

Technical Report 25

Frank Boffa – Natural Character Assessment

ASSESSMENT OF THE NATURAL CHARACTER OF THE COASTAL ENVIRONMENT

PREPARED FOR
WELLINGTON INTERNATIONAL AIRPORT LIMITED

BY

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Executive Summary

- i. Wellington International Airport Limited (WIAL) proposes to extend the runway approximately 350m to the south into Lyall Bay to further enable long haul flights. As part of investigating this proposal, Frank Boffa was engaged by WIAL in November 2015 to carry out an assessment of the effects on the natural character of the coastal environment.
- ii. The original development of Wellington International Airport in 1956-59, and its subsequent further development in 1972 when an additional area was reclaimed to extend the runway (establishing the current coastal edge) has had a significant effect on the natural character of the Rongotai Isthmus and Lyall Bay generally. Construction of the runway has extensively modified the eastern edge of Lyall Bay, creating a linear, rock-armoured edge extending 800m from Lyall Bay beach southwards. The breakwater that extends 150m into Lyall Bay also forms part of this artificial edge.
- iii. An integral component of the runway extension project includes mitigation measures developed in response to some of the natural character landscape and urban design effects. These mitigation measures involve modifying the existing man-made armoured western edge of the runway, including the proposed extension, and creating a 'softer' more natural edge on part of the eastern side of the runway extension, in particular where it joins the beach area along with the creation of and improvements to marine and terrestrial ecological habitats. Other mitigation measures include optimising public access opportunities along Moa Point Road and in the inner part of Lyall Bay.
- iv. Natural character is generally assessed on a continuum of modification that describes the expression of natural elements, patterns and processes (or the 'naturalness') in a coastal landscape/ecosystem. As natural character is assessed over a continuum from highly natural (pristine) to totally modified (urban), half of the continuum (i.e. above moderate) can be considered to be predominantly "natural", while the half below moderate can be considered to be predominantly modified. Consequently, and in natural character terms, the higher thresholds for susceptibility to change occur within the very high to high rankings in terms of both adverse and significant adverse effects.
- v. The natural character assessment focuses on the terrestrial and marine coastal edge in close proximity to the airport, it also considers Lyall Bay as a whole and in the context of the wider south coast. The assessment also focusses on the land in close proximity to the coastal edge rather than the full inland extent of the coastal environment as identified the WCC's 2014 draft Coastal Environment report. This is due to the fact that the area generally inland from the coastal road has been highly modified, and in addition there are likely to be no natural character effects as a result of the proposed runway extension on these more inland areas.
- vi. At a broad scale, the south coast is seen as being 'wild and natural'. The low level of development over much of the south coast is confined largely because of the narrow coastal platform and the ruggedness of the landforms. These aspects together with the often extreme climate and weather events all contribute to this perception of isolation and wildness. In general terms, much of the south coast retains relatively high levels of natural character with areas of modification occurring within some of the more developed bays such as Island Bay, Houghton Bay, Lyall Bay, Breaker Bay and the Seatoun area.
- vii. Given the confined nature of the proposed runway extension and its position and context within Lyall Bay, there will be no change to the natural character of the south coast which will remain high or Lyall Bay overall which will retain its moderate level of natural

character. The Inner Bay and the Outer Bay Component Areas will also maintain their existing levels of natural character, being moderate for the Inner Bay and moderate/high for the Outer Bay.

- viii. Four of the six Inshore Component Areas, namely Hue te Taka Peninsula, Lyall Bay Beach, Inner Western Shore and Te Raekaihau Point will all retain their existing natural character levels following the construction of the airport runway extension. While construction effects will be apparent and will have an effect on natural character, these effects will be transitory and will not be permanent.
- ix. The two Lyall Bay Component Areas that will experience a reduction in natural character will be the Moa Point Embayment Area which will change from moderate to low and the Airport Area which will change from low to very low, both of which will be as a result of a reduction in marine and experiential attributes. These changes, while adverse will not be significant in terms of NZCPS 13(2)(b), and can in part be mitigated.
- x. In terms of the adverse effects on “all other areas” (NZCPS 13(1)(b)), while there will be adverse effects on natural character in the Moa Point Embayment and the Airport Component Areas these will in part be addressed by the proposed mitigation measures.
- xi. Temporary adverse effects on natural character will occur during the reclamation and runway construction process, including increased water turbidity affecting water quality, loss of paua and kina populations, habitat displacement, and disruption to some recreation activities, public exclusion zones and effects on experiential attributes. These effects will only be apparent during the 3 to 4 year construction phase of the project.

1.0 Introduction

- 1.1 Frank Boffa¹ was engaged by Wellington International Airport Limited (WIAL) to prepare a natural character assessment for the proposed extension to the airport runway. While WIAL has investigated extending the runway to both the north (into Evans Bay) and to the south into Lyall Bay (Hui te Pora) or a combination of both, engineering considerations led to the southern extension being preferred. This assessment of natural character effects relates to the proposed southern extension into Lyall Bay.
- 1.2 The natural character of the Lyall Bay area, and in particular the eastern shoreline has over time undergone significant modifications to its natural character. The proposed runway extension will result in further change to the eastern shoreline and in particular to the Moa Point area.
- 1.3 During the preparation of this assessment, close liaison has been maintained with Boffa Miskell Limited who have prepared the Landscape and Visual Effects Assessment and with NIWA who have carried out extensive marine related investigations and have provided relevant natural character information relative to the marine environment.

2.0 Project Description

- 2.1 The proposed extension will enable larger aircraft than can presently be accommodated (particularly Code E) to use Wellington airport. The runway extension will involve a reclamation of approximately 10.8ha at the southern end of the existing runway. The project description and indicative construction programme and methodology are contained in separate AECOM reports².
- 2.2 In summary, the construction of the runway extension will involve the following:
- *Extension of the existing runway reclamation with approximate dimensions – 350m long, 300m wide and 9.0m above mean sea level;*
 - *Construction of a 1.0m high wave wall and security fence around the perimeter of the extension (combined height 2.4m);*
 - *Ground improvement to stabilise the reclamation fill and/or the marine deposits underlying the rock dyke;*
 - *Construction of a rock dyke around the perimeter of the runway extension using rock imported to the site;*

¹ Frank Boffa retired from Boffa Miskell Limited in 2013 and has subsequently been working as an independent consultant focussing on landscape planning projects.

² *Wellington Airport Runway Extension: Construction Methodology Report*, AECOM Consulting Services, April 2016 and Section 6.0, *Wellington International Airport Limited: Runway Extension Project Concept Feasibility and Design Report, Volume 1*, AECOM New Zealand Limited, prepared for Wellington International Airport Limited, April 2016.

- *Armouring the outside edge of the rock dyke using large, multi-tonne concrete blocks (akmons/Accropodes);*
- *Placing reclamation fill inside the rock dyke;*
- *Installation and potential relocation of various infrastructures and services;*
- *Extension of the Moa Point Road underpass and its associated infrastructure under the runway extension;*
- *Construction of a new runway platform on the reclaimed land;*
- *Installation and modification of navigation aids*
- *Construction of a Surf Wave Focusing Structure (SWFS) in the centre of Lyall Bay, and*
- *Temporary mooring systems to enable the construction.*
- *Works associated with landscape amenity improvements to Moa Point Road and Beach.*

2.3 Associated works include removal of a remnant hillock at the south-western end of the airport between Stewart Duff Drive and Freight Drive. The material removed will be used as fill in the reclamation (approximately 79,000m³). Following the removal of the remnant hillock, the area will be levelled and may be used as a construction compound for the duration of the project. Ultimately it is expected the area will be covered in asphalt and used for aircraft and car parking activities.



Figure 1: WIAL Proposed Runway Extension

2.4 An integral component of the runway extension project are several mitigation measures developed in response to some of the landscape, urban design and ecological effects. In summary, these mitigation measures involve modifying the existing man-made armoured western edge of the runway, including the proposed extension, and creating a 'softer' more natural like edge on part of the eastern side of the runway extension.

Other mitigation measures include:

- *Creating a new edge along the eastern side of the runway extension, which would integrate the armoured edge of the runway with the existing 'natural' edge of the Moa Point embayment;*
- *Creation of and improvements to, marine and terrestrial ecological habitats;*
- *Recreational and improved public access opportunities to be developed along the western edge of the airport along Moa Point Road;*
- *The development of a Submerged Wave-Focusing Structure (SWFS) constructed in the inner part of Lyall Bay.*

3.0 Existing Environment

Natural Character

- 3.1 With over 100km of coastline; Wellington City's coastline is a defining topographical element forming the boundary and edge to much of the district. A range of land use activities adjoin Wellington's coastal environment including commercial, urban, suburban, recreation, and open space. Port Nicholson (Te Whanganui a Tara/Wellington Harbour) has approximately 60km of coastline, of which 38km or 65% falls within Wellington City.
- 3.2 Wellington's south coast has extensive areas of rocky shore and reefs which provide habitat for a range of kelp, seaweeds, invertebrates and fish. The south coast is popular for recreational fishing and for gathering of paua, kina and rock lobster (crayfish). The road extending around the south coast provides good access and the many small bays, typical of much of the south coast have residential settlements; generally taking the form of a line of properties strung along the landward side of the coast road.
- 3.3 Narrow shore platforms backed by steep escarpments are typical of Wellington's coastline, especially along the south and west coasts, where exposure to rigorous environmental conditions has helped shape the rugged landforms. Much of the coastline has also been shaped by tectonic processes, some of which are relatively recent. The landscape and marine environment has been subjected to periodic dramatic changes through land movements along numerous fault lines. West of the Wellington Fault, the land has been uplifted, and east of the Fault downward movement formed a basin that is now Port Nicholson, enclosed by the more recently uplifted Miramar Peninsula and Rongotai Isthmus.
- 3.4 Wellington International Airport is situated on the Rongotai Isthmus, the tract of low-lying area of land between Kilbirnie and the Miramar Peninsula. This tract of land is, in geological terms, very recent; it was formerly a shallow tombolo that has filled up. The former Miramar Island (Motu-Kairangi) was separated from the mainland and a second harbour entrance was situated between the Miramar Peninsula and Kilbirnie. The

combined effects of sediment accumulation and uplift eventually joined the island to Kilbirnie, creating the Rongotai Isthmus. The stretches of rocky sea bed exposed by the uplift accompanying the 1855 earthquake are clearly visible around the coastal edge of the Isthmus.

- 3.5 Originally Lyall Bay was a wide semi-circular 4.6km sweep of coastline with rocky headlands containing the bay at Hue te Taka Peninsula (Moa Point) in the east and Te Raekaihau Point in the west. In its wider context, the airport and its associated infrastructure, together with adjoining developments (Wellington's Wastewater Treatment Plant and sewer outfall, Miramar Golf Club, and residential housing, roads and infrastructure) have all contributed to substantial modification of the natural character on the eastern side of Lyall Bay.

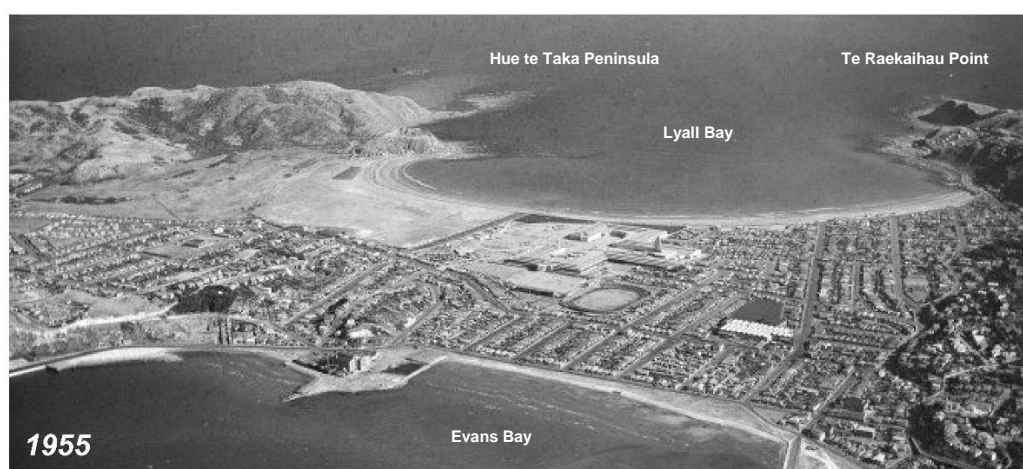


Figure 2: Rongotai Isthmus prior to first airport reclamation

- 3.6 The original development of Wellington International Airport in 1956-59, and its subsequent further development in 1972 when an additional area was reclaimed to extend the runway (establishing the current coastal edge) has had a significant effect on the natural character of the Rongotai Isthmus and Lyall Bay generally. The construction of the airport has involved reclamation at both the northern and southern ends, including 14 ha of the eastern side of Lyall Bay. The construction incorporated a rock outcrop and reef towards the southern end of the runway and the breakwater covers the end of this reef. Construction of the runway has extensively modified the eastern edge of Lyall Bay, creating a linear, rock-armoured edge extending 800m from Lyall Bay beach southwards. The breakwater that extends 150m into Lyall Bay also forms part of this artificial edge.
- 3.7 While the remainder of Lyall Bay beach is still largely intact, residential and recreational development and associated roads and infrastructure have modified all but the seaward fringe of the remnant dunes, which are now contained by a sea wall, a road and residential and commercial buildings. Lyall Bay beach is a popular destination for swimming, board surfing, kite surfing, wind surfing, and surf lifesaving.



Figure 3: Original Airport Development

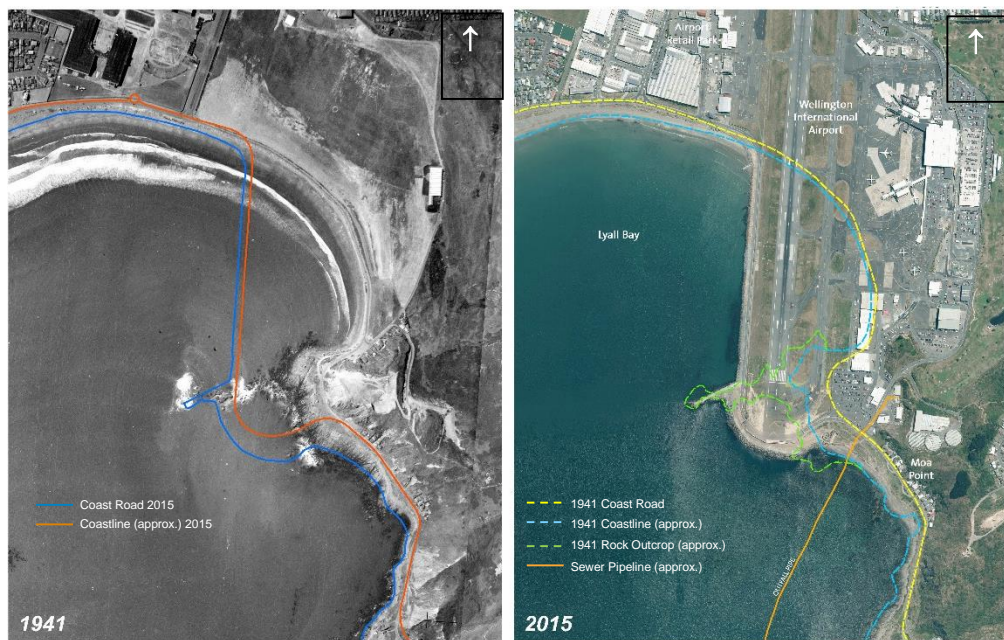


Figure 4: Eastern Lyall Bay Coastline in 1941 and 2015

4.0 Statutory Framework

- 4.1 The key statutory provisions with respect to natural character matters relative to this project are outlined below.

Resource Management Act

- 4.2 Section 5 which sets out the purpose of the Resource Management Act (RMA), Section 6(a) requires, as a matter of national importance, decision makers to recognise and provide for:

“the preservation of the natural character of the coastal environment (including the coastal marine area) wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development.”

- 4.3 In order to give effect to RMA Section 6(a), the New Zealand Coastal Policy Statement (NZCPS) was issued in 2010. The purpose of the NZCPS was to formulate specific objectives and policies in relation to the New Zealand Coastal Environment.

New Zealand Coastal Policy Statement 2010 (NZCPS)

- 4.4 While the NZCPS does not provide specific guidance with respect to defining the inland extent of the coastal environment, Policy 1 provides a list of characteristics as a basis for establishing what might be included within the coastal environment.

Policy 1 Extent and Characteristics of the Coastal Environment

- (1) *Recognise that the extent and characteristics of the coastal environment will vary from locality to locality; and the issues that arise may have different effects in different localities.*
- (2) *Recognise that the coastal environment includes:*
 - (a) *The coastal marine area;*
 - (b) *Islands within the coastal marine area;*
 - (c) *Areas where coastal processes, influences or qualities are significant, including coastal lakes, lagoons, tidal estuaries, salt marshes, coastal wetlands, and the margins of these;*
 - (d) *Areas at risk from coastal hazards;*
 - (e) *Coastal vegetation and the habitat of indigenous coastal species including migratory birds;*
 - (f) *Elements and features that contribute to the natural character, landscape, visual qualities or amenity values;*

- (g) Items of cultural and historic heritage in the coastal marine area or on the coast;*
- (h) Inter-related coastal marine and terrestrial systems, including the intertidal sector; and*
- (i) Physical resources and built facilities, including infrastructure, that have modified the coastal environment.*

4.5 In 2014 Wellington City Council commissioned background research to establish the inland extent of the coastal environment³. The preliminary report identified the whole of the Rongotai Isthmus, including the Hue te Taka/Moa Point area, as being within the coastal environment. Accordingly, the airport and the proposed runway extension are considered to lie within the coastal environment and subject to the relevant RMA and NZCPS provisions. The 2014 Preliminary Coastal Environment Report is currently in draft form and has not yet been adopted by Wellington City Council.

Policy 13 Preservation of Natural Character

- (1) To preserve the natural character of the coastal environment and to protect it from inappropriate subdivision, use and development:*
 - (a) Avoid adverse effects of activities on natural character in areas of the coastal environment with outstanding natural character; and*
 - (b) Avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on natural character in all other areas of the coastal environment;*

Including by:

 - (c) Assessing the natural character of the coastal environment of the region or district, by mapping or otherwise identifying at least areas of high natural character; and*
 - (d) Ensuring that regional policy statements and plans, identify areas where preserving natural character requires objectives, policies and rules, and include these provisions.*
- (2) Recognise that natural character is not the same as natural features and landscapes or amenity values and may include matters such as:*
 - (a) Natural elements, processes and patterns;*
 - (b) Biophysical, ecological, geological and geomorphological aspects;*
 - (c) Natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks;*
 - (d) The natural movement of water and sediment*
 - (e) The natural darkness of the night sky;*

³ Coastal Environment, Wellington City, 2014. Prepared by Boffa Miskell for Wellington City Council, December 2014. This Preliminary Report has not been formally adopted as policy by WCC. However, in 2015 WCC, GWRC and HCC commissioned a natural character assessment of the coastal environment to identify areas of high and outstanding natural character. This study will be completed in the first quarter of 2016.

- (f) *Places or areas that are wild or scenic;*
- (g) *A range of natural character from pristine to modified;*
- (h) *Experiential attributes; including the sounds and smell of the sea; and their context or setting.*

4.6 While natural character is not defined in either the RMA or the NZCPS, the New Zealand landscape profession defines natural character as, *the expression of natural elements, patterns and processes in a landscape.*⁴ Natural Character is the term used to describe the natural elements of coastal environments as the expression of natural elements, patterns and processes in a landscape (or the 'naturalness') where the degree of 'naturalness' depends on:

- *The extent to which natural elements, patterns and processes occur.*
- *The nature and extent of modifications to the landscape, seascape and ecosystems.*

4.7 The highest degree of natural character (greatest naturalness) occurs where there is the least modification. In the context of natural character assessments, naturalness can be defined as a measure of the degree of human modification of a landscape ecosystem, expressed in terms of:

- *Ecological naturalness (indigenous ecology)*
- *Landscape (perceived) naturalness.*

4.8 Relative to natural features and natural landscapes (including seascapes) (NZCPS, Policy 15), Policy 13(2) notes that "natural character is not the same as natural features and landscapes or amenity values". Accordingly, these aspects including public open space and mitigation are covered in the Assessment of Landscape and Visual Effects Report prepared for WIAL by Boffa Miskell Limited.

Policy 14 Restoration of Natural Character

Promote restoration or rehabilitation of the natural character of the coastal environment, including by:

- (a) *Identifying areas and opportunities for restoration and rehabilitation*

4.9 While areas and opportunities for restoration and rehabilitation are in part covered in this report, more specific details relative to overall restoration and/or rehabilitation and mitigation of landscape and marine effects are reviewed and discussed in other reports.

4.10 Regional and District Plan provisions are addressed in the Planning Assessment, which forms part of the Assessment of Environmental Effects Report.

⁴ Best Practice Note, *Landscape Assessment and Sustainable Management*, adopted by New Zealand Institute of Landscape Architects (NZILA) June 2010.

Summary: Key Statutory Provisions

- Preservation of the natural character of the coastal environment and to protect it from inappropriate subdivision, use and development.
- Assessing natural character in the coastal environment by mapping and identifying at least areas of high natural character.
- Avoid adverse effects of activities on natural character in the coastal environment with outstanding natural character.
- Avoid significant adverse effects of activities on natural character in all other areas of the coastal environment.
- Avoid, remedy or mitigate other adverse effects of activities on all other areas of the coastal environment.
- Promote restoration or rehabilitation of the natural character of the coastal environment.

5.0 Natural Character Approach and Methodology

Approach

- 5.1 Natural character is generally assessed on a continuum of modification that describes the expression of natural elements, patterns and processes (or the 'naturalness') in a coastal landscape/ecosystem where the degree of 'naturalness' depends on:
- *The extent to which natural elements, patterns and processes occur and are legible;*
 - *The nature and extent of human modifications to the landscape, marine area and ecosystems;*
 - *The proposition that the highest degree of natural character (greatest naturalness) occurs where there is least modification/uncluttered by obvious or disruptive human intervention and/or influence; and*
 - *Recognition that the degree of natural character is context-dependent and can change over time.*
- 5.2 For this project the effects on natural character have been assessed using the methodology outlined above, with input from NIWA specialists in relation to the assessment of 'marine naturalness'. In this regard, discussions have taken place with several of the authors of the NIWA reports to assess the natural character of Lyall Bay between Te Reikaihau Point and Hue te Taka within the context of the Wellington south coast. These discussions have focussed on the physical (abiotic) and biological (biotic) factors in the Coastal Marine Area (CMA) and for some shoreline aspects of the terrestrial area. Other inputs to the assessment of ecological naturalness of the terrestrial coastal area have come from various reports prepared by a range of

agencies, organisations and individuals.

Methodology

- 5.3 A series of technical reports prepared by NIWA on the marine physical and biological characteristics of Lyall Bay and Wellington's south coast document the factors that need to be considered in relation to natural character.⁵ As a first step, an assessment of the existing natural character was completed based on the methodology set out below. Subsequently, an assessment of the effects of the runway extension on natural character was completed incorporating key aspects that emerged from discussions and meetings between the experts.
- 5.4 Due to the variability of the factors, it was agreed with NIWA, to subdivide the physical and biological factors into their various components and to assess each of these individually. The physical factors in the CMA were subdivided into three areas – the beach, the reefs, and the main part of the bay, including the water column and the seabed surficial sediments. Following this, an overall assessment was then made as to the level of physical naturalness.
- 5.5 Biological factors in the CMA were assessed in relation to the different components and communities (pelagic⁶, benthic⁷, fish, mammals and seabirds, reefs) and a finding on the degree of natural character on each of these was reached.
- 5.6 In terms of the coastal terrestrial area, the physical factors were considered in relation to two primary components (geomorphology and terrestrial coastal processes) with the biological factors assessed in relation to vegetation and fauna.
- 5.7 The experiential components, as noted in NZCPS 2010, take into account perceptions of the coastal environment, including the sense of wildness, isolation, scenic aspects, sounds, aromas, and other transient influences such as surf breaks and the darkness of the night sky. These were reviewed and as appropriate were considered in relation to both the CMA and coastal terrestrial areas.
- 5.8 As a basis for determining levels of natural character, an integrated evaluation matrix was developed for both the terrestrial and the marine areas. While Policy 13(2) of the NZCPS makes reference to a range of natural character matters including biophysical and experiential attributes, often these are collectively assessed under the headings of abiotic, biotic and experiential attributes, the characteristics considered to be relevant to this particular assessment were identified and assessed under the attribute headings of physical, biological and experiential. Examples of "typical environments" within the natural character continuum were also reviewed as a guide to applying and ranking the

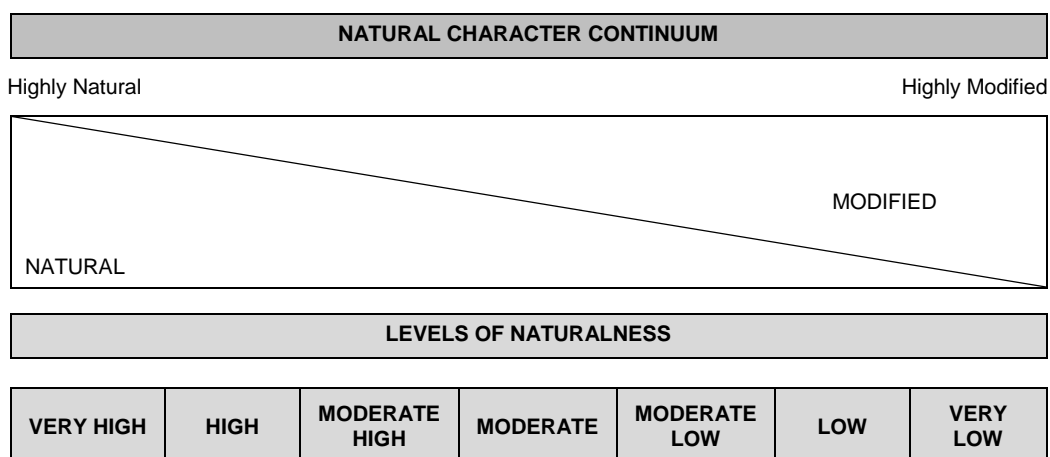
⁵ *Assessment of Ecological Effects of the reclamation and extension of Wellington Airport*, James et al, prepared for Wellington International Airport Ltd, July 2015.

⁶ Biota in the water column.

⁷ Sea floor associated biota.

matrix attributes and characteristics.

- 5.9 Given natural character is assessed over a continuum from highly natural (pristine) to totally modified (urban), half of the continuum (i.e. above moderate) can be considered to be predominantly “natural”, while the half below moderate can be considered to be primarily modified. Consequently, and in natural character terms, where the level of natural character is highest, it is generally more sensitive to change with the potential to incur significant adverse effects. Conversely where levels of natural character are lower (ie moderate and below), they are generally less sensitive to change which would result in significant adverse effects.
- 5.10 The table below illustrates in diagrammatic form, the natural character continuum relative to the 7 point assessment scale used to assess the levels of natural character/modification. The threshold between what can be considered to be a predominantly “natural environment” and a predominantly “urban environment” is also shown.



- 5.11 The matrix approach used to rank the levels of the 3 natural character attributes was based on the following 7 point scale:

NATURAL CHARACTER RANKING SCALE			
Level of Natural Character	Physical Attributes	Biological Attributes	Experiential Attributes
Very High			
High			
Moderate/High			
Moderate			
Moderate/Low			
Low			
Very Low			

- 5.12 While the NZCPS (Policy 13(1)(c)) requires that areas of at least high natural character be mapped and assessed, the assessment involved a wider range of rankings given the extensively modified nature of the Lyall Bay area. In determining the overall level of natural character within each of the character areas, the following weightings were applied to the 3 natural character attribute classes.

ATTRIBUTE WEIGHTING SCALE			
Attribute	Terrestrial	Marine	Total
Physical	20	20	40
Biological	20	20	40
Experiential	10	10	20
Overall	50%	50%	100%

- 5.13 The basis for developing and applying the weightings noted above, is that natural character is a **condition** rather than a **quality** or **value** and to that extent, it exists regardless of experiential or perceived attributes. Consequently, experiential attributes, while required to be considered under the NZCPS, are not considered to be the primary or principal determinants of natural character. The primary determinants of natural character in relation to natural elements, patterns and processes are biophysical.
- 5.14 Policy 13(i)(a) of the NZCPS requires the avoidance of adverse effects on outstanding natural character. Generally areas of outstanding natural character are identified and mapped following a comprehensive natural character assessment based on the 7 point scale referred to in paragraph 5.11. Outstanding candidate areas or parts of areas are selected where appropriate from those areas that have been assessed as having very high and/or high areas of natural character.
- 5.15 With respect to all other areas, Policy 13(i)(b) requires the avoidance of significant adverse effects and the requirement to avoid, remedy or mitigate other adverse effects on natural character in the coastal environment. Given the natural character continuum and the levels of modification illustrated in the diagram in paragraph 5.10, the weightings for “all other areas” have been assessed as follows:
- (i) Where natural character is assessed as being very high (VH) or high (H) a change considered to be significantly adverse, would be a reduction to a lower level of natural character.
 - (ii) Where natural character is assessed as being moderate/high (MH) and less sensitive to change, a reduction to moderate/low or lower levels of natural character would generally be considered to be significantly adverse.
 - (iii) Where natural character is assessed as being moderate (M), or below, there is limited potential to generate significant adverse effects within what is predominantly a modified coastal environment.

Where adverse effects are not considered to be significant, they must be avoided, remedied or mitigated within all classifications.

6.0 Natural Character Assessment

- 6.1 The assessment of existing natural character and effects on natural character as a result of construction of the runway extension need to be considered in relation to scale. While this assessment focuses on the terrestrial and marine coastal edge in close proximity to the airport, it also considers Lyall Bay as a whole and in the context of the wider south coast. The assessment also focusses on the land in close proximity to the coastal edge rather than the full inland extent of the coastal environment as identified the WCC's 2014 draft Coastal Environment report. This is due to the fact that the area generally inland from the coastal road has been highly modified, and in addition there are likely to be no natural character effects as a result of the proposed runway extension on these more inland areas.
- 6.2 The natural character assessment considers the level of natural character for the terrestrial and CMA components separately. Each of these components include physical, biological and experiential attributes and utilise a matrix evaluation guide to rank the existing and post construction level of natural character on a 7-point scale in relation to the natural character attributes. The scale used ranges from Very High (VH) - High (H) – Moderate High (MH) – Moderate (M) – Moderate Low (ML) – Low (L) – Very Low (VL).
- 6.3 For the terrestrial areas the physical attributes were considered in relation to geomorphology, coastal processes and the biological attributes including vegetation, fauna, habitats and ecological associations.
- 6.4 For the CMA the physical attributes were considered in relation to the beach, reefs, and the main part of the bay, including the water column and the seabed surficial sediments. The biological attributes were considered in relation to pelagic, benthic, fish, mammals, seabirds, offshore reefs, and the water column.
- 6.5 The experiential attributes were considered in relation to the perception of naturalness within the coastal environment, incorporating matters such as the senses of wildness, isolation, sounds and smell of the sea.

South Coast

- 6.6 The 25km of Wellington's south coast (Cape Terawhiti to Palmer Head) is characterised by steep ridges and escarpments running down to a narrow rocky shore platform, largely originating from the uplift as a result of the 1855 earthquake and previous large tectonic events. The steep coastal ridges and topography mostly run north-south and are dissected by streams. In places there are small sandy bays. Lyall Bay is somewhat untypical being the largest bay on the south coast separating the Miramar peninsula from the rest of the south coast. While originally there were areas of sand dunes present in several places on the south coast, especially on the Rongotai Isthmus, development of the airport, roading, residential and recreational development has removed or

significantly modified these.

- 6.7 The climate and weather strongly influence the vegetation growing on the south coast and there are many plant species adapted to the exposed environments that prevail. While the original vegetation has long been cleared, a mosaic of native and exotic scrub has established throughout the south coast, and this, together with revegetation of stretches along the foreshore and environs carried out by Wellington City Council and interest groups, provides a mosaic vegetation cover that is establishing slowly given the difficult climatic conditions.
- 6.8 Wellington's south coast hosts a range of recreational activities, both land and water-based, which enable people to enjoy and interact with the coastal environment. The road that has been built on the narrow coastal platform and which runs around most of the south coast provides easy access for a large urban population. While there is a range of water-based activities that attract people to the south coast and specifically to places like Lyall Bay, driving, cycling and walking around the coast are major recreation activities for many people. In addition, the Eastern and Southern Walkways also provide access to areas of open space and opportunities to experience relative remoteness and expansive views from elevated locations on these walkways and other tracks.
- 6.9 At a broad scale, the south coast is perceived as being 'wild and natural' and these and similar terms are regularly used to describe it. The low level of development over much of the south coast is confined largely because of the narrow coastal platform, the ruggedness of the landforms. These aspects together with the often extreme climate and weather events, and the recreation opportunities available, all contribute to this perception of isolation and wildness.
- 6.10 In general terms, much of the south coast retains relatively high levels of natural character with areas of modification occurring within some of the more developed bays such as Island Bay, Houghton Bay, Lyall Bay, Breaker Bay and the Seatoun area.

Lyall Bay Coastal Terrestrial Area

- 6.11 In terms of natural character, the highest degree of naturalness occurs where there is the least amount of human induced modification. The stretch of the south coast environment (in close proximity to the proposal) is highly modified by the existing runway, together with residential, commercial and recreational activities and infrastructure which have significantly modified the form and of Lyall Bay and the adjoining coastal margin. These modifications have also affected the perception of naturalness.
- 6.12 In terms of Wellington's south coast, it is generally the terrestrial area where the greatest degree of modification has occurred as a result of the original vegetation being almost totally removed, the coastal road constructed on the narrow coastal platform, along with residential housing and infrastructure. By contrast, in the coastal marine area, both the physical and biological components have been modified to some extent, however not

to the same degree as in the terrestrial coastal area.

- 6.13 The exception to this along the south coast is Lyall Bay where the scale of modification is such that the natural character of both the terrestrial and marine environments have both been reduced with the terrestrial being reduced more than the marine. In order to assess the different natural character attributes within Lyall Bay, the area has been divided into eight sub- component areas or, which are referred to in the summary tables later in this section as being the 'Inner Bay component' and 'Outer Bay' component. Figure 5 below shows the definition of the Lyall Bay component areas.



Figure 5: Lyall Bay Natural Character Component Areas

Physical Attributes

- 6.14 The landform on the eastern side of Lyall Bay has been significantly modified, largely due to the construction of Wellington International Airport. The Moa Point Wastewater Treatment Plant, the coastal road, residential and recreational development and associated infrastructure have also contributed to this modification. The intact natural headlands on the eastern and western sides of outer Lyall Bay are the least modified areas and both Te Raekaihau and Palmer Head/Hue te Taka are protected as open space.



Figure 6: Te Raekaihau Component Area



Figure 7: Western Shore Component Area

- 6.15 While the 'remnant' of Lyall Bay beach itself is relatively intact, the sea wall at the back of the beach cuts off the landward sand supply and inhibits any natural dune building process. Some re-forming of the dunes and revegetation has been carried out by Wellington City Council to re-establish in part, what would have once existed. Onshore wind disperses sand from the beach and revegetated 'dune' area on to the adjacent

road and environs. There are also four recreational and commercial buildings located along in the middle section of the beach adjoining the sea wall.



Figure 8: Lyall Bay Beach (West) Component Area



Figure 9: Lyall Bay Beach Component Area

- 6.16 The existing rock revetment forming the armoured edge running along the edge of Moa Point Road and along the airport runway has substantially modified this area. The coastal platform, east of the runway has also been modified by construction of the

runway and also by the formation of Moa Point Road and the enclave of residential dwellings. The boundaries of the residential properties extend up the steep hill face behind but the dwellings are clustered along the toe of the slope. There is a narrow shingle beach in the front of the houses and above this a 30-50m wide foreshore reserve which has been planted in coastal native vegetation and is well used by the local community. While construction of the road in the Moa Point Embayment Area, and the residential development have modified the landform, the level of modification is of a far lesser scale than that of the Lyall Bay edge of the airport runway.



Figure 10(a): Airport Component Area



Figure 10(b): Airport Component Area



Figure 11(a): Moa Point Embayment Component Area



Figure 11(b): Moa Point Embayment Component Area



Figure 12: Interface between Airport and Moa Point Embayment Component Areas

- 6.17 The steep slopes behind the residential dwellings and on Palmer Head and environs show few obvious signs of erosion and have been allowed to regenerate with pest animal and plant control regularly carried out by Wellington City Council. Photographs of this area from the 1950s just prior to development of Wellington Airport and also from the 1960s clearly show Palmer Head and the surrounding area devoid of woody vegetation. Palmer Head, including the Rangitatau Historic Reserve, Hue te Taka Peninsula, and the foreshore are administered by Wellington City Council. The historic reserve was named from the Ngai Tara pa that once occupied the headland and it has been acknowledged as the best surviving pa and archaeological site in the Wellington urban area.⁸
- 6.18 The western side of Lyall Bay has also been modified by vegetation clearance, roading, residential development and infrastructure. However, the reef along the shoreline remains intact and the steep enclosing landforms of Te Raekaihau Point remain undeveloped and protected as open space.

⁸ Management Guidelines for Archaeological Sites in the Rangitatau Historic Reserve, ArcZoo 2004.



Figure 13: Hue te Taka Peninsular Component Area

Biological Attributes

- 6.19 The original vegetation on Palmer Head, Rangitatau and Hue te Taka was entirely cleared sometime prior to 1890.⁹ Originally, the vegetation would have been low-growing coastal scrub and forest on the hill slopes of Palmer Head/Rangitatau and Te Raekaihau. Small patches of coastal vegetation would have been restricted to the steep escarpment and deeper gullies and the more sheltered inland areas would have been dominated by coastal broadleaved low forest. Soils and exposure are the main factors that have influenced vegetation cover.
- 6.20 The original foreshore vegetation species on the sandy beach at Lyall Bay would have comprised a wider range of species that have been planted as part of coastal revegetation (pingao, spinifex, silver tussock). In the small embayment east of the runway there are small areas of naturally growing species on the coastal fringe (glasswort, ice plant and other turf field species) but the foreshore has been planted with a limited range of native coastal species (e.g. taupata, coastal flax, pohuehue).
- 6.21 The existing airport and runway are significantly modified environments comprising buildings, sealed surfaces and mown grass. As such, the area does not support indigenous coastal flora and fauna communities.
- 6.22 The coastal cliffs on the eastern and western sides of Lyall Bay are dominated by

⁹ Rangitatau, Tarakena and Hue te Taka: An Ecological Restoration Plan (Draft) prepared for Wellington City Council by Boffa Miskell Limited, September 2013.

taupata shrubland and coastal flaxland and in a few sheltered gullies there is a low canopy of taupata and mahoe. The dry faces and hill slopes are dominated by grasses such as silver tussock with club sedge, gorse and boneseed. There are many adventive species present such as Japanese honeysuckle, Cape ivy, boneseed, broom, karo and spur valerian which have a propensity to colonise low stature coastal vegetation communities.

- 6.23 Various bird surveys of the Hue te Taka Peninsula have noted a range of species, including little blue penguin; there have been plantings of coastal flax and shrub communities to provide habitat for this species, together with provision of nesting boxes in Tarekana Bay and in other bays around the south coast. Bird species observed in a 2014 survey¹⁰ of the area include black shag, pied shag, variable oyster catcher, black-backed gull, fantail, tui, starling, chaffinch and sparrow. Feral cats and dogs have impacted on the presence, range and abundance of bird species.

- 6.24 A 1992 survey of reptiles of the Hue te Taka Peninsula noted that it is one of very few gecko sites remaining in Wellington. A 2013 survey of reptiles in Wellington City Council administered parks and reserves recorded the Hue te Taka Peninsula as having the second highest number of lizards found (43 no.) comprising several species of skink and also species of gecko. Lizards are found in areas of loose rock or other debris and were noted as absent from areas with fine shingle or sandy substrates.

- 6.25 The 1992 survey also noted the presence of two species of indigenous snails and several indigenous insects and spiders. Hue te Taka's rich diversity of species has been attributed to its relative isolation and tidal restrictions has limited public access to the area and also limited predation from cats¹¹.

Lyall Bay Coastal Marine Area

- 6.26 As previously noted, marine specialists from NIWA provided expert input via several technical reports, assessments, and discussions for the CMA component of the natural character assessment. Some of the material in the following section is taken directly from NIWA sources and other parts have been interpreted.

- 6.27 The Lyall Bay shoreline has been significantly altered with urban and infrastructure development over many decades including the construction of the airport runway and a 14 ha reclamation that resulted in the modification of the original crenulated bay (crescent shaped) shoreline to today's more exaggerated separation between the main bay and the smaller embayment on the eastern side of the runway.

- 6.28 While the main impact on the south coast CMA is fishing, both commercial and recreational, the 854 ha. Taputeranga Marine Reserve to the west of Lyall Bay has had a positive effect on the CMA and there has been a rapid increase in the presence, range,

¹⁰ ibid

¹¹ ibid

abundance and size of previously fished species in the reserve since its establishment in 2008.¹²

Physical Attributes

- 6.29 Lyall Bay formed as a broad tombolo, the Rongotai Isthmus connecting the former Miramar Island (Motu-Kairangi) to the hills west of Kilbirnie developed as a result of uplift and sedimentation. The resulting crenulated form of the Lyall Bay shoreline along this tombolo is uncommon in the Wellington region but there are similar crenulated bays and pocket beaches elsewhere in New Zealand that form between two headlands (eg. Northland, Coromandel, Southland). Lyall Bay is enclosed by rocky headlands and it has a relatively small tidal range (average of just over 1.0m); it has been likened to 'an enclosed bath tub', yet still exposed to the influence of weather and swell. The currents within Lyall Bay are far less than those along the south coast generally.
- 6.30 There are reefs on the outer edge of the bay. The spur groyne (breakwater) projecting out into the bay on the western side of the runway was built on top of an existing reef protruding from the adjacent headland thus reducing the original extent of reef. This together with the construction and the subsequent runway extension reclamation reduced the size of the original Lyall Bay beach.
- 6.31 While Lyall Bay is sheltered to the north, east and west, it is very exposed to the south and can be subject to strong southerly winds and swells. Tidal currents in the bay are negligible out to the southern end of the existing airport runway. The wave climate in Lyall Bay is typical for the south Wellington region and there is a difference between the eastern and western sides of the bay. Waves entering Lyall Bay are predominantly from due south and maintain their energy through the deeper water of the outer bay but lose energy in the shallower water around the margins of the outer bay and in the inner western part of the bay as the seabed shoals towards the beach. Waves are smallest in the north-west sector of the bay where the sea floor shallows considerably. Two submerged reefs aligned north-south (i.e. southward extension of the headland at Te Raekaihau and east of the headland between Te Raekaihau and Waitaha Cove) focus waves from the south and result in increased wave heights locally. The entire south coast, including Lyall Bay, is, at times, affected by large waves generated by regional or distant extreme storm events.¹³
- 6.32 Lyall Bay beach and extending out into the bay is characterised by uniformly moderately to well-sorted fine sandy sediments with very low mud content (mean=2.5%) and no clay content.¹⁴ Sediment transport for Lyall Bay is primarily onshore/offshore with sand combed from the nearshore and deposited offshore where it builds up as a bar during seasonal storms, which subsequently is re-distributed back onshore. By contrast, the beach in the small embayment east of the Airport is quite different; it is gravelly and composed of coarse material. It is also quite steep, especially at its western end (8-15°)

¹² *Effects of Marine Reserve Protection on Adjacent Non-protected Populations in New Zealand*, D. Diaz-Guisado, Unpublished PhD thesis, Victoria University of Wellington, 2014

¹³ *Wellington International Airport Runway Extension, Coastal Processes*, RG Bell, NIWA, prepared for Wellington International Airport Ltd, November 2015.

¹⁴ *Ibid. Wellington Airport Runway Extension: Marine sediments and contaminants (Lyall Bay)*, prepared for Wellington International Airport Ltd by Craig Depree et al, February 2015.

and flattens moving eastwards. The beach profile in this small embayment has also been affected by storms and fill material along the edge of the beach adjacent to the runway has been undercut and eroded.

- 6.33 Stormwater from the adjoining fully developed urban catchment is discharged through a series of outfalls at Lyall Bay beach where there is a stormwater outlet that crosses the beach near the surf club and is visible at low tide at Moa Point and near the breakwater at the southern end of the runway. Despite sources of stormwater and waste water, the water quality is generally good; there is very little mud component.¹⁵ NIWA's investigations in Spring 2014 showed that the water colour during calm periods is typical of clear coastal water with a blue-green hue. During storm events, stormwater discharges and wave activity re-suspending seabed sediments may shift water colour to more of a browner colour due to increased suspended sediment concentrations. Contaminant concentrations in the sediments are low and uniformly distributed and well below the established guidelines.¹⁶
- 6.34 The long outfall pipe from Wellington's Wastewater Treatment Plant extends approximately 1.9km from east of the airport runway to outside the mouth of the bay (Figure 4). The outer bay receives treated wastewater from the Wastewater Treatment Plant which is diluted considerably by mixing of the fresh water with the ambient sea water via a multi-port outfall diffuser; occasionally after heavy rainfall there are overflows from the plant of partially-treated waste water.

Biological Attributes

- 6.35 Lyall Bay is the largest embayment along Wellington's south coast. It comprises three main habitats – the water column or pelagic environment, sandy sea floor sediments and rocky reefs around the eastern and western margins. While the biotic environment of Lyall Bay is not pristine, given the presence of the sewer outfall and roads and runoff, these attributes have had only a limited effect on biological attributes.¹⁷
- 6.36 Phytoplankton and zooplankton in terms of abundance, quality and presence are the same as the rest of the south coast. The overall abundance of both phytoplankton and zooplankton was higher in the middle and inner part of Lyall Bay than in the outer bay.¹⁸
- 6.37 The soft sediment sea floor communities in Lyall Bay are typical of those found along the south coast. There is a low overall abundance and species richness of epi and macro-faunal communities; burrow forming ghost shrimp may comprise the bulk of the macrofaunal biomass in the shallow half of Lyall Bay¹⁹. Based on NIWA's investigations, meiofauna was the most abundant component of the soft sediment

¹⁵ Wellington International Airport Runway Extension, Coastal Processes, RG Bell, NIWA, prepared for Wellington International Airport Ltd, November 2015.

¹⁶ Tables 3.1-3.3, Ecological Characterisation of Lyall Bay, Wellington, MacDiarmid et al, NIWA, prepared for Wellington International Airport Ltd, March 2015.

¹⁷ Ecological Characterisation of Lyall Bay, Wellington, MacDiarmid et al, NIWA, prepared for Wellington International Airport Ltd, March 2015

¹⁸ ibid

¹⁹ NIWA notes that these were poorly sampled but infer from the enormous quantities of burrow entrances in the sea floor images that there biomass is probably high.

community, with average densities for this type of habitat. The investigations did not detect any invasive species.

- 6.38 The rocky reef communities support a rich and diverse range of brown, red and green macroalgae and are typical of shallow reef habitats found along the south coast. They also provide habitats for grazing and predatory reef species, some of which provide a food source for paua, kina, rock lobster and a range of reef fish. Investigations detected on sub tidal rocks an undescribed species of foliose red algae not found along other parts of the south coast (it has been found on the Otago coastline).
- 6.39 The construction of the existing airport runway affected the reef habitats in Lyall Bay. While Lyall Bay has a moderately diverse range of reef fish, abundance and size of fish has been significantly affected by fishing, which is similar to what occurs on the south coast generally. This contrasts to recovering reef fish populations in nearby Taputeranga Marine Reserve.²⁰ Of the 44 species of demersal fish that are predicted to occur in Lyall Bay, only 11 were predicted to be common, 12 species uncommon and 21 species rare. Apart from the Marine Reserve, Wellington's south coast is heavily fished. In Lyall Bay there is extensive recreational fishing and also the gathering of paua, kina and rock lobster, with commercial fishing for rock lobster and set netting occurring close to the eastern and western headlands.²¹
- 6.40 Given the extent and type of development that has occurred in Lyall Bay and its surrounds, seabirds in terms of presence, range of species and abundance have been strongly affected; originally many of the species would have been breeding on the headlands and beach. Similarly, many marine mammal species are still recovering from 19th and 20th century exploitation²², and some may be affected by global warming²³. Only a small range of seabird and marine mammal species occurring in Cook Strait have been recorded in Lyall Bay close to the southern end of the airport.

Experiential Attributes

- 6.41 In terms of perceived 'naturalness'²⁴ there is a significant difference between coastal experiences obtained within Lyall Bay generally and the rest of the south coast. The level of modification as a result of the construction of the existing airport and runway, Wastewater Treatment Plant, roads and infrastructure, together with commercial and residential development and consequential modification of the natural coastline and have all contributed to this perception. Accordingly, the south coast generally has a

²⁰ *Effects of Marine Reserve Protection on Adjacent Non-protected Populations in New Zealand*, D. Diaz-Guisado, Unpublished PhD thesis, Victoria University of Wellington, 2014.

²¹ *Ecological Characterisation of Lyall Bay, Wellington*, MacDiarmid et al, NIWA, prepared for Wellington International Airport Ltd, March 2015

²² Two intense decades of 19th Century whaling precipitated rapid decline of right whales around New Zealand and east Australia, E L Carroll et al). PLoS ONE 9(4): e93789. doi:10.1371/journal.pone.0093789, 2014.

²³ From exploitation to conservation: habitat models using whaling data predict distribution patterns and threat exposure of an endangered whale. Diversity and Distributions 1–15, L G Torres et al, 2013.

²⁴ Ecologists and landscape architects views of 'naturalness' are complementary yet sufficiently different to warrant clarification. Ecologists interpret natural character in terms of indigenous attributes (ecological naturalness) whereas landscape naturalness relate to perceptions of nature.

higher level of perceived naturalness than Lyall Bay.

- 6.42 While parts of the south coast's rocky coastline and steep coastal hills and escarpments and the low level of development provide a sense of remoteness and wildness; from sea level, even a short distance offshore it is difficult to imagine that there is a large urban population close by. This sense of isolation and remoteness is however already compromised in the vicinity of Lyall Bay primarily because of the sea wall, runway and the associated activities of aircraft landing and taking off.

Effects on Natural Character (Post Construction)

- 6.43 Some individual aspects that contribute to the existing natural character of the coastal environment will change and these changes are summarised in the tables later in this section. The modification that will occur as a result of the runway extension will reduce the existing natural character in some localised component areas of Lyall Bay and for some attributes more than others. The greatest changes to natural character will occur along the eastern side of Lyall Bay, specifically around the Airport and Moa Point Embayment sub-areas (Figure 8).

Lyall Bay Coastal Terrestrial Area

- 6.44 While in parts of Lyall Bay there will be adverse effects on the natural character of some of the physical, biological, and experiential attributes, the proposed mitigation measures will help to address some aspects of these. The small embayment to the east of the runway extension will be less susceptible to wave run-up as wave heights will be smaller in the more enclosed area formed by the runway extension and the straight armoured edge along Moa Point Road will remain but it will be extended. However, in other parts of Lyall Bay the changes to the physical components will be subject to no change or to very minimal change.
- 6.45 The effects on the biological attributes of terrestrial natural character will be unchanged and very low as no areas of habitat or flora and fauna will be adversely impacted apart from a small area of planting along the coastal edge along Moa Point Road. The proposed mitigation measures however, provide for more planting to improve and enhance terrestrial habitats.
- 6.46 There will be adverse experiential effects in relation to the perception of the coastal environment that will be both short and long term. The runway extension will result in biophysical changes in the eastern part of Lyall Bay (Airport and Moa Point Embayment) and in this area the perceptual changes to natural character will be the greatest. The Moa Point Embayment will become much more enclosed, the airport runway will be brought closer to residential properties and to the Hue te Taka Peninsula and there will be larger aircraft and over time with increased airport activity that will be more apparent. All of these aspects combine to reduce the "natural experience" of the embayment area from the adjacent residential properties.

- 6.47 For the Moa Point Road residents, the experiential effects of the runway extension will amplify those effects that currently exist. In relation to some aspects, the effects will be greater and probably adverse for these residents, mitigation measures such as improving the junction where the runway meets the land and improving the 'south coast gateway' with appropriate landscape and revegetation treatment will provide some environmental improvements for the residents and transient visitors to the area.
- 6.48 During construction of the reclamation, there will be experiential effects on natural character given the effects on water clarity, noise, lighting (i.e. during work at night), the presence and activity of machinery. People's perception of Lyall Bay, particularly the eastern area will be adversely affected but these effects will largely temporary and short term.

Lyall Bay Coastal Marine Area

- 6.49 The potential effects of the reclamation on the physical environment in Lyall Bay are described in Bell et al. (2015) and include:
- *Predicted net change in sea-bed heights following the construction of the runway extension would be no more than minor over seasonal timescales over much of Lyall Bay, including the near-shore area off Lyall Bay Beach. The morphology of Lyall Bay beach will still be dominated by cut and fill along an on/offshore seabed profile governed by southerly storm events.*
 - *Long-term morphological response of the extended runway is less certain, but likely to be minor compared to the effect the existing runway has had on shoaling of the seabed to the west of the rock revetment, which has shaped the wave climate in 'The Corner'.*
 - *A negligible effect on the already very weak tidal currents and during southerly winds, a slightly weaker and broader flow convergence zone in central Lyall Bay would only have a minor effect on the wind-driven hydrodynamics of the central Bay and is unlikely to affect morphological change or flushing of the inner Bay.*
 - *Effects on wave heights, mainly on the eastern side of Lyall Bay in proximity to the existing runway revetment (including 'The Corner') and more localised along the western and eastern sides of the proposed extended runway. The height of wave-trains reaching the central part of Lyall Bay Beach are likely to be only slightly affected by the runway extension, otherwise elsewhere in the Bay, including the western side, the changes will be negligible. The embayment east of the runway will also exhibit a reduction in wave height as a result of the proposed extension. This reduction in wave height is more appreciable inshore and in the NW corner immediately adjacent to the existing runway.*
 - *Temporary, minor adverse effects on in-situ water turbidity within the wider Bay during the construction phase from discharge of suspended-sediment decanted water from the runway infill operations.*
 - *Wave peakiness will be reduced by the runway extension, which in turn will affect surfing with the total number of surf rides reduced by 4-8% in 'The Corner.' However, differences in wave heights and change in wave induced currents will result in negligible impact to changes to swimming safety.*
 - *The proposed Submerged Wave Focusing Structure (SWFS) structure will slightly affect the existing wave pattern; modelling by DHI has indicated that there could be*

a slight reduction in surf ride number and wave height in 'The Corner'. However, the SWFS will mitigate the effects of the runway extension on surfing conditions in that it is designed to increase the frequency, length and wave height of surfable waves in the middle of the bay.

- 6.50 Consideration of the predicted impacts on the physical character of the Moa Point Embayment was ascertained by considering the draft technical report prepared in November 2015 by NIWA on "Coastal Hydrodynamics and Sediment Processes in Lyall Bay". The hydrodynamic modelling suggests that as a consequence of the planned Wellington Airport Extension into Lyall Bay, using the preferred footprint of the reclamation, the following effects may occur in the vicinity of or within the Moa Point Embayment.
- (i) Localised changes in tidal currents due to construction of the runway extension, especially south of where the present runway extends. These changes will be manifested as a weakening of time-averaged residual flow either side of where the new runway extension would extend.
 - (ii) Local, but inconsequential, changes in wind-driven circulation during southerlies in the vicinity of the runway extension, deviating the wind-drive flow path around the perimeter of the extension and reducing wind-driven current speeds.
 - (iii) A reduction in wave height as a result of the proposed extension that is more appreciable inshore and in the corner immediately adjacent to the existing runway.
 - (iv) Likely more resonant standing wave, or "wave-sloshing", behaviour within the more-enclosed cove area the extension has been constructed.
 - (v) In a general sense, maximum SSC values of 5 mg/L above background (for a 1 kg/s discharge source) would extend within a relatively constrained area of up to 500 m around the discharge point, or further if the sediment discharge rate was higher.
- 6.51 The predicted factors as listed above suggest that physical factors within the Moa Point Embayment will be affected in a local sense by the planned runway extension. Specifically, there is likely to be localised reductions in tidal residual flows, wind-driven currents, and wave heights, with more back-and-forward seiching (wave oscillation) in the embayment. Localised changes in suspended sediment concentrations will occur dependent on the location of the discharge sites(s), volumes and rates. Hence, overall it is expected that the physical attributes of the Moa Point Embayment area will be reduced from its present status as moderate to moderate/low.
- 6.52 The potential effects of the reclamation on the biological environment in Lyall Bay are described in MacDiarmid et al and James et al²⁵. There will be a loss of habitat, including soft-bottom and reef habitats covering approximately 11 ha but there should be a net gain in habitat suitable for species living on hard bottom. Specifically these effects comprise:

²⁵ Assessment of Ecological Effects of the reclamation and extension of Wellington Airport, James et al, prepared for Wellington International Airport Ltd, July 2015

- *Benthic sand/gravel communities within the area being reclaimed will be disturbed and most of them completely lost; this represents about 3% of the soft benthic habitat currently present in Lyall Bay.*
- *Changes to sediment grain size in the Moa Point Embayment due to a decrease in wave height, particularly in the north-western corner, is likely to shift the benthic fauna and flora towards a community better suited to sediments finer than presently occurring in the embayment. The rocky community in the embayment was unlikely to be significantly affected by the change in wave climate. Thus the natural character of the biological attributes in the Moa Point Embayment was assessed to be reduced from moderate to moderate/low.*
- *Within 80m of the end of the existing runway approximately 5.87 ha. of the cobbled, pebbled, boulder and bedrock habitat will be lost.*
- *Approximately 4.95 ha of subtidal reef will be lost to the proposed reclamation, which comprise 5.4% of the subtidal rocky reefs in Lyall Bay. Although the proposed rock dyke will provide subtidal reef area of approximately 2.73 ha along 920m of coastline, this represents a net loss of 3.01 ha or 3.05% of subtidal reefs in Lyall Bay. However, assuming the recommendations for enhancing the physical quality of the subtidal artificial hard surfaces, are implemented (by the inclusion of holes, depressions, and textured surfaces), then this loss in reef area could be offset by a gain in reef quality and biodiversity.*
- *Around 280m of intertidal rocky reef will be buried, much of which comprises of akmons, concrete tiles and bricks; however, this will be offset by a net gain of 640m in the length of intertidal reef created by the rock dyke. This represents a 16% net gain in the length of coastline in Lyall Bay bordered by intertidal reef area. Assuming the recommendations for enhancing the physical quality of the artificial hard surfaces intertidally are implemented (by the inclusion of holes, depressions, rock pools, and textured surfaces), then this gain in length of the intertidal zone could be enhanced by a gain in reef quality and consequently intertidal biodiversity.*
- *Paua and kina populations will be affected by the construction of the reclamation and disturbance and it may take 10 or more years for them to become fully re-established on the new rock dyke. Rock lobsters populations will be disturbed but they are likely to re-populate the rock dyke from other reefs in Lyall Bay soon after construction is completed.*
- *In many locations on the south coast penguins have been observed including in the Moa Point area. While penguins may be displaced from the runway extension project area, the extent of any loss of habitat or displacement is likely to be minor in the context of the wider south coast area.*
- *Effects on water quality will occur during construction but will only be temporary.*
- *Disturbance of the sea bed during reclamation will affect suspended sediments resulting in changes in water clarity and colour, changes to feeding and physiological processes of benthic and pelagic animals and flow-on effects to fish and birds. Waves and currents will likely disperse material that settles on the sea floor immediately surrounding the construction area so any impacts on fish communities are likely to be localised and temporary.*
- *The overall impact of these effects on biological attributes in the vicinity of the airport post construction is assessed to result in no change from its present status as moderate.*

6.53 In terms of experiential effects, the potential effects on wave patterns and heights in 'The Corner' may affect the perception of surfers as Wellington's premier and readily

accessible surfing location. However, the effects of the proposed SWFS could broaden the perception and appeal of Lyall Bay as a surfing location catering to a wider range of surfing abilities.

- 6.54 The perception of Lyall Bay being a safe and accessible swimming beach may be temporarily affected during construction, much as it was when the airport was originally constructed. However, given that Lyall Bay is the largest sandy bay on the south coast and is readily accessible to a large urban population and there is good infrastructure (parking, café, surf shops, etc) this negative perception is likely to be relatively short-lived.
- 6.55 There will be a 250m exclusion zone around the construction area for the runway extension and this will affect recreational fishing and other activities; however these effects will be only temporary. As noted above, the paua and rock lobster fishery will recover over time as will recreational fishing for fin fish. The proposed mitigation measures will assist with addressing experiential aspects, including providing new and improved recreational opportunities.

Summary

- 6.56 Based on the 7 point scale used to assess natural character (illustrated in paragraph 5.10), the following tables summarise the results of the assessment for the six inshore Lyall Bay Component Areas.

Lyall Bay In-Shore Component Areas

- 6.57 This includes the terrestrial area seaward of the coastal road, intertidal zone, reefs and marine area close to the shore, including the airport runway extension footprint and the proposed surf reef.

Hue te Taka Peninsula			
		Pre-Construction	Post Construction
Terrestrial	Physical	High	High
	Biological	Moderate	Moderate
Marine	Physical	High	High
	Biological	Moderate/High	Moderate/High
Experiential		High	High
Overall		High	High

Moa Point Embayment			
		Pre-Construction	Post Construction
Terrestrial	Physical	Moderate/Low	Moderate/Low
	Biological	Low	Low
Marine	Physical	Moderate	Moderate/Low
	Biological	Moderate	Moderate/Low
Experiential		Moderate/Low	Low
Overall		Moderate	Low

Airport			
		Pre-Construction	Post Construction
Terrestrial	Physical	Very Low	Very Low
	Biological	Very Low	Very Low
Marine	Physical	Moderate/Low	Very Low
	Biological	Moderate	Moderate
Experiential		Low	Very Low
Overall		Low	Very Low

Lyllall Bay Beach			
		Pre-Construction	Post Construction
Terrestrial	Physical	Moderate	Moderate
	Biological	Low	Low
Marine	Physical	Moderate/High	Moderate
	Biological	Moderate	Moderate
Experiential		Moderate/Low	Moderate/Low
Overall		Moderate/Low	Moderate/Low

Inner Western Shore			
		Pre-Construction	Post Construction
Terrestrial	Physical	Moderate/Low	Moderate/Low
	Biological	Moderate/Low	Moderate/Low
Marine	Physical	Moderate	Moderate
	Biological	Moderate/High	Moderate/High
Experiential		Moderate	Moderate
Overall		Moderate	Moderate

Te Raekaihau Point			
		Pre-Construction	Post Construction
Terrestrial	Physical	High	High
	Biological	Moderate	Moderate
Marine	Physical	High	High
	Biological	High	High
Experiential		Moderate/High	Moderate/High
Overall		High	High

Overall Summary

- 6.58 Given the confined nature of the proposed runway extension and its position and context within Lyall Bay, there will be no change to the natural character of the south coast which will remain high or Lyall Bay overall which will retain its moderate level of natural character. The Inner Bay and the Outer Bay Component Areas (marine areas) will also maintain their existing levels of natural character, being moderate for the Inner Bay and moderate/high for the Outer Bay.
- 6.59 Four of the six Inshore Component Areas, namely Hue te Taka Peninsula, Lyall Bay Beach, Inner Western Shore and Te Raekaihau Point will all retain their existing natural character levels following the construction of the airport runway extension. While construction effects will be apparent and will have an effect on natural character, there effects will be transitory and will not be permanent.

- 6.60 The two Lyall Bay Component Areas that will experience a reduction in natural character will be the Moa Point Embayment Area which will change from moderate to low and the Airport Area which will change from low to very low, both of which will be as a result of a reduction in marine and experiential attributes.

Natural Character	Pre-Construction	Post Construction
South Coast	High	High
Lyall Bay Overall	Moderate	Moderate
Lyall Bay Component Areas		
Hue te Taka Peninsula	High	High
Moa Point Embayment	Moderate	Low
Airport	Low	Very Low
Lyall Bay Beach	Moderate/Low	Moderate/Low
Western Shore	Moderate	Moderate
Te Raekaihau Point	High	High
Inner Bay (Marine)	Moderate	Moderate
Outer Bay (Marine)	Moderate/High	Moderate/High

7.0 Conclusions

- 7.1 With respect to NZCPS Policy 13(1)(a), there are no areas of outstanding natural character within the Lyall Bay or its component areas, or within the south coast in the immediate vicinity of Lyall Bay.
- 7.2 Other than within Lyall Bay there will be no adverse effects or changes to the natural character of the wider Wellington south coast as a result of the airport runway extension.
- 7.3 The two peninsula landforms that define Lyall Bay (Hue te Taka and Te Raekaihau Point) which have been assessed as having high natural character, will not be adversely affected by the proposed airport runway extension. The existing level of natural character will remain unchanged.
- 7.4 While there will be some changes and potential adverse effects on some natural character attributes on the eastern side of Lyall Bay, the Bay's overall level of natural character will largely remain unchanged following the construction of the airport runway extension.

- 7.5 The natural character of the Lyall Bay beach area, which is currently assessed as being moderate/low overall, will remain the same following the construction of the runway extension.
- 7.6 The greatest level of change to natural character in the wider Lyall Bay area will occur in the Airport and the Moa Point Embayment areas, where the overall natural character will be reduced from low to very low in the Airport area and from moderate/low to low in the Moa Point Embayment area. These changes, while adverse will not be significant in terms of NZCPS 13(2)(b), and can in part be mitigated.
- 7.7 In terms of the adverse effects on “all other areas” (NZCPS 13(1)(b)) and in respect of the threshold outlined in paragraph 5.13, while there will be adverse effects on natural character in the Moa Point Embayment and Airport Component Areas these will in part be addressed by the proposed mitigation measures outlined in paragraph 2.4.
- 7.8 While there will be no change to overall natural character levels and as a result of the runway extension beyond the Airport and Moa Point Embayment areas, there will be changes to some individual natural character attributes within some of the other component areas of Lyall Bay. Notwithstanding these changes, when applying the weightings noted in paragraph 5.11, the overall component area ratings does not change.
- 7.9 Temporary adverse effects on natural character will occur during the reclamation and runway construction process, including increased water turbidity affecting water quality, loss of paua and kina populations, habitat displacement, and disruption to some recreation activities, public exclusion zones and effects on experiential attributes. These effects will only be apparent during the 3 to 4 year construction phase of the project and for paua and kina during a longer population recovery period lasting up to ten or more years.