fine sediments and nutrients will reduce the intertidal water depth and allow expansion of saltmarsh. While such a succession might increase the "condition rating" (sensu Robertson and Stevens 2009) or even the "biodiversity value" (sensu s.6(c) RMAct) of the lagoon, it is still the result of an anthropogenic modification and will result in a reduced natural character score.

This example is outlined to emphasise the distinction between enhancement of habitat values and restoration of natural character. Another example is situated in unit MT3 where a rock causeway has been physically removed from the outside of a south-eastern embayment, as it was no longer needed to support a re-routed State Highway 6. The area of causeway removal has been returned to the same elevation as the adjoining intertidal flats and recently replanted with saltmarsh species, and the restored embayment now has a natural character score of 64.5. This reflects an increase in natural character despite the rather raw state of the restoration works and, possibly, an associated small decrease in habitat value.

The size of the Moutere Inlet system assessed in this analysis was 1219ha, considerably more than the 762ha of intertidal and subtidal areas calculated in 2006 for Moutere Inlet as reported by Robertson and Stevens (2009). This is largely because the wider system boundary has been extended to include the Motueka Sandspit and the waters it encloses as well as the ebb-tide delta of the southern entrance. These are an intergral part of the sand exchange system of the Moutere Inlet and largely comprise intertidal sandflats together with unstable supratidal sands and subtidal channels dominated by sands and cobbles.

Ruataniwha Inlet:
This inlet is unusual in comprising both a classic river mouth delta type estuary in the south where Aorere river waters dominate, as well as a classic tidal lagoon type estuary in the centre/north where small catchment inflows are dominated by marine inflows through the shared entrance enclosed by a barrier spit. Because there is an extensive ebb-tide delta system outside the entrance linked to a growing offshore sandspit extending well to the north and protecting the adjoining Waikato Estuary, the boundaries of the Ruataniwha system have been extended to include this

estuary, the offshore sandspit/sandbar and the sheltered waters it encloses. This totals 1069ha of subtidal, intertidal, and supratidal spit areas, compared with 864ha reported by Robertson and Stevens (2009).

Landuse intensification has been increasing in part of the catchment, generating more inputs of fine sediment, nutrients and other contaminants. However, the shallow nature of the inlet and the flushing effect of river flows in the southern part of the inlet do mean that few contaminants are retained and most are exported to the wider Golden Bay.

Conversely, some of the other aspects of the management of the wider Golden Bay ecosystem, especially dredging for scallops and other shellfish, appear to have contributed to an increase in the supply of sand and other coarse sediments to the inshore littoral conveyor system. This is manifest in the development of offshore sandbar/sandspit systems at Ruataniwha and Motueka.
This poses challenges in assigning natural character scores when the degree of anthropogenic contribution to environmental changes is unclear.

Whanganui Inlet:
This is a largely unmodified tidal lagoon type estuary with relatively high tidal dominance, and therefore sandy substrates and clear enough waters to support extensive beds of intertidal and even some subtidal *Zostera* seagrass beds. The two main impacts on the natural character of this inlet are the large number of roading causeways constructed across the heads of several dozen embayments and coastal wetlands, and the artificial diversion of the drainage of the upper Mangarakau wetland eastward into the Whanganui inlet. One of the effects of this diversion is to increase the amount of humic acids in the western inlet and marine reserve. This has resulted in reductions in water clarity and the extent and vigour of seagrass meadows. It seems an anomaly that the seagrass meadows are more vigorous outside the marine protected area.

The causeway impact is reflected in the reduced natural character score for the affected embayments, in accord with the consequences summarised in the commentary for Moutere Inlet.

Measuring the natural character of the terrestrial and freshwater coastal environment surrounding estuaries

Natural character was measured for terrestrial and freshwater areas within a potential revised coastal environment around several estuaries: the catchment surrounding Whanganui Inlet and a short distance on the open coast north of the Whanganui Inlet entrance; Puponga Estuary catchment; Ruataniwha Inlet catchment. The natural character of the coastal environment associated with the open coast from Collingwood to Parapara Estuary was also assessed.

As noted previously (“Defining the Coastal Environment”), because of the limitations in the extent of some of the aerial imagery and because we did not have contour lines we were not able to define a suggested inland boundary for the coastal environment where the first dominant ridge was greater than 300m in elevation. This led to the assessment covering the scope of provided tiles rather than a precise potential coastal environment boundary in places. One result of this was an arbitrary looking eastern boundary on maps 1B and 1D for Whanganui Inlet, and the equivalent for the

western boundary on Map 4 for Ruataniwha Inlet. A consequence of this is that the unit area calculations (Appendix 1) and the area-weighted natural character scores (Table 6) should be considered to be indicative only. [20].

Table 6: Combined natural character scores (NCS) for the assessed parts of the *terrestrial and freshwater* coastal environment[1] for Whanganui and Ruataniwha Inlets and Puponga Estuary[2]

Estuary	Size (ha) [1]	Area-weighted natural character score[1]	Examples of units with NCS considerably lower than the estuary-wide area - weighted NCS	Examples of units with NCS considerably higher than the estuary-wide area -weighted NCS
Whanganui Inlet	5255	53.91[2]	WL13 (0.45 for small reclamation by old wharf with parking, sheds) WL31 (12.18 for 120ha mostly logged forestry area) WL45 (14.12 for 569ha mostly pasture with few small patches native vegetation)	WL16 (86.69 for 177ha mature native forest) WL14 (77.31 for 1906ha mature and regenerating native forest)
Puponga Estuary	238.04	50.2	FS31 (13.28 for 40ha pasture with some buildings)	FS30 (72 for 14.6ha freshwater wetland)
Ruataniwha Estuary [3]	1455.4	25.04[2]	C7 (3.25 for 7.6ha commercial & built Collingwood on the flat) RU22 (1.62 for 29.9ha of active quarry zone)	RU13 (81 for 0.6ha native podocarp/mixed broadleaved forest on alluvial flats RU33 (72 for 0.9ha podocarp remnant on alluvial flats) RU28 (64.1 for 388.5+ha mature & regenerating podocarp/mixed broadleaved forest)

[1]The inland boundary for some parts of the terrestrial coastal environment was not precisely defined and so the size (ha) and the aggregated area-weighted natural character scores are indicative

[2]The suggested inland coastal environment boundary was not precisely determined for some indigenous forest units (see note 1)

[3]Includes the terrestrial Ruataniwha units plus Collingwood units C4-C8b

[20] Boundaries for the terrestrial and freshwater units are on Maps 1A-ǃD (Whanganui), 3 (Puponga) and 4 (Ruataniwha). Unit scores are in Appendix 1.

If only those units with predominantly indigenous cover were included in the scores, the aggregated area weighted natural character scores would be higher than what is shown in Table 6. Much of the indigenous forest for the southern sector of Whanganui Inlet has outstanding natural character with unit natural character scores over 75. In addition the aggregated natural character score for the terrestrial and freshwater coastal environment around Whanganui Inlet includes some farmed areas which, while part of the open coast coastal environment, were included in units that also included land in the Whanganui Inlet catchment.

Conclusion

This project has achieved its primary purpose of refining the QINCCE methodology for South Island application. This has included expanding and revising scoring tables for measuring *progress to present-potential cover*. The methodology has also been refined for areas subject to high levels of natural disturbance, especially estuaries and dunelands. For those estuary locations where off-site human activity has led to significant on-site changes, the application of re-sets has been refined. As requested, we have provided advice on defining the inland boundary of the coastal environment in the light of the 2010 New Zealand Coastal Policy Statement, case law and experience elsewhere in New Zealand.

The QINCCE methodology has been examined as to its utility for regional assessments of natural character, and in particular the relationship between natural character scores and the 2010 New Zealand Coastal Policy Statement thresholds of "high" and "outstanding". Natural character scores are based on the use of standard national reference conditions. Guidance has been provided on using natural character scores for setting thresholds for high and outstanding. This guidance is being refined as part of the application of the methodology to regions in other parts of New Zealand.

Recommendations

For Council to meet the requirements under section 6(a) of the Resource Management Act (for the coastal environment) and policies 1, 13 and 14 of the New Zealand Coastal Policy Statement 2010 it is recommended that:

1. The inland boundary of the coastal environment be manually delineated using a systematic approach based on a variety of information sources as described in this report. This should be defined and digitised before or as part of the process for measuring coastal natural character.
2. The natural character of the terrestrial, freshwater and marine coastal environment (including out to the 12 nautical mile Regional Council boundary) be measured using the QINCCE methodology. There are two alternative approaches that can be used to do this:
    a. All of the coastal environment could be measured using the QINCCE methodology
    b. A set of screening criteria could be used to exclude from assessment those areas that would definitely not reach a threshold of "high". This approach would mean that not all parts of the coastal environment need to be measured using the QINCCE methodology and so it would be a lower cost option. A set of criteria has been

developed elsewhere for doing this. To enable the appropriate setting of thresholds these "triaged" areas would still be digitised (so the size of the area can be determined) and the environment type would be identified

3. To provide a balance between recognising small areas of "high" or "outstanding" natural character and a cost-effective project, it is recommended that natural character be measured at a scale of 1:25,000 using recent aerial or satellite imagery as a base
4. The boundaries of units in which natural character is measured are defined using a set of criteria relating to environment type (generally a unit does not straddle environment types); management regimes (e.g. production land uses versus conservation; different types of marine protection/fisheries management regimes); and relative homogeneity in the levels of natural character present
5. The information used to determine the natural character scores should come from a variety of sources including: various national, regional and local datasets; reports; field- inspections; and aerial and satellite image interpretation. It is not appropriate to rely only upon remote sensing for certain environment types, ecological communities and locations where there has been a lot of recent change or weed invasion
6. Units should not be aggregated before the natural character scores have been assessed against the thresholds of "high" and "outstanding" and then only for the purpose of simplifying the presentation of information to the public or decision-makers. Aggregation of unit data can be appropriate for other reasons such as reporting natural character change over time (for a wider locality, environment type etc)
7. Standard thresholds (based on natural character scores) should be used for "high" and "outstanding". For those environment types where there has been a disproportionate loss of natural character (e.g. alluvial plains and possibly dunelands) lower numerical thresholds could be appropriate.
8. Areas and opportunities for the restoration and rehabilitation of natural character[21] can be identified as part of the process of assessing coastal natural character of the Region

[21] As described in Policy 14 of the operative New Zealand Coastal Policy Statement

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APPENDIX 1: Summary information for Golden Bay Units

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WM1	SW	395.75	0.90	1.00	1.00	0.90	90.00	Whanganui Inlet	Main southern intertidal & subtidal section of the Inlet. Marine reserve since 1994. The outlet from the Mangarakau Swamp has been artificially channelled into the SW corner of the Inlet. There are scattered moorings and buoy channel markers & some old wharf remains. Mangarakau Wharf area is a separate unit	interidal flats, some with sea grass	fringing saltmarsh		
WM2	SW	29.66	0.69	0.95	1.00	0.66	65.54	Whanganui Inlet	Mangarakau River cut-off by road causeway. Upper tidal flats with minimal fringing saltmarsh. Caueseway & bridge	intertidal flats			
WM3	SW	5.70	0.59	0.97	0.99	0.57	56.52	Whanganui Inlet	Cut-off formed by road causeway. Good numbers of Amphibola. Limited fringing saltmarsh. Road causeway	intertidal flats			
WM4	SW	14.10	0.59	0.95	1.00	0.56	56.18	Whanganui Inlet	Cut-off formed by road causeway (Muller Creek). Good numbers of Amphibola. Limited fringing saltmarsh. No sea grass. Road causeway	intertidal flats			
WM5	SW	12.41	0.69	0.95	1.00	0.66	65.54	Whanganui Inlet	Island Creek cut-off formed by road causeway. Some fringing saltmarsh (oioi). Road causeway	intertidal flats			
WM6	SW	1.43	0.57	0.91	0.98	0.51	50.70	Whanganui Inlet	Cut-off formed by road causeway. Upper intertidal flats	intertidal flats			
WM7	SW	2.85	0.57	0.91	0.98	0.51	50.70	Whanganui Inlet	Cut-off formed by road causeway. Upper intertidal flats	intertidal flats			
WM8	SW	26.74	0.69	0.95	1.00	0.66	65.54	Whanganui Inlet	Cut-off formed by road causeway. Upper intertidal flats, mainly sand with more muddy areas near margins with saltmarsh fringe.	intertidal flats			

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
									Banjo Creek				
WM9	SW	5.14	0.69	0.94	0.99	0.64	64.07	Whanganui Inlet	Cut-off formed by causeway for old road (not now used) with outlet cut through rock. Brackish ponding saltmarsh (oioi, *Juncus krausii)*	brackish flats			
WM10	SW	1.01	0.57	0.91	0.98	0.51	50.70	Whanganui Inlet	Cut-off formed by road causeway. Upper intertidal flats	intertidal flats			
WM11	SW	2.65	0.78	0.93	0.99	0.71	71.19	Whanganui Inlet	Cut-off formed by road causeway. Upper intertidal flats. Excellent forest catchment. Scenic Reserve, Marine rreserve	intertidal flats			
WM12	SW	36.86	0.83	0.93	0.99	0.77	76.77	Whanganui Inlet	Cut-off formed by road causeway. Upper intertidal flats. Wairoa River	intertidal flats			
WM13	SW	2049.84	0.76	1.00	1.00	0.76	76.00	Whangani Inlet	Northern main compartment of the Inlet. Wildlife Management Reserve. Extensive sand & silty sand flats with large areas of dense sea grass (compared to WM1). Also shell banks. Limited areas fringing saltmarsh & occasional informal ramp area	intertidal flats with sea grass & shell banks	saltmarsh (oioi, J. krausii),	marsh ribbonwood)	
WM14	SW	20.17	0.64	0.99	1.00	0.63	63.42	Whanganui Inlet	Saltmarsh on both sides of White Pine Creek				
WM15	SW	36.67	0.55	0.96	1.00	0.53	52.98	Whanganui Inlet	Large tidal inlet cut-off by road causeway. Upper intertidal flats. Sea grass not seen. Causeway. Wildlife management reserve	intertidal flats			
WM16	SW	1.05	0.66	0.94	0.99	0.62	61.50	Whanganui Inlet	Upper tidal flats cut-off by road causeway. Good amounts of sea grass & amphibola. Native forest catchment	intertidal flats with sea grass			

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WM17	SW	4.86	0.67	0.95	0.99	0.63	62.97	Whanganui Inlet	Upper tidal flats cut-off by road causeway. Good amounts of sea grass & amphibola. Native forest catchment	intertidal flats with sea grass			
WM18	SW	0.47	0.54	0.93	0.99	0.49	49.46	Whanganui Inlet	Small catchment cut-off by road causeway. Some sea grass. Fringing saltmarsh	intertidal flats with sea grass; fringing saltmarsh			
WM20	SW	2.57	0.67	0.95	0.99	0.63	62.97	Whanganui Inlet	Upper tidal flats cut off by road causeway. Inlet follows road to eastern coast. Silty sand flats with fringing saltmarsh. Road causeway & culvert	intertidal flats with sea grass. Fringing saltmarsh			
WM21	SW	1.56	0.66	0.94	0.99	0.62	61.50	Whanganui Inlet	Small catchment cut-off by road causeway. Intertidal flats & fringe saltmarsh	intertidal flats & saltmarsh			
WM22	SW	3.69	0.68	1.00	1.00	0.68	68.00	Whanganui Inlet	Marine area around old Mangarakau Wharf & boat launching area that is excluded from the Westhaven (Te Tai Tapu) Marine Reserve	interidal flats, channel (wharf & launching ramp in unit WL13)			
WL1	ERS	11.56	0.45	1.00	1.00	0.45	44.84	Catchment Whanganui Inlet	Steep coastal faces at South Head. Mosaic introduced grasses,mixed broadleaved & manuka & kanuka scrub, sand & rosk.	rock & sand	mixed broadleaved scrub; manuka & kanuka scrub	introduced grasses	
WL2	ER	106.77	0.40	1.00	1.00	0.40	39.97	Catchment Whanganui Inlet	Hillslopes with manuka- kanuka & mixed broadleaved scrub & forest with pockets rata & nikau. Occasional small building & some tracking	kanuka dominant scrub	mixed broadleaved scrub; scrub	mixed broadleaved forest	pines
WL3	ER	306.19	0.60	1.00	1.00	0.60	60.20	Catchment Whanganui Inlet	Hillslopes with younger mixed broadleaved - manuka forest with valleys & lower slopes of mature podocarp/ mixed broadleaved forest; manuka & kanuka scrub pockets upper slopes; mixed broadleaved scrub water margin rocky	mixed broadleaved dominant young forest	mature podocarp/ mixed broadleaved forest: rimu-rata/ kamahi-beech	manuka & kanuka scrub	young mixed broadleaved scrub on rocky cliffs

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
									headlands. Road				
WL4	ER	9.53	0.40	1.00	1.00	0.40	39.95	Catchment Whanganui Inlet	Low ridges with manuka, mixed broadleaved scrub & low forest. Occasional emergent tanekaha	manuka dominant scrub	mixed broadleaved scrub & forest		
WL5	ER	5.98	0.34	1.00	1.00	0.34	34.06	Catchment Whanganui Inlet	Manuka dominant scrub with some emergent pines on hillslopes. Road	manuka dominant scrub			
WL6	ER	3.98	0.37	1.00	1.00	0.37	37.35	Catchment Whanganui Inlet	manuka & kanuka dominant scrub, mixed broadleaved scrub on hillslopes	manuka dominant scrub	kanuka & mixed broadleaved scrub & low forest		
WL7	ER	41.36	0.39	1.00	1.00	0.39	39.43	Catchment Whanganui Inlet	manuka & kanuka dominant scrub, mixed broadleaved scrub & forest on hillslopes	manuka dominant scrub	kanuka & mixed broadleaved scrub & low forest		
WL8	IS-ER	0.82	0.50	1.00	1.00	0.50	49.50	Whanganui Inlet	island with mixed broadleaved -manuka scrub	mixed broadleaved - manuka scrub			
WL9	IS-ER	1.21	0.50	1.00	1.00	0.50	49.50	Whanganui Inlet	island with mixed broadleaved -manuka scrub	mixed broadleaved - manuka scrub			
WL10	ER	2.84	0.36	1.00	1.00	0.36	36.35	Catchment Whanganui Inlet	manuka dominant scrub on hillslopes. Road	manuka dominant scrub			
WL11	ER	5.69	0.79	1.00	1.00	0.79	78.99	Catchment Whanganui Inlet	scattered podocarps/ beech-mixed broadleaved forest on hillslopes	podocarp/ mixed broadleaved forest with beech			

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WL12	ER	68.43	0.41	1.00	1.00	0.41	41.26	Catchment Whanganui Inlet	hillslopes with manuka & mixed broadleaved - beech scrub & low forest with some emergent podocarps. Road	manuka dominant scrub	mixed broadleaved - beech scrub	mixed broadleaved - beech forest	
WL13	AL	0.43	0.02	0.30	0.87	0.00	0.45	Catchment Whanganui Inlet	Old wharf area with reclamation, sheds, caravans, pine and parking area	scrub with pine			
WL14	ER	1906.82	0.77	1.00	1.00	0.77	77.31	Catchment Whanganui Inlet	podocarp/ mixed broadleaved forest with beech on hillslopes. Some areas of younger forest and scrub. Road & some tracking to buildings (houses)	podocarp/ mixed broadleaved forest with beech	Young mixed broadleaved forest & scrub		
WL15	IS-ER	0.72	0.43	1.00	1.00	0.43	42.75	Whanganui Inlet	Small island with mostly scrub & low forest	mixed broadleaved forest			
WL16	ER	177.31	0.87	1.00	1.00	0.87	86.69	Catchment Whanganui Inlet	Peninsula opposite entrance with mature podocarp- rata/ mixed broadleaved forest & rata-mixed broadleaved forest on hillslopes. Narrow fringe flaxes & rushes. Road with some large cuttings	podocarp- rata/ mixed broadleaved forest with beech	rata- mixed broadleaved forest		
WL17	ER	8.22	0.38	1.00	1.00	0.38	38.13	Catchment Whanganui Inlet	Hillslopes with manuka dominant scrub and mixed broadleaved dominant scrub & forest	manuka dominant scrub	mixed broadleaved dominant scrub & forest		
WL18	ER	8.79	0.40	1.00	1.00	0.40	39.96	Catchment Whanganui Inlet	Hillslopes with manuka dominant scrub and mixed broadleaved dominant scrub & forest. Road	manuka dominant scrub	mixed broadleaved dominant scrub & forest		
WL19	ER	63.65	0.42	1.00	1.00	0.42	41.72	Catchment Whanganui Inlet	Hillslopes with manuka dominant scrub and mixed broadleaved dominant scrub & forest. Road & tracking	manuka dominant scrub	mixed broadleaved dominant scrub & forest		

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WL20	DU	6.31	0.30	1.00	1.00	0.30	30.09	Catchment Whanganui Inlet	Low dune with manuka dominant scrub & some emergent pines	manuka dominant scrub	introduced grasses		
WL21	ER	9.70	0.40	1.00	1.00	0.40	39.78	Catchment Whanganui Inlet	Hillslopes with manuka dominant scrub and mixed broadleaved dominant scrub & forest.Road	manuka dominant scrub	mixed broadleaved dominant scrub & forest		
WL22	ER	9.18	0.37	0.99	1.00	0.36	36.38	Catchment Whanganui Inlet	Hillslopes with manuka dominant scrub and mixed broadleaved dominant scrub & young forest with some native conifers. Tracking & several buildings	manuka dominant scrub	mixed broadleaved dominant scrub & forest		
WL23	ER	91.58	0.30	1.00	1.00	0.29	29.31	Catchment Whanganui Inlet	Manuka dominant scrub on hillslopes with some clearings. Some tracking & scattered buildings	manuka dominant scrub	mixed broadleaved scrub	introduced grasses	
WL24	DU	3.32	0.20	1.00	1.00	0.20	19.55	Catchment Whanganui Inlet	Pine plantation with mixed scrub on low dunes	pine plantation	mixed scrub		
WL25	AL	176.79	0.14	1.00	1.00	0.14	14.10	Catchment Whanganui Inlet	Rough pasture with gorse patches. Some farm tracking, structures & buildings. Road	introduced grasses			
WL26	AL	81.77	0.47	0.99	1.00	0.46	46.47	Catchment Whanganui Inlet	Freshwater wetland grading to saline wetland at White Pine Creek. Low coastal dunes with manuka scrub & gorse on dunes	raupo (reed)-oioi (rush)-manuka scrub	rush- saltmarsh ribbonwood	manuka - gorse scrub	
WL27	ER	7.44	0.26	1.00	1.00	0.26	25.50	Catchment Whanganui Inlet	Young manuka & gorse scrub on hillslopes; some sprayed	manuka-gorse scrub			
WL28	ER	11.22	0.28	1.00	1.00	0.28	28.05	Catchment Whanganui Inlet	Young manuka dominant scrub on hillslopes; some sprayed	manuka dominant scrub	pasture & sprayed manuka	mixed broadleaved scrub	

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WL29	ER	3.17	0.19	1.00	1.00	0.19	19.13	Catchment Whanganui Inlet	Pine plantation with mixed scrub on hillslopes	pine plantation	mixed broadleaved scrub		
WL30	ER	32.63	0.30	1.00	1.00	0.30	29.79	Catchment Whanganui Inlet	manuka dominant scrub with some emergent pines on hillslopes. Road & some tracking	manuka dominant scrub	mixed broadleaved scrub		
WL31	ER	120.81	0.15	0.84	0.99	0.12	12.18	Catchment Whanganui Inlet	mostly logged (more than indicated on aerial) pine (and eucalypt) plantations with some patches mixed broadleaved forest and scrub on hillslopes. Tracking & skid sites	mostly logged pine plantation	mixed broadleaved scrub & forest		
WL32	ER	25.47	0.38	1.00	1.00	0.38	38.18	Catchment Whanganui Inlet	Mosaic manuka scrub & mixed broadleaved forest and scrub. Access track	manuka dominant scrub	mixed broadleaved scrub & forest		
WL33	ER	4.04	0.21	1.00	1.00	0.21	21.15	Catchment Whanganui Inlet	pine plantation on hillslopes with mixed broadleaved scrub	pine plantation	mixed broadleaved & manuka scrub & low forest		
WL34	ER	121.17	0.67	1.00	1.00	0.66	66.44	Catchment Whanganui Inlet	Predominantely regenerating mixed broadleaved forest with scattered podocarps. Small section of road, some tracks and houses	podocarp/ mixed broadleaved forest	mixed broadleaved scrub		
WL35	AL	1.51	0.61	1.00	1.00	0.61	60.98	Catchment Whanganui Inlet	Freshwater wetland and road	flax- native shrub wetland			
WL36	ER	80.86	0.49	1.00	1.00	0.49	48.74	Catchment Whanganui Inlet	Mosaic of mixed broadleaved scrub & young forest and manuka scrub on hillslopes. Emergent remnant rimu. Some tracking & road	mixed broadleaved scrub & forest (some remnant rimu)	manuka dominant scrub		

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WL37	ER	8.88	0.13	1.00	0.99	0.13	12.77	Catchment Whanganui Inlet	Hillslopes with grass, tracking & some young scrub	introduced grasses	young scrub		
WL38	ER	15.18	0.32	0.99	0.99	0.31	31.23	Catchment Whanganui Inlet	lower hillslopes with primarily manuka dominant scrub, limited young mixed broadleaved scrub. Road around estuary & tracking	manuka dominant scrub	mixed broadleaved scrub (young)		
WL40	ER	350.71	0.72	1.00	1.00	0.72	72.25	Catchment Whanganui Inlet	Mixed broadleaved forest with emergent podocarps & rata on hillslopes	podocarp/ mixed broadleaved forest with rata			
WL41	ER	102.46	0.42	1.00	1.00	0.42	41.67	Catchment Whanganui Inlet	Hillslopes with manuka scrub, mixed broadleaved scrub & forest, road & tracking	mixed broadleaved scrub & forest	manuka dominant scrub		
WL42	AL	1.99	0.55	1.00	1.00	0.55	55.25	Catchment Whanganui Inlet	Mixed broadleaved forest with some introduced species on alluvial plains	mixed broadleaved forest			
WL43	ER	5.66	0.46	1.00	1.00	0.46	46.20	Catchment Whanganui Inlet	mixed broadleaved scrub & forest and manuka dominant scrub on hillslopes & valley floor	mixed broadleaved scrub & forest	manuka dominant scrub		
WL44	ER	2.13	0.38	1.00	1.00	0.38	38.25	Catchment Whanganui Inlet	mixed broadleaved and manuka dominant scrub on low headland	mixed broadleaved &manuka dominant scrub			
WL45	ER	569.60	0.14	1.00	0.99	0.14	14.12	Catchment Whanganui Inlet	Predominantly pasture on coastal hill country, some introduced trees (pines, macrocarpas). Some small areas of manuka dominant scrub (hillslopes and coastal faces). Freshwater wetland areas in some valleys. Tracking, farm buildings	pasture	manuka dominant scrub & rush dominant wetlands		

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WL46	ER	78.31	0.41	1.00	1.00	0.41	41.23	Catchment Whanganui Inlet	Peninsula slopes with indigenous vegetation. Manuka dominant scrub, mixed broadleaved scrub & forest	manuka dominant scrub	mixed broadleaved scrub	mixed broadleaved forest	
WL47	ER	30.34	0.44	1.00	1.00	0.44	43.78	Catchment Whanganui Inlet	Coastal headlands with manuka dominant scrub, mixed broadleaved forest and scrub	manuka dominant scrub	mixed broadleaved scrub	mixed broadleaved forest	
WL48	AL	35.18	0.60	1.00	1.00	0.60	60.39	Kohika Lakes catchment	Low slopes with predominantely mixed broadleaved forest with rata. Some mixed broadleaved scrub & clearings to west	mixed broadleaved forest with rata	mixed broadleaved scrub & shrubland		
WL49	ER	3.84	0.18	1.00	1.00	0.18	18.28	Catchment Whanganui Inlet	coastal slopes with some remnant manuka dominant scrub, other cleared/sprayed areas & pasture	manuka dominant scrub	introduced grasses & cleared/sprayed scrub		
WL50	ER	41.68	0.46	1.00	1.00	0.46	45.90	Catchment Whanganui Inlet	coastal slopes with manuka dominant scrub, mixed broadleaved scrub & mixed broadleaved forest	manuka dominant scrub	mixed broadleaved scrub	mixed broadleaved forest	
WL51	ER	7.23	0.34	1.00	1.00	0.34	34.00	Catchment Whanganui Inlet	coastal faces with manuka & mixed broadleaved scrub	manuka dominant scrub			
WL52	ER	10.52	0.43	1.00	1.00	0.43	42.50	Catchment Whanganui Inlet	coastal slopes with manuka- mixed broadleaved scrub & forest	manuka- mixed broadleaved scrub & forest			
WL53	DU	47.93	0.20	1.00	1.00	0.20	20.26	Catchment Whanganui Inlet	Primarily low dune between rock headland & mainland. Cover mainly introduced grasses. Dune blow-out	pasture & shelterbelts	sand dune blow-out		
WL54	ERS	389.59	0.28	1.00	1.00	0.28	28.03	Catchment Whanganui Inlet	steep rock headland north side Whanganui Harbour entrance with rock outcrops, kanuka & manuka & mixed broadleaved scrub. Limited tracking	introduced grasses & shelterbelts	kanuka & manuka & mixed broadleaved scrub	rock outcrops	

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WL55	ER	1.60	0.17	1.00	1.00	0.17	17.00	Catchment Whanganui Inlet	Pine plantation on hillslopes	pine plantation			
WL56	ER	1.06	0.30	1.00	1.00	0.30	29.75	Catchment Whanganui Inlet	kanuka & manuka dominant scrub on hillslopes	kanuka & manuka dominant scrub			
WL57	ER	8.85	0.51	1.00	1.00	0.51	51.00	Catchment Whanganui Inlet	mixed broadleaved forest on hill slopes	mixed broadleaved forest			
WL58	DU	17.18	0.66	1.00	1.00	0.66	66.30	Whanganui open coast	dune blowout - mostly sand with ridges(at right angles to shore) with marram and other plants	largely bare sand	mix native & non-native sand binders		
WL59	DU	7.94	0.51	1.00	1.00	0.51	50.58	Catchment Whanganui Inlet	supratidal sand area at northern entrance to Whanganui Inlet. Includes grasses, shrubland and low native scrub	largely bare sand	grasses & shrubland with native shrubs	low native scrub	
WF1	LA												
WF2	LA												
RU1	MN	341.92	0.68	0.98	1.00	0.66	65.98	Ruataniwha	North Ruataniwha outer tidal flats. Extensive low tide flats protected by offshore sand barrier. Area of relict saltmarsh	sand & shell flats with some detrital basins & sea grass beds			
RU2	DU	9.07	0.29	1.00	1.00	0.29	28.80	Ruataniwha	South end of northern spit. Pine plantations & gorse dominant scrub	gorse dominant scrub	mixed broadleaved dominant scrub	pine plantation	
RU3	SW	4.56	0.63	0.98	1.00	0.61	61.43	Ruataniwha	Saltmarsh (*Juncus krausii*, oioi), salt herbfield mosaic. Sand blown into lower section. Top section removed by one-way flapgate	saltmarsh & salt meadow			
RU4	DU	1.34	0.23	1.00	1.00	0.23	22.50	Ruataniwha	Low section of dune with marram -gorse scrub- introduced ice plant	marram grass-gorse-introduced			

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
										iceplant			
RU5	SW	19.92	0.67	1.00	1.00	0.67	66.69	Ruataniwha	Saltmarsh (*Juncus krausii,* oioi) with gorse scrub margins. Intertidal flats.	intertidal flats	saltmarsh & salt meadow	gorse scrub	
RU6	SW	252.57	0.68	0.95	1.00	0.64	64.13	Ruataniwha	North compartment Ruataniwha: extensive sand flats, very little low tide freshwater drainage. Mid tide san flats with diatoms. Some fringing saltmarsh. Sea grass previously found in this area not sighted (probably buried)	sand flats			
RU7	AL	150.57	0.14	0.94	0.99	0.13	12.87	Ruataniwha	Pasture & shelterbelts on alluvial flats. Narrow fringe gorse, wider in some areas with mixed broadleaved scrub. Areas rock rip-rap. Several buildings, unsealed roads	gorse dominant scrub with some mixed broadleaved scrub	pasture & shelterbelts introduced species		
RU8	DU	4.42	0.26	0.98	1.00	0.25	25.21	Ruataniwha	Planted pines & some grass. Gorse dominant scrub, manuka-mixed broadleaved scrub, small pond area	planted pines & grass	gorse dominant scrub	manuka-mixed broadleaved scrub	pond
RU9	DU	6.18	0.60	1.00	1.00	0.60	60.17	Ruataniwha	Saltmarsh & patches salt meadow extending to airstrip. Islands gorse & introduced iceplant	saltmarsh, salt herbfield	gorse dominant scrub		
RU9b	DU	2.89	0.28	0.94	0.98	0.26	25.81	Ruataniwha	Dune spit with gorse dominant scrub, introduced grasses, some native scrub; buildings	sand	gorse dominant scrub	introduced grasses & trees	
RU10	SW	12.67	0.73	0.97	1.00	0.71	70.97	Ruataniwha	Waikato Inlet. Sand flats lower reaches, siltier upper flats with saltmarsh & diverse native salt herbfield, northern stop bank dominated by pines & gorse. Areas sand accretion & saltmarsh dieback	intertidal flats	saltmarsh & salt herbfield	pine/gorse and various native species	

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RU11	DU	6.68	0.35	0.99	0.92	0.31	31.35	Ruataniwha	Sand spit with totara forest/ treeland, centre road & houses/baches among the trees. Seawall on outer and much of inner coast	totara forest & treeland	gardens/introduced grasses & trees		
RU12	ER	4.93	0.32	1.00	0.99	0.31	31.49	Ruataniwha	Escarpment & slopes with emergent wattles, mixed broadleaved forest and scrub, kanuka & manuka scrub. Grass areas with introduced trees. Road	mixed broadleaved scrub & forest; manuka dominant scrub & emergent acacias	introduced grasses & trees		
RU13	AL	0.58	0.81	1.00	1.00	0.81	81.00	Ruataniwha	podocarp/ mixed broadleaved forest remnant on alluvial flats west side of Waikato Inlet. Unfenced	rimu-totara/mixed broadleaved forest			
RU14	AL	7.08	0.43	1.00	1.00	0.43	43.20	Ruataniwha	Series low islands in Ruataniwha Inlet with varying levels of emergent (planted) pines & manuka dominant scrub	manuka dominant scrub	pine plantations		
RU15	SW	27.08	0.68	1.00	1.00	0.68	67.50	Ruataniwha	Upper tidal flats in northern compartment with saltmarsh & limited areas of open sand flats	saltmarsh with some areas manuka dominant scrub, salt herbfield & sand flats			
RU16	SW	0.97	0.57	0.84	0.99	0.47	47.20	Ruataniwha	Upper estuary tidal flats with saltmarsh cut off by road causeway	saltmarsh and intertidal flats			
RU17	ER	13.63	0.30	0.98	0.97	0.28	28.01	Ruataniwha	Hillslopes with mosaic of houses, tracking, native & introduced scrub, road	manuka dominant scrub	acacia-totara/ mixed broadleaved scrub & forest	saltmarsh & flax swamp	introduced grasses & trees (plantings)

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RU18	ER	55.47	0.20	1.00	0.99	0.20	20.18	Ruataniwha	Hillslopes in pasture with native scrub & low forest in upper gullies & slopes. Some trackings & buildings	pasture & plantings	totara-mixed broadleaved - kanuka forest and scrub	kanuka & manuka scrub	
RU19	ER	25.22	0.26	1.00	1.00	0.26	25.65	Ruataniwha	Scrub regeneration on hillslopes. Pasture & cleared scrub	mixed broadleaved & manuka scrub	pasture & cleared scrub		
RU20	ER	41.38	0.12	1.00	0.99	0.12	12.17	Ruataniwha	Pasture on easy hill country. Farm tracks & roads & some buildings	pasture			
RU21	ER	21.59	0.37	1.00	0.99	0.36	36.20	Ruataniwha	Escarpment & riparian margins with native forest and scrub & scattered emargent introduced trees. Road, tracks & scattered buildings	kanuka dominant & mixed broadleaved scrub & low forest	pine plantations	grass & gardens	
RU22	ER	29.94	0.05	0.35	0.99	0.02	1.62	Ruataniwha	Active quarry zone with roads, several buildings, open pits. An area of recent mining now in pasture (Google Earth August 2011 imagery not on aerials), few areas remnant scrub	manuka & mixed broadleaved scrub	introduced grasses		
RU23	ER	68.13	0.18	0.88	1.00	0.16	15.78	Ruataniwha	Pasture & shrubland & small areas scrub in previously disturbed hill country. Limited tracking	Shrubland - low density shrubs	introduced grasses	manuka & mixed broadleaved scrub	
RU24	ER	48.60	0.16	1.00	1.00	0.16	15.94	Ruataniwha	pasture on dissected terrace land. Escarpment by road with native mixed broadleaved scrub, gullies with riparian manuka dominant scrub	manuka & mixed broadleaved scrub	introduced grasses	saltmarsh	
RU25	ER	1.78	0.18	1.00	1.00	0.18	18.00	Ruataniwha	Pine plantation on hillslopes	pine plantation			
RU26	ER	10.18	0.13	1.00	1.00	0.13	12.90	Ruataniwha	Pasture on hillslopes with rough gorse & rush shrubland near road. Road	pasture	gorse-introduced rush shrubland		

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RU27	ER	3.48	0.18	1.00	1.00	0.18	18.00	Ruataniwha	Pine plantation on hillslopes	pine plantation			
RU28	ER	338.55	0.64	1.00	1.00	0.64	64.13	Ruataniwha	Mature podocarp-rata/ mixed broadleaved forest with mixed broadleaved forest and kanuka dominant scrub & forest on lower slopes. [Boundary truncated due to extent of aerial imagery provided)	podocarp-rata/mixed broadleaved forest	mixed broadleaved forest & scrub	kanuka & manuka scrub & low forest	
RU30	SW	255.90	0.68	1.00	1.00	0.68	67.50	Ruataniwha	Southern delta compartment of Ruataniwha Inlet (Aorere River). Extensive intertidal flats dissected with numerous stream & river drainage channels (cf RU6)	Upper intertidal flats & fringing saltmarsh			
RU31	SW	5.27	0.64	1.00	1.00	0.64	63.68	Ruataniwha	Stream channel with saltmarsh margins & mostly a narrow fringe native trees	saltmarsh & stream channel	mixed broadleaved forest		
RU32	AL	369.42	0.13	0.40	0.99	0.05	5.19	Ruataniwha	Pasture flats with cattle & sheep. Shelterbelts, some buildings, paved areas & tracks	pasture & shelterbelts	riparian manuka, mixed broadleaved and some introduced species		
RU33	AL	0.87	0.72	1.00	1.00	0.72	72.00	Ruataniwha	Small remnant podocarp remnant on alluvial plains. Some weeds with lot of intact understorey. Previously partly logged & grazed	totara forest			
RU34	AL	13.26	0.16	0.43	1.00	0.07	6.84	Ruataniwha	Pasture on alluvial flats with remnant podocarp trees (kahikatea, totara), Aorere riparian	pasture	remnant trees	riparian native & introduced scrub	
RU35	AL	163.78	0.13	1.00	0.99	0.13	13.15	Ruataniwha	Alluvial floodplains with pasture with some shelter belts & trees (eucalypts & pines & macrocarpas). Small secondary kahikatea pole stand, riparian scrub/plantings	pasture	riparian vegetation		

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RU36	SW	10.93	0.60	0.92	1.00	0.55	55.14	Ruataniwha	Cut-off arm of current Aorere delta. Surrounded by drains. Mosaic saltmarsh & channel (lower ground); freshwater rush-flax-toetoe wetland; flax-native scrub with emergent native trees (higher ground). Road	saltmarsh	Freshwater rush-flax- toetoe wetland; emergent native trees/flax-native shrubs		
RU37	SW	147.86	0.63	0.86	1.00	0.54	53.74	Ruataniwha	Aorere river mouth, its present delta, its oxbow to causeway & bridge. Saltmarsh & associated scrub, salt herbfield & intertidal flats. Includes wharf, seawall, rock rip-rap, small derelict training wall. Very small island with pines	saltmarsh & intertidal flats	small island with pines & mixed broadleaved native species		
RU38A	AL	3.60	0.38	1.00	1.00	0.38	38.25	Ruataniwha	Aorere river mouth delta levees with mixed native & introduced shrubs & trees	manuka-mixed broadleaved scrub & introduced trees			
RU38B	AL	1.97	0.38	1.00	1.00	0.38	38.25	Ruataniwha	Aorere river mouth delta levees with mixed native & introduced shrubs & trees	manuka-mixed broadleaved scrub & introduced trees			
RU39	AL	3.21	0.11	1.00	0.85	0.10	9.77	Ruataniwha	Low ground between saltmarsh (RU36) and low escarpment. Recycling depot & industrial site. Road	mixed broadleaved native & introduced scrub			
RU40	ER	3.75	0.28	1.00	1.00	0.28	27.63	Ruataniwha	Low escarpment with manuka dominant scrub, mixed broadleaved scrub & pines & other introduced trees	manuka dominant scrub & mixed broadleaved scrub	pines & other introduced trees		

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C4	ER	9.80	0.11	1.00	0.89	0.10	9.72	Collingwood	Collingwood residential area - roads, paving, buildings, gardens & lawns	cut-off saltmarsh	manuka dominant scrub with introduced trees	gardens & grass	
C5	ER	6.31	0.23	1.00	0.97	0.22	22.37	Collingwood	Vegetated escarpment with houses on top	introduced tree species (wattles, pines, eucalypts)/ mixed broadleaved scrub (native & introduced)	gardens/introduced grasses & trees		
C6	ER	4.38	0.13	1.00	0.86	0.11	10.99	Collingwood	Residential area of Collingwood on hillslopes. Mixed native & introduced matrix.	emergent eucalypts & pines/mixed broadleaved scrub	gardens/introduced grasses & trees		
C7	ER	7.59	0.04	1.00	0.73	0.03	3.25	Collingwood	Commercial & built part of Collingwood on the flat. Includes motorcamp, boat launching area, retaining walls, carpark	gardens & lawns			
C8	DU	2.92	0.28	1.00	1.00	0.28	28.14	Collingwood	Older sand accretion. Marram grass & other introduced grasses. Carpark areas & tracks	marram grass-introduced grasses - some native rushes & low shrubs			
C8b	DU	2.14	0.52	1.00	1.00	0.52	51.85	Collingwood	Recent accretion sand area with patchy vegetation cover	sand & native sand binders on foredune	mid-dune marram dominant	swale introduced grasses & herbs	
C9	ER	5.27	0.12	1.00	0.98	0.12	11.69	Collingwood	Residential settlement along the base of the escarpment. Road, coastal rip-rap	mixed broadleaved scrub	gardens & lawns		

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C10	ER	16.30	0.40	1.00	0.99	0.40	39.50	Collingwood	Escarpment with mixed broadleaved forest and scrub with some introduced species (e.g. pines), scattered houses & paved/tracking	mixed broadleaved scrub & forest with some pines	gardens & lawns		
PN1	ER	7.14	0.12	1.00	0.86	0.10	10.44	Parapara North	Milnthorpe settlement. Houses with mixed native & non-native margin	manuka & mixed broadleaved scrub with some introduced species	gardens & lawns		
PN2	DU	5.07	0.68	1.00	1.00	0.68	68.00	Parapara North	Freshwater/brackish wetland. Manuka dominant scrub & rushes.	manuka dominant scrub & rushes			
PN3	DU	4.08	0.77	1.00	1.00	0.77	76.50	Parapara North	Freshwater wetland with manuka dominant scrub; rushland; flax-sedges-scattered shrubs	oioi rushland, flax-sedges-scattered shrubs			
PN4	DU	11.45	0.38	1.00	1.00	0.38	38.25	Parapara North	Low & narrow coastal foredune with eucalypt forest & treeland with mixed broadleaved species. On foredune marram & introduced grasses	eucalypt forest & treeland with mixed broadleaved species.			
PN5	ER	15.26	0.51	1.00	1.00	0.51	51.00	Parapara North	Manuka dominant scrub on poor soils	manuka dominant scrub			
PN6	ER	65.56	0.37	1.00	1.00	0.37	36.55	Parapara North	Mosaic of planted & wilding introduced trees (especially pines, eucalypts) & natives. Includes small lake with fringing flax/manuka & outlet stream (should be in a linked PN9 & PN5 or included in PN2)	mosaic planted & wild native & introduced trees. Canopy eucalypts, introduced conifers	manuka dominant scrub on poor soils	small lake& fringing flax & manuka	

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PN7	ER	51.62	0.55	1.00	1.00	0.55	55.25	Parapara North	Mosaic manuka & kanuka scrub, mixed broadleaved forest and scrub with some wilding conifers, tracks	manuka & kanuka scrub & low forest; mixed broadleaved scrub & forest			
PN8	SW	1.00	0.68	1.00	1.00	0.68	68.00	Parapara North	saltmarsh in Parapara Estuary arm- upper estuaryflats with saltmarsh with wooded margins	saltmarsh			
PN9	ER	7.68	0.55	1.00	1.00	0.55	55.25	Parapara North	Manuka dominant scrub on poor soils	manuka dominant scrub			
PN10	DU	7.25	0.16	1.00	0.99	0.16	16.00	Parapara North	Rough pasture with gorse, introduced trees. Some farm tracking, scattered buildings.	rough grass & weeds (especially gorse)			
PN11	ER	29.39	0.36	1.00	1.00	0.36	36.21	Parapara North	Manuka dominant scrub, mixed broadleaved scrub & forest on hillslopes	manuka dominant scrub & mixed broadleaved scrub	introduced grasses		
PN12	ER	18.75	0.29	1.00	1.00	0.29	28.84	Parapara North	Hillslopes with a mosaic of manuka & kanuka scrub, mixed broadleaved scrub, planted pines & eucalypts, access roads & several buildings	manuka dominant scrub & mixed broadleaved scrub	planted pines & eucalypts		
PP1	DU	3.68	0.56	1.00	1.00	0.56	56.10	Parapara Estuary	Sandspit tip & outer dune vegetation. Area TDC restoration with native sand binders (pingao, spinifex, *Carex pumila*, shore convolvulus). Also marram grass. Narrow inland band gorse & mixed broadleaved scrub	sand & sand binders	gorse & mixed broadleaved scrub		
PP2	DU	5.52	0.34	1.00	1.00	0.34	34.00	Parapara Estuary	Recurved tips of sandspit. Gorse & mixed broadleaved scrub. Some emergent pines & macrocarpa	gorse, manuka & mixed broadleaved			

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										scrub			
PP3	DU	6.46	0.16	1.00	1.00	0.16	15.85	Parapara Estuary	Large grazed sandflat with small areas gorse-mixed broadleaved scrub & some tall planted macrocarpa	introduced grasses & macrocarpa	mixed broadleaved scrub with gorse		
PP4	SW	2.66	0.60	1.00	1.00	0.60	59.50	Parapara Estuary	Small inlet nearly enclosed by sandspit. Saltmarsh	intertidal flats & saltmarsh (mainly *Juncus krausii)*			
PP5	SW	6.68	0.68	1.00	1.00	0.68	68.00	Parapara Estuary	Outer inlet on silty sand. Saltmarsh *(Juncus krausii* & oioi*)* & limited salt herbfield. Narrow fringing manuka dominant scrub behind	Saltmarsh (Juncus krausii & oioi) & limited salt herbfield. Narrow fringing manuka dominant scrub			
PP6	SW	150.28	0.81	0.93	1.00	0.75	75.33	Parapara Estuary	Main intertidal flats area with channels. Fringing saltmarsh near freshwater seeps. Pacific oyster found in low densities in SW. Gracileria & filamentous green algae by culvert in south. Good saltmarsh through & around river delta	Extensive tidal flats with limited patches sparse sea grass. Fringing saltmarsh (J. Krausii, oioi, 3-square sedge)			
PP7	SW	23.16	0.44	0.76	1.00	0.33	33.46	Parapara Estuary	Estuary arm cutoff by road causeway. Water largely retained at low tide, fringing saltmarsh. Very littke intertidal for upper estuary because of small undersized culvert with invert set too high. Road & causeway	flats largely covered by water at low tide; fringing saltmarsh			

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PP8	SW	8.16	0.68	1.00	1.00	0.68	67.50	Parapara Estuary	Outer estuary between sandspits. Strong currents. Heavily armoured with cobbles. Wharf (old). Limited fringing saltmarsh true left margin.	cobble amouring, limited fringing saltmarsh			
PP9	SW	1.70	0.71	0.98	1.00	0.69	69.04	Parapara Estuary	Small enclosed inlet. Foot causeway & 2 culverts. Cobble base, fringing saltmarsh	cobble base, saltmarsh fringe			
			0.00	1.00	1.00	0.00	0.00						
FS1	DU	5.44	0.17	1.00	1.00	0.17	17.00	Farewell Spit	Mature pine plantation/ shelterbelt	mature pines			
FS2	DU	3.63	0.50	1.00	1.00	0.50	50.40	Farewell Spit	Older dunes with mahoe dominant scrub on sand with thin band marram grass on foredune	mixed broadleaved scrub with gorse	marram & other introduced grasses		
FS3	DU	11.53	0.59	1.00	1.00	0.59	58.50	Farewell Spit	kanuka dominant forest and scrub on old dunes	kanuka dominant scrub & forest			
FS4	DU	30.30	0.57	1.00	1.00	0.57	56.70	Farewell Spit	Older dune mosaic with manuka & kanuka scrub; mixed broadleaved scrub with flax & gorse; clearings with introduced grasses, flax, I*solepis nodosus* & native shrubs	manuka & kanuka scrub; mixed broadleaved scrub with flax & gorse	clearings with introduced grasses, flax, native shrubs		
FS5	DU	213.52	0.54	0.74	1.00	0.40	39.96	Farewell Spit	Mobile unvegetated dunelands including extensive flats & some remnant dunes with generally patchy marram grass	sand dune blowouts with limited marram grass			
FS6	DU	13.42	0.43	1.00	1.00	0.43	43.20	Farewell Spit	Dune swale wetlands dissected by transverse dune blowouts	native rushland (J. krausii, oioi) with native shrubs	gorse dominant scrub on higher land		

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FS7	DU	5.88	0.32	1.00	1.00	0.32	31.50	Farewell Spit	Low fringing foredune to Golden Bay	gorse-marram shrubland with introduced grasses & native shrubs including *Coprosma acerosa*			
FS8	DU	3.43	0.72	0.80	1.00	0.58	57.60	Farewell Spit	Ephemeral shallow dune lakes in a sand matrix with limited or no rushes. Green algae present	ephemeral dune lakes in sand matrix sand with part cover of marram grass and some tauhinu & C. acerosa			
FS9	DU	3.82	0.32	1.00	1.00	0.32	31.50	Farewell Spit	Steep dune between two swale areas. Relatively sparse cover with marram grass dominant but some native shrubs				
FS10	DU	8.01	0.43	0.97	1.00	0.42	41.90	Farewell Spit	Extensive dune swale mosaic with shallow ponds, herbfields, native rushes & sedges, gorse patches, native shrubs (tauhinu, Coprosma sp) occasional cabbage tree, residual pastoral grassland	ponds and native rushland (oioi, *Isolepis nodosus)*	gorse dominant scrub with native shrubs	residual pastoral grassland	
FS11	DU	11.50	0.61	0.97	1.00	0.59	58.93	Farewell Spit	Extensive dune swale with deeper ponds/ lakes; native rushland; small scrub patches on higher ground	Ponds with native flora - *Myriophyllum propinqum*, charophytes, *Ludwegia, Elatine* & emergent	oioi rushland with native sedges & shrubs	Gorse dominant scrub with native shrubs	

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										Elaeocharis			
FS12	DU	1.26	0.32	1.00	1.00	0.32	31.50	Farewell Spit	Steep vegetated dune between dune swales. Consolidated back dune	Marram grass-introduced grasses with some native low shrubs & bracken	Gorse dominant scrub with native shrubs (kanuka, tauhinu, mahoe), flax		
FS13	DU	7.58	0.54	1.00	1.00	0.54	53.55	Farewell Spit	Dune swale area with low stature swale vegetation especially native rushes. Some foredune (marram & sand)	low stature dune swale vegetation, especially native rushes	mixed broadleaved scrub & manuka scrub	marram grass & sand on foredune	
FS14	DU	3.51	0.44	1.00	1.00	0.44	44.10	Farewell Spit	Manuka-kanuka scrub on slopes, pond with wetland rushes & sedges around pond. Unfenced	manuka-kanuka scrub -patchy in places	pond & wetland with rushes & sedges		
FS15	DU	84.40	0.12	1.00	1.00	0.12	12.30	Farewell Spit	Pasture on flats, pockets of unfenced manuka & some wet areas with rushes & sedges	manuka scrub unfenced	pasture		
FS16	ER	58.43	0.13	1.00	1.00	0.13	13.46	Farewell Spit	Puponga Farm Park slopes with pockets of manuka & gorse scrub,& mixed broadleaved scrub (generally unfenced). Limestone rock outcrops. Patches sedges & non-native rushes in wet areas	manuka-gorse scrub; mixed broadleaved scrub	improved pasture		

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FS17	ER - o	24.35	0.46	1.00	1.00	0.46	46.22	Farewell Spit	From open coast to inland. Hillslopes with manuka dominant scrub and some gorse on upper slopes with introduced grasses. Gullies with mixed broadleaved scrub	manuka dominant scrub	mixed broadleaved scrub (& possibly some low forest)	introduced grasses	
FS18	ER-s-o	10.63	0.54	1.00	1.00	0.54	54.00	Farewell Spit	Steep limestone headlands with kanuka dominant scrub, mixed broadleaved scrub (Including abundant nikau palms), some gorse & shorter scrub on headlands	kanuka dominant scrub; mixed broadleaved scrub & forest			
FS19	ER	35.04	0.50	1.00	1.00	0.50	49.50	Farewell Spit	Hillslopes with low fertility soils. Manuka dominant scrub	manuka dominant scrub			
FS20	ER	112.34	0.63	1.00	1.00	0.63	63.00	Farewell Spit	Low fertility sandstone slopes & ranges with dramatic rock outcrops. Infertile with low scrub, tussocks & rushes & species normally found at higher altitudes	low manuka-gorse-hebe scrub with patches of native rushes & some subalpine species			
FS21	DU	1.22	0.54	1.00	1.00	0.54	54.00	Farewell Spit	Dune swale on margins of dune blow-out. Includes native rushes & sedges, shrubs,	native rushland with sedges & shrubs			
FS30	AL	14.57	0.72	1.00	1.00	0.72	72.00	Puponga Estuary	Freshwater wetland at head of Puponga Estuary. Manuka margins, sedges & flax, Stream	low fertility swamp with (cabbage tree)/ flax-native shrubs -sedges			
FS31	AL	40.39	0.13	1.00	0.99	0.13	13.28	Farewell Spit	Pasture with small patches scrub, road, some tracking, few buildings on relict alluvial flats	manuka & gorse scrub	pasture & some pines		
FS32	DU	25.76	0.37	1.00	1.00	0.37	37.35	Farewell Spit	Dune sequence- foredune, swale & immediate back dune. Marram grass & sand on low foredune; kanuka dominant scrub; flax-rushland; mixed broadleaved scrub;	kanuka dominant scrub	flax, rushland & mixed broadleaved scrub	sand & marram grass	introduced grasses & bracken

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									introduced grasses & bracken				
FS33	ER	20.63	0.42	1.00	1.00	0.42	41.85	Farewell Spit	Hillslopes with manuka & kanuka scrub : mixed broadleaved scrub & forest	manuka & kanuka scrub	mixed broadleaved scrub & forest		
FS34	ER	11.13	0.35	1.00	0.99	0.35	34.83	Farewell Spit	Hillslopes with Manuka & kanuka scrub (with wilding pines), mixed broadleaved scrub, buildings & roads/tracks	manuka & kanuka scrub with wilding conifers	mixed broadleaved scrub & low forest		
FS35	AL	2.82	0.18	1.00	0.99	0.18	18.13	Farewell Spit	Grass/pasture, manuka scrub, house , road & parking	manuka dominant scrub	introduced grasses & plantings		
FS36	ER	1.89	0.60	1.00	1.00	0.60	60.30	Farewell Spit	Fenced mixed broadleaved scrub & forest with limestone rock outcrops on hillslopes	mixed broadleaved scrub & forest with diversity of species			
FS37	ER	3.53	0.41	1.00	1.00	0.41	40.50	Farewell Spit	kanuka- mixed broadleaved scrub on hillslopes	kanuka-mixed broadleaved scrub			
FS38	ER	4.15	0.19	1.00	1.00	0.19	18.70	Farewell Spit	Part of old farm on hillslopes. Gorse, introduced grasses & some manuka scrub	introduced grasses & gorse	manuka dominant scrub		
FS39	ER	5.10	0.38	1.00	1.00	0.38	38.25	Farewell Spit	Rock island connected at low tide. Surrounded by sand flats. Low manuka scrub, some wilding pines, limited areas gorse & mixed broadleaved scrub & introduced grasses	native scrub (manuka; mixed broadleaved)	gorse scrub & introduced grasses		

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
FSM1	MN	545.12	0.90	0.98	1.00	0.88	88.20	Farewell Spit	Very extensive intertidal sand flats. Very sparse patchy sea grass, large cockles, some stranded filamentous green algae, small patches saltmarsh being buried in places. Part of Department of Conservation nature reserve	extensive sand intertidal flats			
FSM2	MN	102.34	0.90	1.00	1.00	0.90	90.00	Farewell Spit	Extensive open coast intertidal flats. Part of Department of Conservation nature reserve	intertidal sand flats			
PE1	SW	27.01	0.76	0.99	1.00	0.75	74.91	Puponga Estuary	Main Puponga Estuary - upper tidal area has river cobbles; lower tidal area is silty sand. Fringing saltmarsh at head, limited salt herbfield. Road causeway. No sea grass	cobbles & sand flats, fringing saltmarsh & salt meadow			
PE2	SW	1.86	0.81	0.97	1.00	0.79	78.57	Puponga Estuary	Estuary below causeway. Cobbles with patches of sand with dense sea grass. Limited fringing saltmarsh	cobbles & sand patches with sea grass, fringing saltmarsh			
PE3	MN	11.47	0.85	1.00	1.00	0.85	84.65	Puponga Estuary	Sand flats with some shingle & shell flats. Abundant sea grass & waders. Includes old wharf breakwater	Sand flats with some shingle & shell flats. Abundant sea grass			
PE4	DU	10.56	0.15	1.00	1.00	0.15	15.08	Puponga Estuary	Puponga Beach settlement. Low key houses & gardens, road, narrow strip of grass & marram grass on sand shore	manuka dominant scrub	lawns & gardens		
PE5	SW	4.07	0.65	0.84	1.00	0.55	54.56	Puponga Estuary	Small cutoff wetland by road causeway. Saltmarsh surrounded by manuka & kanuka scrub. Small area sand flats.	saltmarsh with sand flats	manuka & kanuka scrub		
PE6	DU	1.69	0.54	1.00	1.00	0.54	54.00	Puponga Estuary	manuka & kanuka scrub & low forest	manuka & kanuka scrub & low forest			

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WK1	ER-o-s	16.95	0.63	1.00	1.00	0.63	63.00	Whararikі Beach	Rock headland with low coastal scrub (manuka-flax- mixed broadleaved scrub) with taller scrub further inland & in gullies	manuka-flax-mixed broadleaved scrub			
WK2	ER-o-s	8.40	0.77	1.00	1.00	0.77	76.50	Whararikі Beach	Small sandstone rock outcrops on beach. Low coastal scrub & flax	mosaic low mixed broadleaved scrub, flaxland, manuka scrub			
WK3	DU	11.48	0.59	1.00	1.00	0.59	58.50	Whararikі Beach	Relict dunes with large expanses of bare sand with relict marram grass on steep remnant dunes	sand & small patches marram grass			
Wk4	DU	9.53	0.32	1.00	1.00	0.32	31.50	Whararikі Beach	Back dune with grassland & shrbland. Introduced grasses -pohuehue-sedges-bracken-flax-manuka scrub- marram grass	introduced grasses-pohuehue -bracken-scattered shrubs			
WK5	DU	29.43	0.60	1.00	1.00	0.60	60.30	Whararikі Beach	Manuka dominant scrub on sandstone with patches native mixed broadleaved scrub	manuka dominant scrub, with some mixed broadleaved scrub			
WK6	DU	21.60	0.14	1.00	1.00	0.14	13.50	Whararikі Beach	Complex backdune swale system with pasture & sheep grazing.	pasture & scattered rushes			
WK7	DU	4.95	0.72	1.00	1.00	0.72	72.00	Whararikі Beach	Relatively mature native forest with increasing manuka towards edges. Good birdlife	mixed broadleaved forest including nikau			

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description	natural area 3 or BAA description	natural area 4 or BAA description
WK8	DU	1.00	0.68	1.00	1.00	0.68	68.40	Whararikі Beach	Nikau Lake. Dune lake that is relatively heavily peat stained. Wetland . Recently fenced, new marginal plantings	dune lake with most margin wetland or native forest, natural peat staining	wetland sequence raupo; sedge-flax-raupo; introduced grasses -gorse & manuka scrub		
WK9	ER-o-s	2.73	0.77	1.00	1.00	0.77	76.50	Whararikі Beach	Series of sandstone islets/ rock stacks & a peninsula with low native scrub & flax	mixed broadleaved scrub, manuka scrub with flax			
WK10	ER-o-s	7.24	0.68	1.00	1.00	0.68	67.50	Whararikі Beach	Sandstone headland with native scrub & flax	Mosaic manuka scrub, mixed broadleaved scrub & flaxland			
WK11	DU	5.93	0.30	1.00	1.00	0.30	30.42	Whararikі Beach	Duneland mosaic of manuka, mixed broadleaved scrub, introduced grasses, & barcken. Marram grass & gorse on front of foredune	marram & gorse on foredune	manuka, mixed broadleaved scrub, introduced grasses & bracken		
WK12	DU	1.31	0.32	1.00	1.00	0.32	31.50	Whararikі Beach	Duneland with low steep dunes dominated by marram grass	dense marram grass on foredune (100%)	Steep slot with swale, 2nd dune marram grass-with mostly native shrubs & bracken in part		
WK13	ER	10.39	0.13	1.00	1.00	0.13	12.75	Whararikі Beach	Hillslopes with pasture	pasture			
WK14	DU	35.52	0.90	1.00	1.00	0.90	90.00	Whararikі Beach	Intertidal sand flats on exposed coast	intertidal sand flats			

APPENDIX 2: Summary information for Tasman Bay Units

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description
MT1	MN	66.99	0.68	1.00	1.00	0.68	67.50	Moutere	Ebb-tide delta, sand/cobbles, mid-tide & low-tide lagoons, partly exposed waters.	blue mussels, algal patches on sand/cobbles	
MT2	SW	287.16	0.76	0.95	1.00	0.72	71.95	Moutere	Main SE arm of Moutere Inlet, good marginal saltmarsh & saltmeadow. Riprap along road margins	*J.krausii* & oioi, sarcocornia & iceplants, diatom film on sandflats	
MT3	SW	3.13	0.65	1.00	1.00	0.65	64.60	Moutere	SE inlet of estuary after recent removal of causeway & roadway, replanting with saltmarsh spp.	saltmarsh & saltmeadow	recent planting Juncus
MT4	SW	2.60	0.65	0.61	0.98	0.39	38.82	Moutere	SH6 causeway with cut-off lagoon to MHWS. Pampas & gorse margins excluded. Some algal blooms	saltmarsh, limited *Plagianthus*, & sandflats	
MT5	SW	4.01	0.54	0.67	0.97	0.35	34.65	Moutere	SH6 causeway & local causeways with 3 cut-off saltwater lagoons (to MHWS). Roading debris in lagoons. Limited saltmarsh & saltmeadow.	saltmarsh & saltmeadow & mudflats	
MT6	LA	4.38	0.32	0.36	0.96	0.11	11.24	Moutere	SH6 causeway with cutoff lagoon, turbid freshwater and not tidal. Waterfowl habitat	open water, minor rushes and marginal herbs	
MT7	IS-DU	1.27	0.54	1.00	1.00	0.54	54.00	Moutere	2 small islands, manuka dominant scrub, saltmarsh fringe	manuka dominant scrub with ngaio & acacias, saltmarsh fringe, some P*lagianthus*	
MT8	SW	1.39	0.43	0.60	0.96	0.25	24.99	Moutere	SH6 causeway with 2 cutoff lagoons, with saltmarsh and mudflats	saltmarsh and mudflat	

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description
MT9	SW	11.81	0.65	0.84	0.99	0.54	54.23	Moutere	SH6 causeway with large cutoff saltwater lagoon, with saltmarsh and sandflats	sandflats and minor saltmarsh	
MT10	IS-DU	1.22	0.68	1.00	1.00	0.68	67.50	Moutere	Low sand island on floodtide delta. Grasses and rushes with scattered shrub manuka and intoduced species	*Stipa & Juncus* with manuka	
MT11	SW	1.62	0.54	0.64	0.95	0.32	32.29	Moutere	SH6 causeway with small cutoff saltwater lagoon. Good saltmarsh, bare mid-tide flats	*Juncus* & Oioi saltmarsh, bare tidal flats	
MT12	SW	8.08	0.73	0.92	0.98	0.65	65.48	Moutere	SH6 causeway with large cutoff saltwater lagoon. Saltmarsh and fine-sand flat with *Amphibola*	*Juncus, Plagiantus* & Oioi saltmarsh, bare tidal flats	
MT13	SW	255.49	0.63	0.75	1.00	0.47	47.25	Moutere	Midsection of Inlet between entrances. Includes Moutere River lower channel. Limited fringing salt meadow with patches of saltmarsh throughout bare tidal flats. Some eutrophic algae.	*Saltmarsh Juncus & Schoenoplectus*, *Sarcocornia* salt meadow, patches *Gracilaria & Enteromorpha* .	
MT14	SW	2.80	0.57	0.71	0.96	0.39	38.81	Moutere	SH6 causeway with small cutoff saltwater lagoon. Saltmarsh & raupo/flax in upper intertidal. Eutrophic algae patches on mid-tidal flats.	Saltmarsh *Juncus, Plagianthus*, oioi with raupo & flax inland. Gracilaria, Enteromorpha & Ulva algal patches	
MT15	SW	1.99	0.47	0.67	0.96	0.30	30.15	Moutere	SH6 causeway with small cutoff saltwater lagoon. Saltmarsh and salt meadow in upper intertidal with several old buildings on poles. Bare mid-tidal flats.	Saltmarsh *Juncus, Schoenoplectus*. Salt meadow *Sarcocornia*.	

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description
MT16	SW	59.55	0.63	0.72	1.00	0.45	45.36	Moutere	NW arm of Moutere inlet, west of river inlet, but not cut off by causeway (excluded). Patches of saltmarsh extensive, salt meadow smaller and many smothered by accumulations of silty sand.	*Juncus* dominant saltmarsh, *Sarcocornia* salt meadow damaged.	
MT17	SW	51.67	0.65	0.87	0.98	0.55	55.19	Moutere	Upper Moutere Inlet in NW, cut off by Wharf Rd causeway and tidegates (incl). Floodtide delta cobble armoured. Saltmarsh margins in west, salt meadow predom in east. Some restoration plantings.	*Juncus* dominant saltmarsh, *Sarcocornia* salt meadow . Planting restoration. Some eutrophic algae	
MT18	SW	16.45	0.24	0.59	0.90	0.13	12.66	Moutere	Motueka wharf, marinas, dredged channels, boats, training walls, adjoins Talley's fish factory Narrow embayment opposite Moutere wharf and jetty. Intertidal flats with clean sands, shellfish	Tidal rivers, cobbles, sand, highly modified by dredging/oysters	
MT19	SW	7.12	0.72	1.00	1.00	0.72	72.00	Moutere		intertidal flats with clean sands, shellfish	
MT20	SW	311.25	0.62	0.91	1.00	0.56	56.31	Moutere	Outer Motueka lagoon, bounded by Motueka sandspit, township and Jackett Island. Includes outer Moutere river channel and intertidal sandflats.	Intertidal flats mainly sand some cobble in west, patches of algae, shellfish. Wharf, small reclamation for swimmingpool	

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description
MT21	DU	77.13	0.86	0.88	1.00	0.75	75.24	Moutere	Motueka Sandspit Scenic Reserve, comprising supratidal sands, dune islands with intertidal flats on the distal end and floodtide delta. Up to 10,000 waders roost on the sandspit and many breed.	Supratidal sands, dune islands, shellbanks, intertidal flats.	
MT22	SW	21.32	0.64	0.87	0.98	0.55	54.78	Moutere	SH6 causeway bounding SE half of Moutere River estuary, excl. river channel. Extensive upper tidal flat with good saltmarsh at head.	Intertidal mudflats, *Juncus krausii* saltmarsh, *Sarcocornia* salt meadow	
MT23	SW	23.29	0.56	0.90	0.99	0.50	49.55	Moutere	SH6 causeway and bridge bounding NW half of Moutere River estuary, incl. river channel. Upper tidal flats with saltmarsh & salt meadow. Extensive modifications with power poles, drains, reclamation spoil dumping, vehicle tracks thru saltmarsh, weeds	Intertidal mudflats with *Juncus & Plagianthus* saltmarsh & salt meadow	river channel & spoil-raised banks with gorse/grasses on banks
JI	DU	0.00	0.00	1.00	1.00	0.00	0.00	Motueka	Jackett Island barrier island. Mosaic of pines with variety of introd and native trees, shrubs, grasses. Scattered baches, limited tracking		
KP1	DU	0.00	0.00	1.00	1.00	0.00	0.00	Motueka	Kina peninsular tip with low density baches, plantings, regen of native & intro spp, some tracking		
KP2		0.00	0.00	1.00	1.00	0.00	0.00	Motueka	Kina peninsular		
KP3		0.00	0.00	1.00	1.00	0.00	0.00	Motueka	Kina peninsular		
KP4		0.00	0.00	1.00	1.00	0.00	0.00	Motueka	Kina peninsular		

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description
MK1	SW	71.94	0.54	0.28	1.00	0.15	15.12	Motueka	Motueka Relict Estuary (Kumeras). Substantial sedimentation since removal of flood flushing flows. Intertidal flats with smothered salt meadow & limited saltmarsh. Cobbles underlie sands in channel outlet.	Upper tidal flats with fringing saltmeadow & patchy saltmarsh	
MK2	DU	23.31	0.26	1.00	1.00	0.26	25.50	Motueka	Sandspit bounding Motueka Relict Estuary (Kumeras)	Marram grass with occassional emergent pines/acacias, some gorse with patchy lupins	
MK3	SW	4.37	0.29	0.12	0.99	0.03	3.41	Motueka	An old river mouth into the Motueka Relict Estuary (Kumeras) which was subsequently separated from the river channel of the northern delta. Comprises river channel & upper tidal flats, bissected by causeways/floodgates and drains.	Dense beds Ulva sea lettuce in channels. Salt meadow on silty intertidal flats	
		0.00	0.00	1.00	1.00	0.00	0.00				
MA1	SW	1.08	0.60	1.00	1.00	0.60	59.50	Marahau	Estuarine inlet bounded by northernmost sandspit. Extensive saltmarsh with open sandflats, some covered with detritus from recent dieback of vegetation.	Saltmarsh includes *Juncus,* oioi, *Schoenoplectus*. Sandflats partly covered by organic detritus.	
MA2	SW	4.78	0.62	0.96	1.00	0.60	59.89	Marahau	Upper intertidal mosaic of saltmarsh, saltmeadow and sandflat patches bounded by causeway and several bridges supporting walkway to National Park.	Saltmarsh includes *Juncus*, oioi, *Plagianthus*. Salt meadow with *Sarcocornia & Samolus*. Gorse & weeds on upper margins.	

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description
MA3	SW	10.24	0.72	1.00	1.00	0.72	72.25	Marahau	Estuarine inlet bounded by central sandspit and neighbouring stream channels. Natural sand incursions as barrier spit migrates inland and buries saltmarsh	Saltmarsh includes *Juncus, Plagianthus* & patches of oioi. Saltmeadow incl. *Sarcocornia.* Sandflats over midtidal reaches.	
MA4	SW	10.22	0.64	1.00	1.00	0.64	63.75	Marahau	Delta for Marahau River, bounded by souther sandspit. Mainly saltmarsh and saltmeadow, with minor sandflats. Some weed invasion at margins. River channel somewhat unstable.	Saltmarsh includes *Juncus Plagianthus,* oioi. Salt meadow *Sarcocornia.*	
MA5	DU	2.84	0.43	1.00	1.00	0.43	42.50	Marahau	Three sandspits bounding the "ëstuarine" intertidal component of the Marahau Delta system in Sandy Bay. All are migrating inland over saltmarsh. Southern one infested with weed species.	Southern spit with marram, gorse, iceplant, lupin, broom. Central and norther with remnant native saltmarsh.	
		0.00	0.00	1.00	1.00	0.00	0.00				
OW1	DU	5.69	0.34	0.99	1.00	0.33	33.12	Otuwhero	Sandspit enclosing Otuwhero Estuary. Heavily modified by roadend carpark, vehicle tracking, rock riprap, weed invasions and plantings	Small amount of bare sand, mostly introduced gorse, marram , iceplant, lupin, pines with small areas of native Isolepis and akeake.	
OW2	SW	53.27	0.59	1.00	1.00	0.59	58.86	Otuwhero	Lower intertidal flats, good invertebrate populations within unvegetated sands, some eutrophic algae. Several moored boats and mooring blocks.	Intertidal flats and channels with minor saltmarsh and saltmeadow on margins	

Unique identifier	Environment type	Area ha	ENI	HGNI	FBSI	NCI	Natural character score	Locality	Summary	natural area 1 or BAA description	natural area 2 or BAA description
OW3	SW	28.30	0.60	1.00	1.00	0.60	59.50	Otuwhero	Upper intertidal flats with saltmarsh and salt meadow	Saltmarsh includes *Juncus & Plagianthus* with some introduced grasses on margin. Saltmeadow includes *Sarcocornia & Samolus*	
OW4	SW	12.29	0.73	1.00	0.99	0.72	72.09	Otuwhero	Upper intertidal flats separated by causeway carrying main road formation. Bridge across stream leaves flows relatively intact	Saltmarsh includes Juncus, OiOi Plagianthus, manuka scrub and some intro grasses	