MILFORD OPPORTUNITIES

MILFORD OPPORTUNITIES PROJECT

Conservation Impact Analysis Report

17 March 2021

Boffa Miskell

Boffa Miskell Ltd

Report prepared by:

Scott Hooson
Senior Principal / Senior Ecologist
Boffa Miskell Ltd

Dr Jaz Morris
Ecologist
Boffa Miskell Ltd

Katrina McDermott
Senior Ecologist
Boffa Miskell Ltd

For Boffa Miskell and Stantec

Document Quality Assurance

Bibliographic reference for citation: Boffa Miskell Ltd 2021. *Milford Opportunities Project: Conservation Impact Analysis Report*. Prepared by Boffa Miskell Ltd for Milford Opportunities Governance Group.		
Prepared by:	Scott Hooson Principal / Senior Ecologist Boffa Miskell Ltd	
	Dr Jaz Morris Ecologist Boffa Miskell Ltd	
	Katrina McDermott Senior Ecologist Boffa Miskell Ltd	
Reviewed by:	Scott Hooson Principal / Senior Ecologist Boffa Miskell Ltd	
Status: FINAL	Revision / version: 5 14 February 2020	Issue date: 17 March 2021

Template revision: 20200422 0000

File ref: Conservation Impact Analysis Report.docx

CONTENTS

APPENDICES

APPENDIX 1: MAPS

TABLES

FIGURES

EXECUTIVE SUMMARY

Largely because of its landscape and conservation values, Milford Sound Piopiotahi is New Zealand's premier visitor attraction and a world-class natural heritage destination. As a result, Milford Sound Piopiotahi and the Milford Corridor are under increasing pressure from visitors. The purpose of the Milford Opportunities Project (MOP) is to develop a collaborative Master Plan for the Milford Corridor and Milford Sound Piopiotahi sub-regional area to ensure:

"that Milford Sound Piopiotahi maintains its status as a key New Zealand visitor 'icon' and provides a 'world class' visitor experience that is accessible, upholds the World Heritage status, national park and conservation values and adds value to Southland and New Zealand Inc."

Milford Sound Piopiotahi, the Milford Corridor and Fiordland are nationally and internationally important for the conservation of many ecosystems and species. The area supports a wide range of highly intact ecosystems that are nationally and internationally important for a very high diversity of indigenous species including a wide range of nationally Threatened and At-Risk plant, bird, insect, lizard, bat and marine mammal species. Some of the ecosystems and species present in the area are globally unique. This is recognised by the area's status as a National Park (Fiordland National Park) and its UNESCO World Heritage status (as part of Te Wāhipounamu). The area continues to be a major focus of ongoing conservation efforts. Conservation values are threatened by the impacts of introduced animal and plant pests throughout and are dependent on ongoing control efforts. Direct human / visitor impacts to species and habitats are of concern, although they are largely restricted to the immediate vicinity of the road corridor and Milford Sound Village. Other key challenges for the area's outstanding conservation values are climate change, marine biosecurity and over-fishing, road maintenance / improvement activities and ensuring there is sufficient and sustained funding for conservation management.

Section 4 of this report provides a summary of what is known about the conservation values of Milford Sound Piopiotahi and the Milford Corridor (the main project area), and more briefly the wider regional context of the project area. This information was obtained through a comprehensive literature review, a site visit to the Project Area, and consultation with DOC and other conservation stakeholder groups. This baseline information was used to inform decision making and to provide advice during the option refinement process. Using a range of spatial data, and information collected during the assessment stage of the project, a series of maps have been prepared. These maps define relevant known areas of conservation value, areas of human impacts / habitat modification, and land status. Figures 3 – 16 (Appendix 1) identify 1) highly modified / built areas, 2) somewhat modified areas and 3) specific locations of high value habitats that are inappropriate for future development. These maps were used to guide, at a high level, decision making around the possible locations or areas for specific proposals for tourism / visitor activities and potentially the development of appropriate infrastructure.

The Conservation Analysis workstream provided input into the creation of long-list ideas and evaluated and provided commentary on all of the long-list ideas that were relevant to conservation, biodiversity and the natural environment. As part of the long-listing process, several long-list ideas were developed to identify how tourism revenue could be used to benefit conservation. A description and rationale for each of the ideas are provided in Section 5. All of the ideas to utilise tourism revenue to improve conservation and environmental outcomes (described in Section 5) will benefit conservation. Although visitor impacts to the area's exceptionally high value ecosystems and species are a high priority for management, particularly in the context of this project, in our opinion, the impacts of introduced mammalian predators are the greatest management issue for conservation in the area. For this reason, landscape scale control of introduced mammalian predators is recommended as a priority for additional investment.

Throughout the short- and long-listing process the Conservation Analysis workstream provided advice and recommendations to the project team (including the Master Planning team) to refine the options being considered. Guiding ecological principles, listed in Section 6, were developed by the Conservation Analysis team to inform the development of the Master Plan in order to ensure that Master Plan options were appropriate from a conservation perspective. Section 6 also describes the process the Conservation Analysis team used to evaluate each of the longlist ideas and includes a set of simple criteria used as an evaluation framework for the long-listing stage of the project.

Section 7 of this report provides a high-level assessment and recommendations on each of the short list ideas. As part of the option refinement process, input from the Conservation Analysis team involved assessing the potential effects of proposed ideas on conservation values in various locations. Visitor impacts on conservation values, including increased human activity and noise, human interaction with and disturbance of fauna, pollution, further introduction and spread of animal and pest plant species as well as effects associated with new infrastructure (including habitat loss, disturbance and fragmentation, edge effects, light spill, waste management) were considered in relation to the proposed Master Plan options. For some locations and / or proposed ideas the potential effects were considered too high to be pursued further, some of the proposals were supported subject to a number of recommendations being met, and others received full support. Specific recommendations are included for short-list ideas that are relevant to conservation and a high-level summary of Conservation Analysis team's comments and evaluation of the ideas / specific proposals is provided in Table 4.

Key recommendations were to:

- Consolidate infrastructure within existing modified / built areas (mapped as part of the process).
- Consolidate visitor activities at a small number of locations rather than dispersing visitor impacts.
- Ensure any visitor facilities, including infrastructure, are sensitively located and are designed, constructed and / or operated in a way that is sympathetic to the natural environment.

If a decision is made to implement the Master Plan, the Master Plan recommendations are expected to be further refined and developed through further engagement, more detailed studies (which may influence the shape or scale of some Master plan recommendations), detailed site investigations and detailed design.

1 PROJECT BACKGROUND / INTRODUCTION

PURPOSE OF THE MILFORD OPPORTUNITIES PROJECT

1.1 The purpose of the Milford Opportunities Project (MOP) is to develop a collaborative Master Plan for the Milford corridor and Milford Sound Piopiotahi sub-regional area to ensure:

"that Milford Sound Piopiotahi maintains its status as a key New Zealand visitor 'icon' and provides a 'world class' visitor experience that is accessible, upholds the World Heritage status, national park and conservation values and adds value to Southland and New Zealand Inc."

PROJECT AMBITION

1.2 The Milford Opportunities Project Master Plan must be world class, ambitious and creative. It should not be constrained simply by what can be done now within the current rules, instead it must consider what needs to be done and what the most appropriate outcome will be. The project is about making a substantive change and creative 'outside the box' thinking is needed before it is filtered by practical operational realities. The outcome must be:

- Consistent with the project's purpose and objectives.
- Consider a time frame of at least 50 years.
- Able to significantly enhance both conservation and tourism.

The Master Plan must give effect to the seven pillars (or values) identified in Stage One of the project and be supported by robust assessment and analysis. Two of the specific seven pillars (or values) identified for the project, as presented below, were particularly relevant to the conservation analysis workstream:

- Tourism funds conservation and community: The visitor experience will become an engine for funding conservation growth and community prosperity.
- Conservation: Manage Fiordland National Park to ensure ongoing protection of pristine conservation areas, while enabling restoration of natural ecological values in other areas.

PROJECT PILLARS

1) MANA WHENUA VALUES WOVEN THROUGH

Iwi's place in the landscape and guardianship of mātauranga Māori me te taiao (Māori knowledge and the environment) are recognised. Authentic mana whenua stories inform and contribute to a unique visitor experience.

2) A MOVING EXPERIENCE

Visitors experience the true essence, beauty and wonder of Milford Sound Piopiotahi and Murihiku / Southland through curated storytelling, sympathetic infrastructure and wide choices suited to a multi-day experience.

3) TOURISM FUNDS CONSERVATION AND COMMUNITY

The visitor experience will become an engine for funding conservation growth and community prosperity.

4) EFFECTIVE VISITOR MANAGEMENT

Visitor are offered a world class visitor experience that fits with the unique natural environment and rich cultural values of the region.

5) RESILIENT TO CHANGE AND RISK

Activities and infrastructure are adaptive and resilient to change and risk, for instance avalanche and flood risks, changing visitor trends, demographics and other external drivers.

6) CONSERVATION

Manage Fiordland National Park to ensure ongoing protection of pristine conservation areas, while enabling restoration of natural ecological values in less pristine areas.

7) HARNESS INNOVATION AND TECHNOLOGY

Leading technology and innovation is employed to ensure a world class visitor experience now and into the future.

PROJECT OBJECTIVES

1.3 The objectives for the MOP are:

a) Protect and conserve the place now and into the future.

b) Recognise iwi's place in the landscape, guardianship and values.

c) Increase the effectiveness, efficiency and resilience of infrastructure.

d) The visitor experience funds conservation growth and community prosperity.

e) Reduce visitor exposure and risk to natural hazards.

f) Increase the connection of people with nature and the landscape.

g) Offer a world class visitor experience that is unique and authentically New Zealand.

h) Identify sustainable access opportunities into Milford Sound Piopiotahi.

i) Identify parts of the built environment that are surplus to requirements or could be shifted to improve visitor function and resilience.

j) Identify opportunities to create additional economic benefit for the communities of Southland and Otago including Queenstown via the pulling power of Milford Sound Piopiotahi.

k) Develop a Master Plan that:

   i. Creates and encapsulates a unique experience.

   ii. Is culturally, environmentally and physically appropriate and sustainable.

   iii. Clearly articulates what is acceptable and what is not acceptable visitor management and development within the identified value framework.

   iv. Considers the impacts of climate change at place.

   v. Supports the economic stability of Te Anau, Queenstown, Southland and NZ Inc.

   vi. Portrays a clear future for investment.

   vii. Informs the review processes for Fiordland National Park Plan and Southland Coastal Plan.

   viii. Sets out the ideal governance and management structure to ensure successful delivery on the objectives.

NATURAL DISASTERS AND COVID-19 IMPACTS

1.4 MOP stage 2 approach was impacted significantly by the 2020 Fiordland floods and then the COVID-19 pandemic.

1.5 Strategically, the consultant project team were required to be flexible in our approach and creative in our delivery. As a response to changing conditions we proposed methodologies to make allowance for factors such as lack of visitors, an initial inability to undertake site visits, and at times a restricted or reduced availability of staff from external organisations.

WORKSTREAM OBJECTIVES

1.6 These Objectives were refined from Stage 1 and were agreed with the Governance Group during Stage 2. The application of the Objectives within this Workstream is shown in Table 1 below.

Table 1: Stage 2 Objectives.

#	Stage Two Objective	Application to Conservation Analysis
1	Ngāi Tahu's role as mana whenua and Treaty partner is acknowledged and Te ao Māori values are embedded throughout.	How will functions, design and structure enable tino rangatiratanga to be exercised?

#	Stage Two Objective	Application to Conservation Analysis
2	Milford Sound Piopiotahi is protected and conserved as required by its World Heritage status.	How do we ensure that conservation management, and conservation acitvities remain key?
3	The visitor experience is world class and enhances conservation of natural and cultural heitage values and community.	What will be the impacts on management of infrastructure and services, and concession arrangements, approval, review and term?
4	Infrastructure is effective, efficient, resilient, and sustainable (including access methods).	How do we ensure ongoing investment into infrastructure in a coordinated, sustainable manner?
5	Visitors benefit communities, including Ngāi Tahu, communities of Te Anau, Southland, and Otago.	How do we support connection to destination management and local economic development potential?

PROJECT AREA

1.7 The Project area is focused on Milford Sound Piopiotahi and the Milford Corridor between Milford Sound Piopiotahi and Te Anau (Figure 1). The wider sub-regional area considered in the Master plan is the Te Anau Basin, Southland and southern Otago.

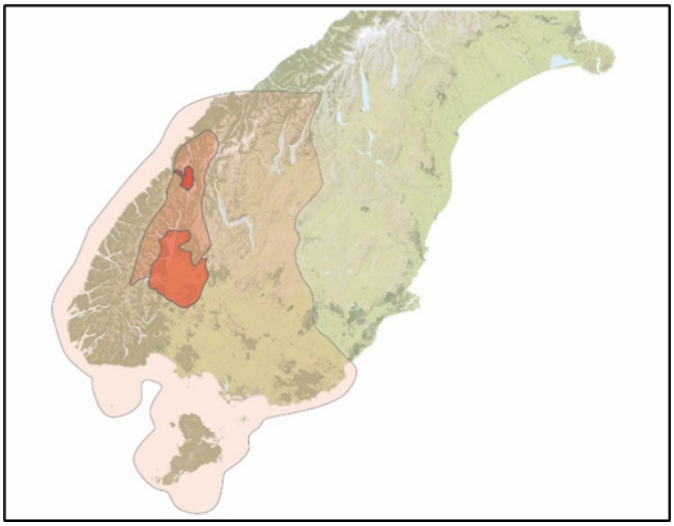


Figure 1: The project area

STAGE TWO MASTER PLAN

1.8 Stage Two of the Project is the development of the Master plan that is to 'define and choose options to reach the objectives and vision. The vision will describe how the place will look and feel while the Master plan will describe the steps and processes required to get there.' The Master plan is to:

- Create and encapsulate a unique experience.
- Be culturally, environmentally and physically appropriate and sustainable.
- Clearly articulate what is acceptable and what is not acceptable visitor management and development within the identified value framework.
- Consider the impacts of climate change at place.
- Support the economic stability of Te Anau, Queenstown, Southland and NZ Inc.

- Portray a clear future for investment.
- Inform the review processes for Fiordland National Park Plan and Southland Regional Coastal Plan.
- Set out the ideal governance and management structure to ensure successful delivery on the objectives.

1.9 The Master plan is to be world class, ambitious and creative. A multi-discipline approach was required with seventeen workstreams are combining their expertise and insights to develop the Master plan.

SCOPE OF THE CONSERVATION ANALYSIS WORKSTREAM

1.10 The scope of work, outlined in the Request for Proposal (RFP), stated that:

"The conservation values for Milford Sound Piopiotahi and the Fiordland National Park road corridor need to be clearly identified both generally and spatially. An understanding of the benefits to conservation outcomes that additional funding investment could provide is also important."

1.11 Based on the scope and key outcomes listed in the RFP for the Conservation Analysis workstream, our proposed approach, as outlined in our Proposal was to complete three distinct phases of work as follows:

Phase 1:

Reviewing and collating relevant available information on the terrestrial, freshwater and marine conservation and biodiversity values of Milford Sound Piopiotahi, the Fiordland National Park / UNESCO World Heritage Area and inland waters through:

1. Desktop review of existing information, including data collected during phase one of the MOP.
2. GIS analysis and mapping using relevant ecological spatial layers.
3. Undertaking a site visit during the information gathering stage to obtain high level conservation / biodiversity information.
4. Engagement with DOC and other conservation groups to gather additional information on baseline conservation values and discuss priorities for future conservation management through additional investment.
5. Preparation of spatial maps and plans that:
    a) Identify the locations of conservation / biodiversity values and ecologically significant sites identified during the information gathering stage (above).
    b) Identify opportunities and constraints (i.e., areas of focus and areas to be avoided with new infrastructure development).
6. Preparation of a Baseline Report that:
    a) Provides a high-level description of existing conservation and biodiversity values.
    b) Identifies opportunities and constraints based on the spatial maps and plans.
    c) Identifies opportunities for conservation management and the level of conservation / biodiversity improvement that could be achieved with varying levels of additional investment.
    d) Provides high-level recommendations and guiding ecological principals to inform the development of the Master Plan and criteria for an evaluation framework to assess the Master Plan options against known conservation values.

Phase 2:

Participation in and provide input into the options assessment process to enable the identification and development of strategic options that take into account the findings of the Conservation Analysis.

Phase 3:

Preparation of a Technical Report (this report).

1.12 It is important to note that this is a master planning level report, derived from:

- A comprehensive review of existing available information.
- A high-level site visit.
- Consultation / engagement with stakeholders.

1.13 It is a high-level document that identifies key conservation values to guide and inform the master planning process. It does not provide a detailed assessment of the potential impacts on those values as a result of the Master plan nor does it replace the need for further specific ecological impact assessments before implementing any of the Master Plan recommendations.

1.14 Due to the generally higher conservation values within Milford Sound Piopiotahi, Fiordland National Park and the UNESCO World Heritage Area, and the focus of the project on Milford Sound Piopiotahi and the SH94 corridor within Fiordland National Park, more emphasis is placed on these areas.

REPORT STRUCTURE

1.15 This report:

- Outlines the methodology for the desktop assessment, site visit, consultation and mapping of conservation values, constraints and opportunities to inform this conservation analysis.
- Summarises the existing conservation values of Milford Sound Piopiotahi and the Milford Corridor (the main project areas), and more briefly, the wider regional context of the project areas.
- Provides a summary of the long-list evaluation process and describes the long-list items for Main Idea 7; *"using tourism to improve conservation and environmental outcomes"* that were put forward by the Conservation Analysis Team.
- Provides guiding ecological principals developed to inform the development of the Master Plan and briefly outlines the process and evaluation framework used to refine long-list ideas to develop the short-list.
- Provides high-level recommendations to inform the short-list ideas and master plan recommendations.
- Provides a summary and conclusions.

2 METHODS

DESKTOP REVIEW

2.1 A comprehensive review of existing available information on the conservation values of the project area was undertaken by the report authors Scott Hooson (Senior Principal / Ecologist) and Dr Jaz Morris (Ecologist, Boffa Miskell). The complete list of references is included in Section 10. As part of the desktop review knowledge gaps were identified that could be addressed during consultation workshops (e.g., with DOC).

SITE VISIT

2.2 Scott Hooson (Senior Principal / Ecologist) and Dr Jaz Morris (Ecologist, Boffa Miskell) undertook a high-level site visit to Milford Sound on 18 June 2020. During this site visit, several sites identified during the mapping process (see Section 3.9, below) as being of particular conservation value, or sites of particular human impacts and habitat modification were visited. The purpose of this site visit was to:

- For Scott and Jaz to re-familiarise[1] themselves with key locations in the context of the project;
- Undertake a high-level ground-truthing of the desktop mapping.
- Obtain photographs.
- Discuss with representatives from other workstreams, at a high-level, the suitability of some of the locations identified for potential activities / developments in the area.

Detailed site investigations were not required for this stage of the project (i.e., informing the master planning process) and were outside the scope of this work. For this reason, the site visit did not include detailed ecological surveys at any locations.

CONSULTATION

2.3 Consultation with DOC and other conservation stakeholder groups was undertaken to gather additional information on baseline conservation values and discuss priorities for funding conservation management through visitor funding. This consultation is briefly summarised below.

DEPARTMENT OF CONSERVATION

2.4 Originally a single, one day, workshop with the Conservation Analysis project team and DOC staff at Te Anau was planned. However, as a result of the Covid-19 lockdown in March – April 2020 this workshop was conducted as two online video conference workshops.

The first workshop was held on 3 April 2020. The purpose of the workshop was:

- For the Conservation Analysis project team to explain the context and purpose of the MOP and the workshop and outline the project team's information needs.
- To allow DOC staff to share their extensive knowledge of conservation values, conservation management (including community-led conservation programmes) and their ideas for appropriate visitor opportunities within the project area. This was facilitated using maps in DOC GIS.

The second workshop was held on 9 April 2020. The purpose of the workshop was to:

[1] Both Scott and Jaz have worked and / or recreated extensively throughout the project area.

- Discuss opportunities and ideas for the MOP project to enhance conservation values along the corridor / in FNP through tourism revenue.

- To allow DOC staff to share their knowledge of conservation values and conservation management issues in the wider area: Takitimu Mountains, Mavora Lakes, Titiroa / Borland area, Murchison Mountains, Doubtful, Dusky and George Sounds, Lake Hauroko, Lake Monowai.

- To briefly discuss the evaluation process for ideas that are generated by the project that may impact on conservation values.

ENVIRONMENT REFERENCE GROUP

2.5 The Environment Reference Group (ERG) was comprised of representatives from a number of groups and organisations with conservation and environmental interests including Forest and Bird, Southland Conservation Board, Fiordland Marine Guardians, Fiordland Conservation Trust, Fiordland Guardians of the Lake, the Waiau Working Group and New Zealand Fish & Game. Three online video conference workshops were held between the ERG and Project Working Group and MOP Project Team members:

- The first meeting was held on 15 June 2020. This introductory meeting was an opportunity to introduce the MOP project and Project Team to the ERG. A wide range of matters relating to conservation and the environment within Fiordland and Milford Sound Piopiotahi were discussed including conservation tourism, impacts on marine conservation values, cruise ships, the Milford Village area and the SH94 Road Corridor.

- The second meeting was held on 29 July 2020. The purpose of this meeting was to outline and receive feedback on the long-list ideas that were relevant to conservation and the environment.

- The third meeting was held on 15 October 2020. The purpose of this meeting was to obtain feedback short-list ideas that were relevant to conservation and the environment, including perceived pros, cons and ideas for enhancing / optimising the ideas.

MEETINGS WITH STAKEHOLDERS IN TE ANAU

2.6 While in Te Anau and the Milford area between 17 and 19 June 2020, Scott Hooson and Dr Jaz Morris met to discuss the MOP Project and conservation and environmental opportunities and issues with representatives from the following environmental groups:

- John Whitehead (Southland Conservation Board).

- Kerri-Anne Edge-Hill (Fiordland Guardians).

- Toby Jones (Fiordland Conservation Trust).

MAPPING OF CONSERVATION VALUES, CONSTRAINTS AND OPPORTUNITIES

2.7 As part of this project, a series of maps has been produced by the Conservation Analysis Team in order to define relevant known areas of conservation value, human impacts / habitat modification, and land status.

These maps are:

- Land status (Appendix 1: Figures 1-2).
- Areas of specific conservation value or habitat modification identified by the Conservation Analysis Team: a series of maps showing areas of conservation value, human impacts / habitat modification. These are presented as maps of the overall Milford corridor (Appendix 1:

Figure 3, and Figures 5-16) with a more detailed map for Milford Sound village (Appendix 1: Figure 4).

These maps are intended to guide, at a high level, decision making around the possible locations or areas for opportunities for tourism / visitor activities and potentially the development of appropriate infrastructure.

DATA / INFORMATION SOURCES

The main features of these maps that are derived from other sources are as follows:

2.8 **Land Status Maps**

These maps depict the cadastral boundaries of Fiordland National Park, other public conservation land (including marginal strips), the marine reserve at Milford Sound Piopiotahi, and those QEII Trust covenants for which spatial information is publicly available).

2.9 **Maps of Areas of Specific Conservation Value or Habitat Modification**

- Indigenous habitat / exotic habitat: Provides a high-level indication of the type of vegetation cover in an area, based on the Land Classification Database Version 5 (Landcare Research / Manaaki Whenua).
- Wetlands: Wetlands listed as 'Regionally Significant' in the proposed Southland Regional Land and Water Plan (2019) have been included, along with other wetland locations. 'Other wetlands' in these maps have been manually mapped by the authors based on analysis of Topo50 map data, Freshwater Environments of New Zealand (Ausseil et al. 2008) spatial data, and a brief scan (1:10000 scale) of aerial imagery to identify other wetlands not included in these data sources.
- The Department of Conservation's Ecological Management Units (EMUs)[2] and Species Management Units (SMUs)[3] (only where they are entirely on public land).
- Lakes and waterways were sourced from topographical data.
- Other features: tracks data was sourced from topographical data and the Department of Conservation.

MAP FEATURES

2.10 Features of these maps that have been created as part of this study are as follows:

Colour-coded layers are included in these maps to provide an indication of some specific areas of conservation value, and specific locations of human impacts / habitat modification. These map layers have been produced based on 1:2,500 scale analysis of aerial imagery. Ground-truthing of features and their extents was undertaken at key locations during a site visit on 18 June 2020.

- Highly modified / built areas: Areas of extensive human impact. Such areas are essentially built or constructed and provide limited habitat for indigenous species. This includes buildings, gravel stockpiles, runways etc.
- Somewhat modified areas: Areas of partial modification, or highly modified areas with a very small footprint, are indicated. In spite of some degradation, these areas are still likely to provide habitat for indigenous flora and fauna, potentially including Threatened and At Risk species. These areas include some campsites, areas of secondary indigenous vegetation, and some modified areas that could readily be remediated.

[2] EMUs are places identified by the Department of Conservation as important for management because of the types and condition of the ecosystems and species there. They are usually large areas that often include groups of related ecosystems which are managed together. Many also include threatened species.

[3] SMUs are only managed for the threatened species within them.

- Specific locations of high value habitats: Areas of uncommon habitat types, or areas known to provide highly important and localised habitat for Threatened and At-Risk flora and fauna are indicated. Because of the nature of the data, the areas in these maps are not exhaustive but are indicated based on records of rare taxa in sources such as the DOC Bioweb Database, other published and unpublished records, and an analysis (1:10,000 scale) of aerial imagery to identify features such as naturally uncommon or sensitive ecosystems (frost hollows, lakes) not included in these data sources.

MAP LIMITATIONS

2.11 Users of these maps should be aware that the maps are intended to be high level and indicative, are not exhaustive, and are based on often incomplete or sparse specific data. These areas have not been subject to detailed ground survey, but key locations were ground-truthed during a site visit undertaken as part of this project. Compared to the 'highly modified' and 'high value' locations, the indications of 'somewhat modified' areas are by necessity the most subjective and are based upon what information could be obtained as part of this study and on the observations of the authors.

Users should be aware that the indigenous / exotic vegetation data are derived from satellite and inaccuracies are likely, although some known errors at Milford Sound Piopiotahi in this database were manually corrected in order to produce these maps. It should also be noted that grasslands (depicted as exotic) in the Eglinton Valley, while indeed largely exotic in character, support a range of indigenous species, and some areas will support high conservation values and not suited to development.

Road footprints (e.g., SH94) have not been included in these map layers, for clarity. Areas that are not part of Fiordland National Park and are outside of the Milford corridor (e.g., east of Lake Te Anau) whether they are modified (e.g., towns, infrastructure, farmland) or of high value have also not been mapped, except where highly specific data is available.

Records of locations for most rare taxa (nationwide, and in Fiordland) and particularly for plants are sparse and sporadic because it is not common practice for conservationists or ecologists to record such specific data and there is no requirement to record such data in any common database (as there is for native fish species for example). Lakeshore habitats at Lake Te Anau, which are of very high value for Threatened and At-Risk plants, have not been mapped for practical reasons. Further, there is no practical way to map habitats for specific mobile fauna (e.g., nationally Threatened kaka and kea, which may have habitat ranges across thousands of hectares).

To avoid giving any impression that sensitive flora and fauna are restricted to only a subset of locations, not all locations of Threatened and At-Risk flora are indicated, particularly where the records that do exist in the Milford area are of species that are likely to be scattered across large areas (e.g., nationally At Risk mistletoe species in primary beech forest). In general Fiordland National Park consists entirely of relatively intact primary (original growth) vegetation and habitats that are ecologically significant (under S.6c RMA) and are of very high ecological value, and so these 'specific locations' are not the only places of exceptional or localised ecological value.

INTERPRETATION OF MAPS

2.12 **Land Status Maps**

Management of potential ecological impacts from new activities outside Fiordland National Park and other Public Conservation Land (PCL) is subject to standard RMA consenting processes. Activities within Fiordland National Park and other PCL are subject to other statutory requirements (e.g., the Fiordland National Park Management Plan and / or a Conservation Management Strategy) in addition to RMA consenting processes. However, users should be aware that the road reserve for SH94 (which is not part of Fiordland National Park) does not match the actual footprint of the road in many places (e.g., Upper Hollyford) and the actual road alignment may be 10s to 100s of metres from its location on the cadastre.

2.13 **Maps of Areas of Specific Conservation Value or Habitat Modification**

- Highly modified / built areas: From a purely ecological perspective, such areas are most likely to be most appropriate for future development in the Milford Sound / Milford corridor area, because of the baseline level of modification.

- Somewhat modified areas: These areas may be appropriate for future development in the Milford Sound / Milford corridor area, providing that specific measures to avoid, remedy or mitigate adverse effects to flora and fauna are incorporated at an early stage in the development of any such proposals.

- Specific locations of high value habitats: These areas are inappropriate for future development, excluding activities that directly protect or enhance their specific conservation values[4].

- Indigenous / exotic vegetation and habitats: Areas mapped as indigenous habitats (which cover most of these maps) generally have very high ecological values and activities involving vegetation clearance or modification (excluding development of basic walking tracks) are likely to be inappropriate in most places. Activities involving vegetation clearance or modification in the Milford Sound / Milford corridor area are likely to be more appropriate in areas mapped as exotic habitats.

- Wetlands: Areas that are mapped as wetlands should be interpreted as being 'high value habitats' by default, even though the specific values of wetland habitats in the Milford corridor area varies. Boundaries of these areas are indicative. Wetland habitats are identified because their historical loss nationwide makes these habitats priorities for protection. This context, and the recent notification of new National Environmental Standards for Freshwater, means that such areas are likely to practically constrain any developments that may result in wetland loss or degradation.

[4] We note that DOC prioritises management of ecosystems and indigenous species within Ecological Management Units and Species Management Units (shown in Figures 1 and 2, Appendix 1). The large size of these management units mean they were not particularly relevant to the evaluation undertaken for this report. However, these areas support very high conservation values and are high priority areas for conservation management in a national context.

3 BASELINE: CURRENT STATE / EXISTING CONDITIONS

3.1 Milford Sound Piopiotahi and the Milford Corridor that leads to it are easily recognised as the best-known part of Fiordland National Park, New Zealand's largest national park and a core part of Te Wāhipounamu - South West New Zealand World Heritage Area[5].

3.2 Ngāi Tahu is tangata whenua of Te Rua o te Moko (Fiordland) Ngāi Tahu has maintained ahi kāroa in Te Rua o te Moko for centuries and the expression of its cultural heritage is fundamental to Ngāi Tahu exercising its tino rangatiratanga and kaitiakitanga in Milford Sound Piopiotahi and the wider area. Ngāi Tahu has a rich diversity of living heritage, including practices, tikanga, mātauranga and pūrākau that deepens its identity, wellbeing and social cohesion. Milford Sound Piopiotahi and the wider area have long been a significant feature of Ngāi Tahu history and its nomadic lifestyle (Kauati 2020).

3.3 Fiordland, Milford Sound Piopiotahi and the Milford Corridor are of international significance for its conservation value and as a largely undeveloped national and international hotspot for threatened and at-risk species, the area has been a major focus of ongoing conservation efforts and scientific study. Notwithstanding the decades of work, new species discoveries still occur. Critical threats to the area's outstanding biodiversity values posed by invasive species and human impacts are ongoing and increasing.

In this section, we provide a brief summary of what is known about the conservation values of Milford Sound Piopiotahi and the Milford Corridor (the main project area), and more briefly, the wider regional context of the project area. This section has a particular focus on species and habitats that are nationally Threatened or At Risk[6], or those endemic to, or having their stronghold in the project area, and discusses the relative importance of the area in conservation terms.

MILFORD SOUND PIOPIOTAHI

3.4 Milford Sound Piopiotahi is a spectacular glacier-sculpted fiord fed by the Arthur, Cleddau, and Harrison Rivers, which capture some of the highest rainfall volumes in some of the steepest topography in the world. The area is characterised by unusual habitat types, including a tannin-stained freshwater layer that overlies the marine influence of the fiord, extremely steep alpine herbfields and grasslands, and habitat mosaics formed by regular forest avalanche sequences. In addition, some relief from the relentless spread of introduced mammalian pests due to the extreme topography has delayed but not prevented the impact of these pressures on the indigenous biodiversity of this part of northern Fiordland.

Milford Sound Piopiotahi is of traditional importance to Māori as a source of tangiwai pounamu but was not permanently settled when encountered for the first time by Europeans in 1812. Since European settlement, impacts associated with permanent occupation and the development of infrastructure for national and international tourism have wrought changes to the area over the past century, concentrated at Milford Sound Village.

MILFORD SOUND VILLAGE

3.5 Built infrastructure at Milford Sound Village has a roughly 30 ha footprint centred on Freshwater Basin and Deepwater Basin at the delta of the Cleddau River. The developed area of Freshwater Basin hosts a tourist boat terminal, carparking, and other visitor facilities. Adjacent to Deepwater Basin accommodation facilities, an aerodrome and a boat terminal that primarily services fishing vessels abuts flood protection infrastructure. Other notable developed areas in the vicinity of the Village includes the Milford Sound Lodge, an area known as 'Little Tahiti' (an historic dump, since

[5] The Manawhenua Aspirations and Values Report (Kauati 2020) emphasises that currently recognition of the natural heritage of Te Wāhipounamu is limited and does not effectively encapsulate the cultural heritage of Ngāi Tahu. Further work is needed to understand and utilise the opportunities of the World Heritage status for Ngāi Tahu.

[6] Based on the New Zealand Threat Classification System (Townsend et al. 2008), see Robertson et al. (2016) for indigenous birds, Hitchmough et al. (2016) for herpetofauna, Hoare et al. (2017) for lepidoptera, de Lange et al. (2018) for indigenous vascular plants, O'Donnell et al. (2018) for bats, Dunn et al. (2018) for freshwater fishes. In this report, common names are used, and for species that lack a common name, or where a common name may be ambiguous, scientific names are used.

levelled and gravelled) adjacent to the River, and a borrow site to the north of Little Tahiti where hard fill has been extracted since 2011 for flood protection works.

Figure 2: The famous view of Milford Sound Piopiotahi from near the Village, showing coastal rushlands. Photo J Morris.

Milford Sound village is largely surrounded by silver beech / kamahi forest on bouldery lower slopes, southern rātā is common among similar forest on steeper faces, silver beech – mountain beech forest occurs on alluvial surfaces adjacent to the Cleddau delta, areas of shrubland and grassland characterise flood-disturbed or deliberately cleared areas, and salt marsh rushland and turfland fringes the edge of the tidal area (Johnson and Timmins 1985). The silver beech – mountain beech forest area at Deepwater Basin (west of the aerodrome) is considered of ecological importance by two reports (Johnson and Timmins 1985, Jacobs 2019). Other notable features in terms of vegetation include a small area of red beech forest on a spur south of the main village, which is the only patch of red beech in the Milford Sound area (Johnson and Timmins 1985).

In terms of conservation importance and ecological considerations for future developments in the area, the salt marsh herbfield / rushland area at the intertidal zone represents part of a naturally uncommon ecosystem that is nationally vulnerable to further loss (estuaries; Williams et al. 2007, Holdaway et al. 2012). Most of the remaining habitat types, while well-represented in Fiordland, are of course of very high ecological value as naturally occurring and largely unmodified indigenous habitats in the context of a protected National Park.

In terms of notable plant species, *Crassula ruamahanga* (At Risk – Naturally Uncommon) is present, and likely occurs in damp, open areas of vegetation in Deepwater Basin (referenced in WSP – Opus 2018), and Fiordland sedge *Carex pleiostachys* (also Naturally Uncommon) is a Fiordland endemic present in jointed rush rushlands near the Village (Johnson and Timmins 1985). Scarlet mistletoe (At Risk – Declining) is known from silver beech trees in the Village area (DOC Bioweb Database). Surrounding the Milford Sound Lodge, no Threatened or At Risk plant species appear to have been recorded, although the forest and shrublands at this site occur on a relatively fertile alluvial terrace land environment that is scarce in Fiordland overall (Wildlands

2013). *Uncinia distans* (Not Threatened) is only known in Fiordland from a borrow-pit site north of Little Tahiti near the mouth of the Tūtoko River; this borrow pit site also includes *Coprosma* spp. shrublands not represented well elsewhere in the Cleddau catchment (Wildlands 2009).

In terms of indigenous fauna in the Village area (excluding marine species and those using freshwater habitats), several Threatened and At-Risk species are present. South Island kaka (Threatened – Nationally Vulnerable) and northern Fiordland tokoeka (Threatened – Nationally Vulnerable) may utilise terrestrial forest habitats near or in the Village (and Lodge) area from time to time (Wildlands 2009, DOC 2015a), along with kea (J Morris, *pers. obs*.; kea are Threatened – Nationally Endangered). Western weka and a range of other relatively widespread (i.e., Not Threatened) indigenous forest bird species are also present, including yellow-fronted kakariki, rifleman, bellbird and kereru. South Island robin were translocated to the Cleddau delta forest area in 2011 and 2012, but these spread elsewhere in the catchment and did not establish in this area (DOC 2015a, Edge Hill and Reid 2017). Milford Sound is notable as the only known site for the Milford boulder butterfly (*Lycaena ianthina*, Threatened – Nationally Critical), which has been found in just two places, one at Little Tahiti and the other on roadside and open areas at Deepwater Basin Road (Patrick 2017). This species is entirely dependent on open areas that support its host plant creeping pohuehue.

Threats to the indigenous biodiversity of the Village area are chiefly direct human / visitor impacts and mammalian predators, including possums. A trapping network in the area is largely maintained by community groups / commercial sponsors. It is excluded from aerial 1080 pest control operations (Contract Wild Animal Control New Zealand [CWAC] 2019). Weed species such as gorse, Spanish heath and pussy willow have been largely eradicated or receive ongoing surveillance and control; as well as these, tutsan and montbretia are the major concerns that remain at present (Edge Hill and Reid 2017), and small areas of blackberry are also present (J Morris, *pers. obs*.).

Figure 3: Milford Sound Piopiotahi cruise ship terminal, Freshwater Cove, and village area. Photo J Morris.

MILFORD SOUND PIOPIOTAHI CATCHMENT

3.6 The valleys that feed into Milford Sound Piopiotahi have a degree of intactness and support such a wide range of Threatened and At-Risk species that the Milford Sound Piopiotahi Catchment is one of the most important sites for terrestrial biodiversity in New Zealand that is readily accessible to the general public. These values are maintained by a high degree of conservation management effort spanning many decades and includes trapping networks in all the major valleys (bar the Harrison), aerial 1080 pesticide operations in many places (particularly as part of 'Operation Ark' and 'Tiakina Nga Manu / Battle for our Birds' programs of the past ~15 years), and research and monitoring of target species.

The Harrison River valley is a large valley that feeds directly into Milford Sound, draining a series of alpine lakes, the steep slopes of Mt Pembroke, and the Ngapunatoru Glacier. Aside from an underwater observatory at Williamson Point, the valley is unmodified and has no formal tracks or structures. Little specific information is available about the conservation values of the valley, but it is known in particular as an important study site for the tawaki (Fiordland crested penguin, Threatened – Nationally Vulnerable), which has a breeding population at Harrison Cove. Around 150 pairs of tawaki are believed to be present throughout several breeding sites in Milford Sound Piopiotahi as of 2017 (Mattern and Long 2017). The New Zealand Penguin Initiative operates an automated tawaki monitoring system at Harrison Cove that feeds into knowledge of this species' behaviour and population ecology (Mattern and Seed 2020). A small trap network has also been established to protect tawaki (DOC 2018a), and the Harrison has been included in aerial 1080 pest control operations in the past (DOC 2018a), but not recently (CWAC 2019). To our knowledge the Harrison does not receive other specific or ongoing biodiversity management (DOC 2018a), and deer are present in somewhat greater numbers than in other tributary valleys of Milford Sound Piopiotahi due to its relative accessibility from deer populations spreading from the north.

The Cleddau catchment, including its major tributary rivers the Tūtoko, Donne, and Gulliver is exceptional in New Zealand as the only large mainland catchment believed to be free from deer. Below the natural treeline, it is cloaked largely in silver beech forest (parasitised by relatively healthy populations of the At Risk – Declining yellow, red, and scarlet mistletoe species) with occasional emergent podocarps (in particular rimu and miro), and due to the lack of deer browse, the forest has a dense understory that is largely unmodified and intact. In the sub-alpine to the nival zone, extensive tussocklands and herbfields are present along with boulderfields and permanent snowfields. Steep valley walls have South Island rātā and silver beech forest, and gullies and areas disturbed by rock and snow avalanches have seral forest / scrub dominated by pioneer species such as mountain ribbonwood, wineberry, pate, tree fuchsia, tree tutu, and koromiko. This vegetation type (sometimes referred to as 'kakapo gardens') is a productive food source for indigenous forest birds.

The Gulliver / Donne and Tūtoko catchments, along with Sinbad Gully and the Transit River west of Milford Sound Piopiotahi were the last sites of mainland kakapo, which persisted there at least until the mid-late 1980s. Richard Henry, the only Fiordland kakapo successfully integrated into the modern breeding program, was captured in the Esperance (a tributary of the Gulliver) in 1975. In terms of indigenous birds, the Cleddau catchment now supports northern Fiordland tokoeka, South Island kaka, long-tailed cuckoo (At Risk – Naturally Uncommon), kea, southern rock wren (Threatened – Nationally Endangered) in the alpine zone, and other Not Threatened species including western weka (Edge Hill and Reid 2017); South Island robin (from 2011 - 2012 translocation efforts down valley) may persist. Around 20 adult whio (Threatened – Nationally Vulnerable) are present in the fast flowing rivers and tributaries of the catchment as of early-2020 and the area is part of the Northern Fiordland 'security site' for long-term management of the species (Edge Hill and Reid 2017, Jackson and Lee 2017, DOC Whio Survey Results unpublished data, 2020). While indigenous bat species (e.g., long-tailed bat; Threatened – Nationally Critical) are not known from the Cleddau, they may be present, particularly in the hollows of large beech trees.

Figure 4: Milford Sound Piopiotahi seen in the distance above the Cleddau and Gulliver Rivers, from near Gertrude Saddle. Photo J Morris

Information about indigenous freshwater ecological values in the catchment is sparse. The freshwater fish records that could be found include inanga, longfin eel and kōaro (all At Risk – Declining) and the Not Threatened redfin bully (Ryder 2009, URS 2011, New Zealand Freshwater Fish Database [NZFFDB], accessed 2020). All are migratory and this may enable these species to recolonise habitats after severe and sometimes frequent flood events.

Barrier skink (Threatened – Nationally Endangered) and Cascades gecko (At Risk – Declining) have been recorded in alpine regions of the catchment, with some recent records coming from recreational rock climbers[7].

Possums and other mammalian pests (stoats, rats and mice) are present throughout the catchment and are the focus of aerial pest control operations, and a number of trapping networks in the area are maintained for stoats (the area is managed as the Cleddau Biodiversity Management Unit, BMU). Without these operations, it is likely that many bird species in the area would be absent or highly restricted in numbers. Chamois are also present, particularly in alpine areas, and are subject to occasional aerial control, particularly south of SH94 (Edge Hill and Reid 2017).

Visitor impacts along the SH94 corridor include litter, effluent, and development of informal trails, and the zone of greatest impact is largely limited to the immediate vicinity of the road, carparks, a popular short walking track at the Chasm, and more rugged tramping / mountaineering access routes into the Tūtoko and Gulliver. The footprint of the road is most prominent at the western Homer Tunnel portal where there is a large protective entrance structure and occasional rock blasting work is carried out on the cliffs above to pre-emptively clear sources of potential rock-fall that may threaten the road. These sorts of road maintenance activities, which are undertaken for visitor safety reasons, are likely to have a number of detrimental effects on the sensitive ecological values in the alpine zone These impacts likely include mortality of fauna and long-lasting physical disruption to or loss of habitat, but effects are largely invisible to visitors

[7] Unless otherwise indicated, herpetofauna records are from the DOC 'Bioweb,' Database an unpublished geodatabase accessed in April / May 2020. Due to concerns about facilitating the illegal poaching of rare herpetofauna, generic location descriptions for herpetofauna are given except where specific locations are already in the public record.

compared to the more obvious effects of vegetation clearance and earthworks in the immediate SH94 footprint. This area is home to locally endemic and critically Threatened lizard and invertebrate species (see Section 4.12, below). As such, blasting and similar activities should be avoided to the greatest possible extent, and if undertaken extensive measures to avoid or minimise adverse effects to fauna should be heavily prioritised, befitting the National Park status of the area. We do note that the area is naturally subject to frequent rockfall and avalanche events that at times cause similar adverse effects to flora and fauna across very large areas. However, these events often occur along recurring avalanche paths or at active slips. This context serves to highlight the importance of minimising additional anthropogenic disturbance in new sites, because some species (e.g., lizards) may persist largely in areas of refugia (i.e. cliff areas not in natural avalanche paths) that are less frequently subject to natural disturbance.

The Arthur Valley and its tributaries receive extensive trapping and aerial pest control efforts (focusing on stoats, particularly since 2005 as part of the Arthur BMU), and the main Arthur Valley is publicly accessible via the famous Milford Track. The area forms part of the Northern Fiordland whio 'security site,' with a present population in the Arthur and Joes Rivers of around 40 adult birds (DOC Whio Survey Results unpublished count data, 2020). The Arthur was the site of a successful translocation of pāteke (North Island brown teal, At Risk – Recovering) in 2009, supports northern Fiordland tokoeka, South Island kaka, and kea, and has red mistletoe and a population of the At Risk – Declining tufted hair grass *Deschampsia cespitosa* at Lake Ada (Edge Hill and Reid 2017, DOC Bioweb Database). The Arthur supports large numbers of longfin eels (At Risk – Declining) and shortfin eels; sports fish (trout) are prolific in the lower valley, but information about other indigenous fish species that may be present was not found during this study. Blackberry is unfortunately a known weed issue adjacent to the track, having been apparently spread by trampers some decades ago (Edge Hill and Reid 2017, DOC Bioweb Database).

Figure 5: Lowland beech forest covers the edge of a tributary of the Arthur River, near the Milford Track. Photo J Morris

Figure 6: Estuarine rushlands adjacent to the Cleddau Delta forest area. Photo J Morris

Sinbad Gully, despite being the site of an early release of possums in the 1890s, is well-known as an extremely unmodified habitat and 'natural sanctuary' that has been important for conservation efforts for kakapo and more recently herpetofauna (Nicol 2001, Loe 2016). Steep valley walls afforded the valley a delay to the invasion of deer (present only since the 1980s) and support one of the most remarkable associations of sympatric alpine lizard species in the world, with Cascades gecko, cryptic skink and the locally endemic Sinbad skink (Threatened – Nationally Endangered) occupying the same cliff area at the head of the valley (Bell et al. 2008, Loe 2016). It supports low numbers of whio, South Island kaka, northern Fiordland tokoeka, mohua (Threatened – Nationally Vulnerable), and southern falcon (Threatened – Nationally Vulnerable), a breeding population of tawaki at the coast, a number of poorly known and probably locally endemic invertebrate species, including *Powelliphanta* spp. snails, and Fiordland endemic plants that includes At Risk – Declining alpine / subalpine species (Loe 2016, Edge Hill and Reid 2017, Thomas and Mattern 2017, DOC 2019). With funding from a private tourism venture the Sinbad Sanctuary project has been in place since 2009, with pest control and threatened species monitoring. In 2014 the Sinbad Gully became part of the Arthur BMU, with numbers of tokoeka and other forest species increasing since trapping began (DOC 2019).

Other areas in the wider Milford Sound Piopiotahi Catchment of conservation importance include Anita Bay, which has a tawaki breeding population and an associated trap network, and the Bowen Valley, which supports whio and has a trap network that was established and was maintained initially by volunteers but is now serviced by DOC (DOC 2018a).

In general, very little information was obtained during this study about indigenous fish and invertebrates inhabiting freshwater habitats in the Milford Sound Piopiotahi Catchment and Village area. As previously discussed, frequent large floods may mean that diadromous fishes are able to recolonise these naturally dynamic environments. Because essentially the entire catchment is intact indigenous habitat, water quality and in-stream habitat conditions are likely to be extremely high and of very high ecological value. Human activities that may introduce sediment or pollutant runoff to these habitats, or the culverting of streams under roads in a way that prevents fish passage must be avoided. Didymo is still believed to be absent from the catchment, and its accidental introduction would be a loss for the otherwise pristine freshwater environment.

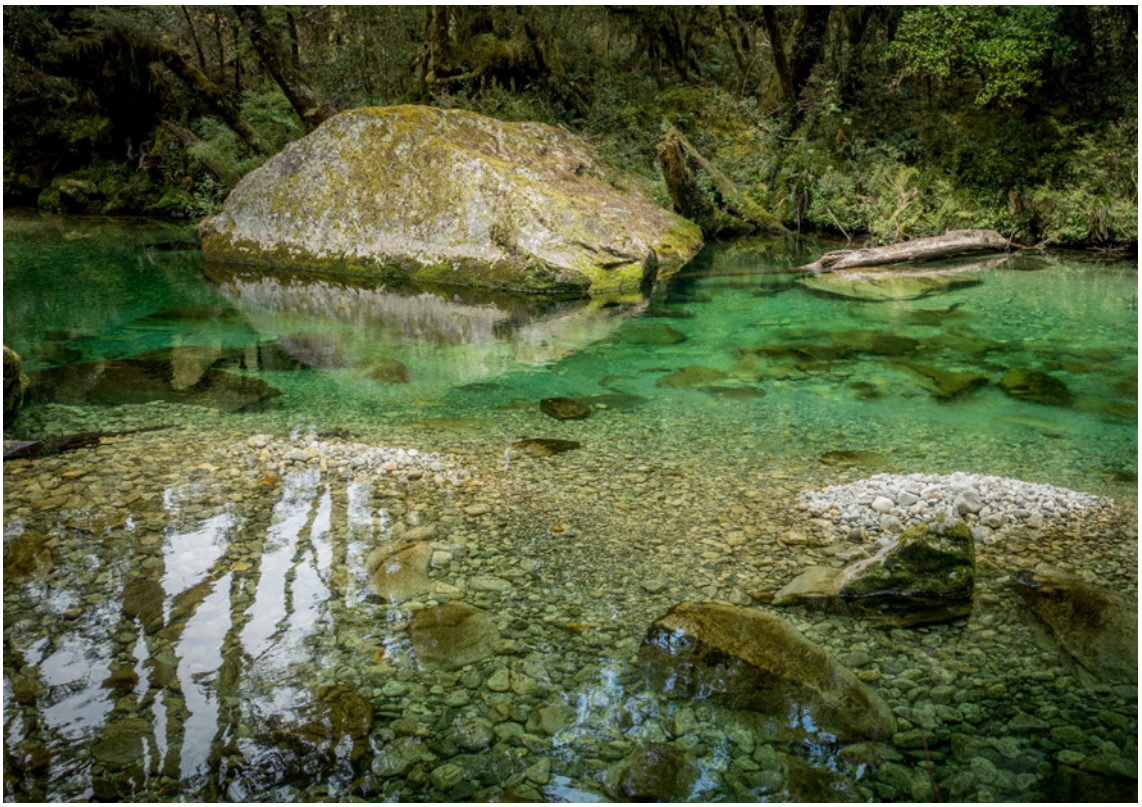


Figure 7: Forested catchments and relatively stable bedrock means that water quality and in-stream habitat values in Fiordland are very high. Photo of the North Branch of the Clinton River, which feeds Lake Te Anau, by J Morris.

MILFORD SOUND PIOPIOTAHI MARINE ENVIRONMENT

3.7 The Milford Sound Piopiotahi marine environment is 16 kms in length, from the head of the fiord to the open sea and has a maximum depth of 269 m (Stanton and Pickard, 1981). High rainfall in the surrounding catchment discharges huge volumes of freshwater into the fiord through streams and rivers such as the Cleddau, Arthur, Harrison and Bowen Rivers and Sinbad Gully. This water is stained brown with tannins from the rich forest floor. This tea-stained freshwater layer, which varies from 5 cm to more than 10 m in depth, sits above the denser saltwater of the fiord, significantly reducing the light penetrating into the water column (FMG 2017). This paired with the low wave energy of the inner fiord, results in a phenomenon known as deep water emergence, where deep sea species are found at much shallower depths.

As a result of deep water emergence, the benthic marine fauna within the inner fiord are globally unique (Cunningham et al. 2019). Kelp species that would normally form the basis of such communities, are replaced with black corals (antipatharians; e.g. *Antipathes fiordensis*), soft corals (gorgonians), hydrocorals and brachiopods (Sirota, 2016; FMG 2017). Rock lobster are present throughout the inner fiord on rocky outcrops and species such as bottlenose dolphins (Threatened – Nationally Endangered), tarakihi and blue cod are common. On rare occasions, whales are observed within Milford Sound Piopiotahi, with a Southern Right Whale (At Risk – Recovering) observed within the Sound in early 2012 (Baker et al. 2019). The deeper inner fiord seabed is typically comprised of fine, muddy substrates. Here heart urchins and tube worms dominate to depths of around 200 m. Below this bivalves, tusk shells and crabs dominate the benthic community (FMG 2017).

The outer fiord is subjected to much higher wave energy and has less freshwater influence, resulting in a different marine community. Here kelps flourish in the turbulent waters and the marine communities present are typical of southern New Zealand coastlines (FMG 2017). Rock lobster and paua are abundant and fish communities are more diverse (FMG 2017).

The Milford Sound Piopiotahi coastline is home to New Zealand fur seals (kekeno), Fiordland crested penguins (tawaki), and blue penguins (kororā) (At Risk – Declining) (Robertson et al. 2017).

A marine reserve was established within the inner fiord in 1993 and covers a total of 690 hectares of the east and north-eastern side of the Milford Sound Piopiotahi. It contains underwater habitats comprised of predominately deep, muddy fiord basin, with a large section of deep reef and a small section of shallow rock wall (DOC 2020). Commercial fishing is also banned within the wider inner fiord, while recreational fishing for blue cod (*Parapercis colias*) is also prohibited in response to a decline in blue cod fish numbers (Sirota 2016).

A long-term biological monitoring programme was established in 2006 and 2007 with an objective of establishing a baseline of current biodiversity, measuring any changes attributable to marine reserves and undertaking biosecurity surveys (Wing 2006; Wing and Jack 2007). During the surveys data on reef fish communities, sea urchin and common kelp (*Ecklonia radiata*) abundance, diversity of macroinvertebrates and sessile rock wall invertebrates, and subtidal communities was undertaken. The biological monitoring programme surveyed common species as well as identifying 'indicator species'; rock lobster (*Jasus edwardsii*), blue cod, black coral, brachiopods (*Liothyrella neozelandea*, *Terebratella* spp., *Notosaria nigricans*), common kelp and sea urchins (*Evechinus chloroticus*). Checks were also undertaken on man-made structures for any invasive species. As part of this monitoring programme a total of four biological monitoring and three biosecurity sites were located within Milford Sound Piopiotahi. These biological monitoring sites were re-surveyed in February 2020 (R. Kinsey, *pers. comm.* May 11, 2020).

This initial programme was found to have inadequate replication and was considered unsuitable for the detection of any real changes as a result of management changes (NIWA 2017). In general, there is a lack of robust scientific studies that have been undertaken within the Sound, with much of the research to date being piecemeal. Marine mammal studies have predominantly focused on bottlenose dolphin populations, with some studies undertaken within Milford Sound Piopiotahi (Williams 2007, Sirota 2016).

Milford Sound Piopiotahi is the only fiord within Fiordland that is directly accessible by vehicle. Because of this it is extremely popular with visitors which puts increasing pressure on the marine environment. Visitors typically view the Sound from visitor boats based at Freshwater Basin or by air. These boats are known to seek out pods of bottlenose dolphins and populations of New Zealand fur seals. Bottlenose dolphin populations have been shown to be directly affected by boats operating within the fiord, particularly tourist vessels (Lusseau 2005). Lusseau (2005) demonstrated that bottlenose dolphins have a preference for the sound entrance and areas with less vessel traffic. New Zealand fur seals have also demonstrated a behavioural change from tourist vessels, with anthropogenic noises such as coughing and the sound of venting scuba tanks prompting them to dive into the water (Sirota 2016). Ship strike of marine mammals is also a concern from both commercial and recreational boats, particularly those that travel at higher speeds through the inner fiord to access the outer fiord.

Visitors also access Milford Sound Piopiotahi on private boats or cruise ships. While cruise ships have environmental concerns such as the discharge of effluent and air pollutants, of bigger concern is the potential introduction of new marine species. Biosecurity, through invasion of marine pest species, is seen as the single biggest threat to the marine conservation values of Milford Sound Piopiotahi (FMG 2017). There is the potential for species to be introduced through ballast water, or through biofouling. Once a pest species establishes it can quickly spread, having detrimental effects on the marine habitat, food chains, fish stocks and recreational activities (FMG 2017). Smaller, domestic vessels can also introduce marine pests through biofouling of pest species already present within other areas of the country. To the best of our knowledge there are currently no known marine pest species within Milford Sound Piopiotahi. However, the Asian kelp *Undaria pinnatifida* has been detected within Te Puaitaha / Breaksea Sound and Taiari / Chalky Inlet, and considerable effort has been undertaken to prevent its spread. While it is not on the common 'tourist route' for tourist vessels, vessels, and particularly private vessels, do move between Te Puaitaha / Breaksea Sound and Taiari /Chalky Inlet, and Milford Sound Piopiotahi providing a pathway for the introduction of *Undaria*. The Fiordland Marine Regional Pathway

Management Plan (FMPP) was adopted in 2017 and has an overarching objective of preventing the introduction and spread of invasive marine species to the Fiordland Marine Area. Part of this plan requires all vessels entering within one nautical mile of the landward boundary of the Fiordland Marine Area to hold a Clean Vessel Pass and to comply with the associated standards. This includes domestic vessels and is in addition the Ministry for Primary Industries Craft Risk Management Standard.

Management of the Fiordland area and Milford Sound Piopiotahi is overseen by the Fiordland Marine Guardians (the Guardians). The Guardians are a statutory advisory body appointed by the Minister for the Environment. They are responsible for providing advice to the Minister, government departments and Environment Southland on the management of the Fiordland Marine Area (MfE 2018). The group are officially recognised under the Fiordland (Te Moana o Atawhenua) Marine Management Act 2005 and are administered by the Ministry for the Environment. Sub-committees of the Guardians focus specifically on biosecurity, monitoring, compliance, communication and engagement with users. The Guardians vision is that the quality of Fiordland's marine environment and fisheries, including the wider fishery experience, be maintained or improved for future generations to use and enjoy.

Looking to the future, there is ample opportunity for more comprehensive research of the marine environment of Milford Sound Piopiotahi to be undertaken. Of particular interest to the DOC would be further research on the impact of tourism operations on marine mammals. The Guardians would like to see a greater focus on developing methods that will enable fast and effective responses to marine pest incursions along New Zealand's coastlines (FMG 2019).

THE MILFORD CORRIDOR

3.8 Encompassing SH94 and the surrounding environments from ridge-top to ridge-top, the Milford Corridor comprises a ~110 km strip of Fiordland and northern Southland, with most of its length included in Fiordland National Park or other parts of the Conservation Estate (although the road itself is outside the Park and is managed by Waka Kotahi NZ Transport Agency). From Te Anau to the Divide, a strong rain-shadow from the steep ranges of central Fiordland west of Lake Te Anau, and landforms east of the lake sculpted by the advance of Pleistocene glaciers has left vast areas of lowland beech forest, shrubland bogs and fens, and in modern times substantial areas of farmland. From the mouth of the Eglinton River near Te Anau Downs, SH94 heads away from the lake to the glacier carved u-shaped Eglinton Valley to a low crossing of the mountains at the Divide. From the Divide, SH94 descends to the Hollyford Valley, and continues to the head of the valley to the Homer Tunnel leading to the Cleddau (discussed in Section 4.6). A side-road descends from near the Divide down the Hollyford Valley past Gunn's Camp to the start of the Hollyford Track.

TE ANAU TO TE ANAU DOWNS / BOAT HARBOUR

3.9 The Te Anau Basin has typically received less conservation attention than the adjacent National Park, because much of the area is privately owned and / or has been subject to habitat modification. Nevertheless, substantial conservation values exist. During the Pleistocene, glacial advance and retreat left behind a landscape of hummocks and depressions east of Lake Te Anau. Depressions with impeded drainage allowed for extensive peat deposition and there are outstanding fen and bog wetlands throughout the Te Anau Basin. The surrounding raised (or free draining) areas that were cloaked in beech forest until historical fires in Polynesian and early European times are now largely covered in indigenous secondary vegetation or farmland (Burrows and Dobson 1972, Cromarty and Scott 1995). The following section describes habitats and conservation values between Te Anau Village and Te Anau Downs / Boat Harbour) starting with areas west of the road, followed by areas to the east.

From the township of Te Anau, SH94 follows the eastern shore of Lake Te Anau, set back from the lake by a strip of indigenous vegetation that predominantly comprises regenerating mountain beech and mānuka forest, scrub, or shrublands from Patience Bay north. Bracken fernlands fringe the road, and weeds (particularly gorse, broom, Spanish heath, and willows) are present in many places, particularly around waterways. This strip is held in the Conservation Estate as the Ewe

Burn Conservation Area, which extends north to the Fiordland National Park boundary near Boundary Creek. Areas of bog and fen wetland in the vicinity of the Ewe Burn are of high conservation value and an area is mapped as being of regional significance in the proposed Southland Land and Water Regional Plan (Lookout Hill Wetland). From Boundary Road north to Pleasant Bay, vegetation types are similar, but in places are more intact, of taller stature, and maybe older than habitats to the south. An area of forest between Pleasant Bay and Boat Harbour contains beech forest, including areas of swamp forest that includes podocarps such as miro, mountain tōtara, rimu and kahikatea (Boffa Miskell 2017).

Lakeshore habitats around Lake Te Anau, especially turflands at the lake edge, are known to contain important populations of nationally Threatened and At-Risk species, including lakeshore dwarf daisy (Threatened – Nationally Critical), the buttercup *Ranunculus ternatifolius*, (Threatened – Nationally Vulnerable), iti cress (*Cardamine lacustris*; At Risk – Naturally Uncommon; DOC Bioweb Database, Burrows et al. 2015). Lake shore shrublands also host rare species; leafless mistletoe (*Korthalsella salicornoides*, Threatened – Nationally Critical) is found near Henry Creek, and Boat Harbour supports *Coprosma pedicellata* (At Risk – Declining; DOC Bioweb Database, B. Rance, *pers. comm*. 2019, Burrows et al. 2015). These lakeshore areas are of high ecological importance, and recognition of their value has influenced the regulatory regime around the operation of the level of Lake Te Anau (which is managed within a legally gazetted range as part of the Manapōuri Power Scheme).

Little information about indigenous birds, herpetofauna, or aquatic species present in specific locations in the Te Anau to Te Anau Downs area was located during this study. In general, forest and scrub areas are likely to provide habitat for widespread (i.e., Not Threatened) forest bird species such as tomtits, bellbird, and brown creeper. Open areas and the lake shore are likely to support black-fronted tern (Threatened – Nationally Vulnerable), and widespread waterfowl / wetland bird species including scaup, pūkeko, and swamp harrier. Bog and fen wetlands in the Te Anau Basin in general are likely to support important wetland bird species such as Australasian bittern (Threatened – Nationally Critical), as well as marsh and spotless crake, banded rail, and South Island fernbird (all four are At Risk – Declining; Cromarty and Scott 1995). Streams in the Te Anau Basin, including those draining wetlands, are likely to support kōaro, giant kokopu, and longfin eel (all At Risk – Declining) and Not Threatened species such as banded kokopu, shortfin eel and common bully; records for indigenous fish species in the area are generally scarce and knowledge is poor (Cromarty and Scott 1995, NZFFDB).

East of the road, areas of private farmland are prevalent as far north as the Ewe Burn. North of the Ewe Burn, several regionally significant wetlands occur on private land (often in covenants) or in the Snowdon Forest Conservation Area which extends to the east. One such wetland complex that includes Lake Te Aroha, the Dome Mire, and Dismal Swamp was subject to detailed study in previous decades; the Dome Mire is nationally outstanding as perhaps the best example nationwide of a raised oligotrophic peat bog (Burrows and Dobson 1972, Johnson 1977, Cromarty and Scott 1995). This wetland complex contains important plant species including *Coprosma elatirioides* and tufted hair grass (both At Risk – Declining), the only known location of silver pine east of the main divide and, historically at least, also supported breeding populations of black-fronted tern and South Island fernbird (Moar et al. 1973, Johnson 1977). Otherwise, similar bird and indigenous fish species are likely to be present in habitats east of the road to those described above. A patchwork of protected and private land in the vicinity of Henry Creek to Lake Mistletoe also includes regionally significant wetlands against a general backdrop of private farmland that extends beyond Retford Stream to the east. Vegetation types in Te Anau Basin wetlands generally include red tussocklands, wire rushlands, mountain beech forest, mānuka – *Dracophyllum* spp. scrub, sphagnum mossfields, and open water habitats with rushes and pūrei tussocks (Burrows and Dobson 1972, Cromarty and Scott 1995).

Rivers and waterways on both sides of SH94, as previously mentioned, are threatened by weeds, and many including the Upukerora contain didymo. Mammalian predators are present, along with possums and deer, and pigs threaten wetland areas.

In the wider Lake Te Anau area, other areas of exceptional conservation importance cannot go unmentioned. The Murchison Mountains, a restricted access area that is managed intensively for

mammalian pests, famously supports takahe (Threatened – Nationally Vulnerable; this area was the site of their rediscovery, having been presumed extinct, in 1948), kea, kaka, and a host of other threatened species (Edge Hill and Reid 2017). In an exciting recent development, a chance recording led to an unexpected discovery of long- and southern short-tailed bats (Threatened – Nationally Critical and At Risk – Recovering respectively) in the Ettrick and Snag Burn area of the Murchison Mountains (DOC 2018b). Predator-free Centre Island near Pleasant Bay along with Bute Island in Middle Fiord is managed as a creche site for captive-reared juvenile Haast tokoeka (Threatened – Nationally Critical) (Edge Hill and Reid 2017).

Figure 8: Lake Te Anau and the Te Anau Basin from the Countess Range to the north-east. Photo J Morris.

TE ANAU DOWNS TO FIORDLAND NATIONAL PARK BOUNDARY

3.10 From Te Anau Downs to the point where SH94 enters Fiordland National Park at the Eglinton Valley, very little specific information about conservation values could be obtained. North of Te Anau Downs to the mouth of the Eglinton River, the regionally significant Bog Lake occurs among beech forest. Lake shore areas near the river support Threatened and At-Risk turf plant species such as those described in Section 4.9 (DOC Bioweb Database), but Russell lupin is a problematic weed in the vicinity of the river and didymo is present in the river. Large areas of private farmland between the Eglinton River and the Snowdon Forest Conservation Area have been converted to improved pasture and plantation forestry in the past decade via extensive clearance of regenerating mānuka scrub, with a likely loss of significant ecological values. Weed species such as Himalayan honeysuckle and broom have become dominant in some of these recently cleared areas east of the road and will likely pose a threat to the nearby conservation estate in the coming years as weeds inevitably spread. The Retford Stream and Bog Lake wetlands are regionally significant. Conservation areas east of the private farmland are silver and mountain beech forest with alpine tussocklands and herbfields in the Countess and Dunton Range above around 1000 m in elevation. An area of tops in the Snowdon Forest Conservation Area accessible from Boyd Creek supports a large area of red tussocklands and *Oreobolus* spp.-dominated cushion vegetation that has several Threatened and At-Risk plant species (DOC Bioweb Database), is likely to have high conservation values, but is vulnerable to visitor impacts (in particular from trampling). West of the Eglinton River, in Fiordland National Park, large limestone scarps west of End Peak and Mt Eglinton face the lake and are a visually impressive feature that may have distinct ecological values.

Figure 9: Bog Lake near the mouth of the Eglinton River, looking north. Photo J Morris

Figure 10: *Oreobolus* spp. cushion bog habitat and red tussocklands in wetlands above Boyd Creek. Photo J Morris

EGLINTON VALLEY

3.11 The Eglinton Valley, from the Fiordland National Park boundary to the Divide, is justifiably famous as one of the most important areas of habitat for Threatened and At-Risk species in the country, with over 30 such plants and animals present (DOC 2013, Edge Hill and Reid 2017). Conservation values are maintained across a ~5000 ha area via mustelid, rodent and possum traps, ground laid

poison baits, and aerial pesticide operations (particularly as part of 'Operation Ark' and 'Tiakina Nga Manu / Battle for our Birds' programs of the past ~15 years). One of the largest areas of lowland mixed beech forest in the country includes extensive areas of red beech forest on the flat, fertile valley floor, with silver and mountain beech more prominent on the steep valley sides. Frequent heavy frosts in winter have induced areas of frost hollow vegetation (specially adapted shrublands, mossfields and grasslands). The Eglinton River has the only braided river habitat in Fiordland.

The East Branch of the Eglinton (which has only a rough tramping track and receives few visitors) has lower rainfall levels and supports beech forest and tussockland habitats more typical of eastern (Central Otago – northern Southland) mountain areas. The steep hanging tributary valleys to the west of the larger West Branch are largely unmodified (although tramping tracks and informal routes link some valleys); there are no huts and few bridges. Knobs Flat has a small settlement that almost exclusively houses conservation and highway maintenance workers. The Knobs Flat area, the immediate road corridor, several campsite areas, carparks, and roadworks stockpiles are modified but represent a relatively minor overall footprint of ongoing human impact in the area.

Specific plants of conservation concern present in the Eglinton include tufted hair grass at Lake Gunn and elsewhere, *Coprosma intertexta* (likely to occur in shrublands in wetland areas), as well as yellow, red, and scarlet mistletoe (all At Risk – Declining; DOC Bioweb Database). Grazing by livestock until the late 1990s has led to a general loss of the palatable indigenous grasslands that were historically present, and large areas of open country are now modified and dominated by exotic grass species (such as browntop, and sweet vernal) in association with both indigenous and exotic herb species (Lee 1981).

The Eglinton Valley has been the scene of a great deal of nationally important research into predator-prey cycles in beech forests. Beech mast seeding events lead to increases in rodents, followed by increases in stoats, that can in a single season threaten the viability of local populations of vulnerable species. A particular feature of the Eglinton Valley is the extent of mature red beech forest. Cavities in the trunks of large old trees or standing dead trees provide nesting and roosting habitat for nationally important populations of hole-nesting birds and bats that are vulnerable to predation, particularly following mast seeding events. These species are protected by aerial pesticide, trap networks, and management of populations via monitoring and even translocations.

Mohua – a population of mohua in the Eglinton is subject to ongoing monitoring and has in the past been supplemented with translocations from offshore island populations. A transfer of 100 mohua from Anchor Island occurred in 2017. Over 170 were counted in the Eglinton prior to the transfer, up from 18 individuals in the early 2000s (Edge Hill and Reid 2017, Mohua Charitable Trust 2017). However, this population remains extremely vulnerable to predation (with existing levels of predator control), and we understand that the most recent population estimates are of fewer than 70 birds. Advice from DOC is that further conservation management of this species in the area is unlikely to include additional translocations.

South Island kaka – like mohua, South Island kaka nest in cavities in tree trunks, and egg and chick incubating female birds are vulnerable to possums as well as mustelids and rodents. With the current level of pest (particularly stoat) control, the reasonably large South Island kaka population in the valley appears secure (Edge Hill and Reid 2017).

Long-tailed bat – the Eglington Valley is home to one of the largest and best-studied populations of the critically endangered long-tailed bats in the South Island (Edge Hill and Reid 2017). They roost in cavities of large beech trees, typically those over 16 m in height and 100 years in age, and 95 % of roosts are found in open forest on the level valley floor within 500 m of the forest edge (Sedgeley and O'Donnell 1999). Roosts are frequently shifted and in fact seldom used in an ongoing basis, long-tailed bats feed over a wide range, and these habitat preferences puts the vast majority of the population within a short distance of SH94 and renders essentially the entire forested area of the valley floor as likely bat roosting and feeding habitat.

Southern short-tailed bat – rediscovered in 1997, the Eglinton Valley population of the southern short tailed bat was until very recently thought to be the only mainland population of this species (other populations of this subspecies are present on Whenua Hou and in the Murchison Mountains; Edge Hill and Reid 2017, DOC 2018b). These, and long-tailed bats, are highly dependent on ongoing pest control (particularly for rats) in the Eglington to ensure the persistence of these populations.

Other Threatened and At-Risk species which are present, but for which less information is generally available, include kea, black-fronted tern, rock wren, southern falcon, as well as korero gecko and southern grass skink (both At Risk – Declining; (Edge Hill and Reid 2017, DOC Bioweb Database). The healthy population of Not Threatened yellow-crowned kakariki (which is also vulnerable to predation as it nests in tree cavities) in the Eglinton is also noteworthy. Kiwi species are absent and have never been known from the Eglinton (Edge Hill and Reid 2017).

Freshwater habitats in the Eglinton include a number of large lakes and large tributary streams and are renowned trout fishing waters, but the presence of sports fish likely limits population sizes for some indigenous fish where trout (and brook char are present). Nevertheless, longfin eel and kōaro have been recorded in the river, as well as a reasonably recent (2014) record of the non-migratory gollum galaxias (Threatened – Nationally Vulnerable; NZFFDB). Freshwater habitats, particularly for invertebrates, are degraded somewhat by the presence of didymo, but as with the Milford Sound Piopiotahi catchment the wider Eglinton, including tributaries, are likely to have high ecological values in terms of instream habitat for indigenous invertebrates and fish.

Figure 11: A much younger report author assists with routine monitoring of a long-tail bat population in the Eglinton Valley, 2008. Photo J Morris collection

The Eglinton, as an accessible area containing some areas of relatively modified habitat, is subject to development interest (e.g., a private lodge proposal on the valley floor near the start of the Dore Pass tramping route). However, a number of constraints to developments and other activities in the Eglinton Valley relate strictly to conservation matters, aside from general issues pertaining to effects on very high value indigenous habitats in a National Park context. These include a need to avoid or strictly manage any effects on mobile fauna, particularly effects on

large trees that may provide roost and nest habitat for bats and birds that are absolutely protected under the Wildlife Act 1953. Grassland areas of the valley floor are modified by exotic weeds but are nevertheless of importance particularly at the forest edge as habitat for foraging long-tailed and southern short-tailed bats, southern falcon, and Not Threatened species including morepork. Wetland areas on the valley floor, which include small open water and swamp areas at Mirror Lakes, sphagnum / *Oreobolus* spp. bog areas near Waterfall Creek, and the regionally significant Deer Flat wetland are wetland habitats that have been greatly reduced in their extent nationwide and are a priority for protection. Frost hollow areas, which includes many roadside grassland, shrubland and mossfield areas of the valley floor, are a naturally uncommon and nationally Endangered ecosystem type (Williams et al. 2007, Holdaway et al. 2012).

In terms of threats to the biodiversity of the Eglinton Valley, introduced mammalian pests are undoubtedly the main concern, and much of the distinctive and important indigenous fauna of the area is dependent on aerial pest control (1080) and ongoing trapping. A number of studies conducted in the Eglinton itself and elsewhere in New Zealand demonstrate the clear need for pest control, particularly following mast seeding events, to maintain populations of hole-nesting species (see Edge Hill and Reid 2017). The Eglinton is the only area of Fiordland known to have ferrets, large numbers of rabbits may be an issue for palatable indigenous grass and herb species in open areas, cats are present, and possum control is of importance particularly for South Island kaka and mistletoe species. Weeds are kept under effective control by surveillance and management from DOC, except for widespread exotic grasses and Russell lupin in the riverbed (which would require significant resources, over decades, to eliminate). Vehicle movements on SH94, particularly at night, cause road-kill of species such as morepork (and possibly bats), and any use of artificial lights in the vicinity of Knobs Flat and campsites may alter invertebrate (and bat) feeding behaviour and potentially make such species more vulnerable to direct or indirect (e.g. predation) effects associated with human activities and presence. Road maintenance activities, particularly the felling of large trees considered a possible threat to the road corridor by the Milford Road Alliance, is also notable. We understand that an estimated 234 ‘at risk’ trees have been removed from the corridor since 2017 (K Thompson, Milford Road Alliance, *pers. comm*. 2021). These are generally large, old beech trees of the sort that likely provide roosting and nesting habitat for bats, kaka, and mohua. The loss of large trees creates breaks in the canopy that can cause ‘edge effects.’ In this situation, the combination of increased susceptibility to high wind, physical disturbance to the forest floor, and higher light levels favours the growth of exotic weed species. Edge effects caused by the maintenance of an open road corridor and the clearance of roadside trees likely exacerbates natural processes of tree windfall in the ordinarily sheltered forest interior, causing further habitat loss.

UPPER HOLLYFORD VALLEY

3.12 The Upper Hollyford Valley (above the Lower Hollyford Road turnoff) is a dramatic landscape of powerful avalanches, a tumbling river, and precipitous cliffs beneath hanging snowfields. Silver beech forest predominates on the valley floor and valley walls below the natural treeline, except in areas susceptible to winter and spring avalanche (for example, much of the area between the Homer Hut and Monkey Creek). Steep hillsides have tussocklands and herbfields, and large boulderfields and shrublands occur at the toes of cliffs and in some infrequently disturbed areas.

In the upper valley, the presence of SH94 has a left substantial footprint of modification on the true right of the narrow valley floor, with flood embankments, large road cuts, bridges, stockpiles and frequent maintenance efforts required to clear large slips and avalanches from the road. Carpark areas are provided at Monkey Creek, the Gertrude Valley, and near the Homer Tunnel. The New Zealand Alpine Club (NZAC) operates the Homer Hut at a former Ministry of Works road workers campsite at the start of the Gertrude Valley, and a new roadworkers building (the previous building known as ‘the Chapel’ was recently removed) is nearby. A popular walking track leads to Gertrude Saddle, and an area centred on the tops between Mt Moir to Barrier Peak is of recreational importance for rock climbing and mountaineering.

The Upper Hollyford supports kea, which famously congregate around cars at the Homer Tunnel. It is a whio ‘recovery site’ with 6 adult birds recently recorded above Falls Creek (DOC Whio Survey Results unpublished count data, 2020). The area is a stronghold for southern rock wren,

with around 100 birds present (Weston et al. 2019). Cirque walls in the area, including Barrier Knob to the north, are home to barrier skink and Cascades gecko (Bell et al. 2008, DOC Bioweb database), and New Zealand pipit (At Risk – Declining) are often observed in alpine areas. Leaf-vein slugs are locally abundant in crevices on cirque walls, and it seems likely that some of these species are At Risk or Threatened, and endemic to the immediate area. In terms of rare flora, species in the area appear to be typical rather than exceptional, although mistletoes are present near Falls Creek and the Fiordland endemic hebe *Veronica zygantha* (= *Hebe laxa,* At Risk – Naturally Uncommon) was first described from Homer Tunnel (Johnson 1979, DOC Bioweb Database).

Figure 12: Southern rock wren, at home in the diorite of the Darrans near Gertrude Saddle. Photo J Morris

At least two species are known only from the Homer Tunnel area, reflecting the importance of this site not only for unique fauna but also for its accessibility to researchers and incidental public observation of threatened species. The Awakopaka skink (classified as Data Deficient and likely to be critically threatened) is known only from a handful of observations near the Tunnel (Wildlands 2019). The grasshopper *Sigaus homerensis* (Threatened – Nationally Critical) is also apparently unique to the site (Morris 2003).

Aside from a single record of kōaro from the Hollyford near Falls Creek (NZFFDB), no information about the freshwater ecological values of this area was found during this study; the general comments made in section 4.6 are likely to apply here also.

Mammalian pests, as elsewhere in Fiordland, are of concern in the Upper Hollyford. Cats are present in the vicinity of Homer Hut and despite the presence of a trap network have proven difficult to eliminate (J Morris *pers. obs.*). Stoats, possums, and rodents are also present despite a frequently inhospitable climate. Mice, while not generally of concern for larger indigenous birds are effective nest predators of southern rock wren and are believed to be an increasing problem in the area perhaps because of recent cooler winters and climate change. Southern rock wren are extremely vulnerable to predation, with almost total nesting failure prior to the implementation of a trap network by the Southland Section of the NZAC in 2013; stoats have been responsible for

around 50% of nesting failures, and mice a further 10% since then, but rock wren numbers are increasing due to this predator control (Weston et al. 2019).

Human visitor impacts include trampling damage and damage from deposition of human waste and other litter to vulnerable alpine plant communities at Gertrude Saddle, and to shrublands at SH94 near Monkey Creek where visitors frequently stop. Visitor interactions with kea have led to significant numbers of kea deaths (in the context of the now very much reduced population size of this species), including from road-kill, and further deaths have likely occurred from poisoning as a result of being inappropriately fed. Road maintenance and ancillary activities in the alpine and subalpine zone are likely to adversely affect the sensitive ecology and intrinsic natural values of the area, as in the case of cliff-blasting above the Homer Tunnel (discussed in Section 4.6). In addition, recently re-constructed 'Chapel' structure used for road workers has been built at the forest edge below the eastern tunnel portal and represents a relatively large footprint beyond the highway itself. Large-scale use of machinery for in-river construction works since catastrophic floods in early 2020 to effect road repairs and rebuild gabion baskets and other road-protecting revetment structures has occurred in core whio habitat and has significantly altered large areas of riparian vegetation, much of which likely had a natural role in riverbank stabilisation anyway. Further, since these works by necessity occur during low river levels, any associated introduction of sediment or pollutants may have a relatively greater effect on in-stream ecological values (e.g. the invertebrates that whio depend on for food) than natural sediment discharge during high intensity but short duration flood events. Ongoing ecological impacts of the sorts described above are essentially inherent to the maintenance of a busy public highway. Managing visitor flow / road usage in a way that minimises the need for such activities to occur would be the easiest way to avoid such effects.

Figure 13: SH94 in the Upper Hollyford Valley winds its way to Homer Tunnel, seen from Mt Christina at Cirque Creek. Photo J Morris

LOWER HOLLYFORD VALLEY

3.13 The Lower Hollyford Valley is a large glacial valley that discharges rivers captured from a large catchment, including the Red Hills and Olivines via the Pyke River to the north, Hidden Falls Creek and the peaks above the Routeburn Track, the Upper Hollyford, and the Darrans Mountains including Mt Tūtoko to the west. Extensive lowland silver beech forest with frequent podocarps (rimu, miro, kahikatea) covers the valley floor, with important lowland podocarp forest present near Martins Bay. Some areas near Gunn's Camp, Hidden Falls Creek, Lake Alabaster and the failed settlement of Jamestown were cleared in the 19th and early 20th century and used for cattle grazing. The area is popular for a range of recreational activities, with access often by aircraft or jetboat. Tourists visiting Milford Sound have led to increased pressure on short walks such as the walking track to Hinepipiwai Lake Marian, with substantial vegetation clearance for the expansion of an existing carpark occurring in recent years. Flood damage in early 2020 has damaged visitor infrastructure and the settlement at Gunn's Camp, caused extensive slip damage, and opened a new river channel from the Hollyford Valley to Martins Bay.

The Lower Hollyford provides habitat for a range of Threatened and At-Risk species. A single whio, or possibly a pair of whio is present at Hinepipiwai Lake Marian and small numbers of other whio are present downstream (A. Smart 2020 pers. comm.). Kaka and other forest birds are present in valley floor habitats, with kaka observed particularly during summer when they travel from the Eglinton to feed on rātā; kea and southern rock wren are present in alpine regions (Edge Hill and Reid 2017). Predator trapping along the Routeburn Track has boosted southern rock wren numbers in the track area since 2015 (DOC 2020). Mistletoes have been recorded at Lake McKerrow, and pingao and shore spurge are present on sand dunes at Martins Bay and at Big Bay (both At Risk – Declining; DOC Bioweb Database).

Figure 14: Lowland mixed beech / podocarp forest in the Hollyford Valley, near Hidden Falls Creek. Photo J Morris.

Records in the NZFFDB from the Hollyford River above Lake McKerrow include kōaro, longfin eel, and torrentfish (all are At Risk – Declining). At Lake McKerrow and around Martins Bay, longfin eel, inanga, common and redfin bully, freshwater shrimp, and lamprey (Threatened – Nationally Vulnerable) have been observed, but all records in this area are many decades old. Lake

Alabaster and the Pyke River have been utilised for a commercial eel fishery in the past, and commercial whitebaiting occurs at Big Bay. Brown trout and chinook salmon are also present throughout the lower Hollyford and Pyke (NZFFDB) and are likely to predate upon indigenous freshwater species. But, as a very large and generally unmodified catchment overall, the lowland river and lake habitats in the lower Hollyford and Pyke are likely to have very high ecological values for freshwater invertebrates and other indigenous fish species.

Deer, possums, rodents and mustelids are all present in the Lower Hollyford. Exotic grasses and blackberry are present in some currently or formerly settled areas, and tutsan has been recorded near Lake Alabaster (DOC Bioweb Database). The Hollyford Track to Martins Bay is a former bullock track, with blasting and benching in places. A road linking the Hollyford to Haast via the rugged and remote Olivine Wilderness Area to the north, or construction of a tunnel to Glenorchy have both been mooted from time to time.

Figure 15: The Central Darrans mountains, with Mts Tūtoko and Madeline prominent at right, seen from near the Routeburn Track. Photo J Morris

MILFORD REGIONAL CONTEXT

3.14 Northern Fiordland and the Milford Sound Piopiotahi area are by no means the only areas of major conservation importance in the local context. Detailed descriptions of all the localities that support Threatened and At-Risk species and ecosystem types is not the purpose of this report, but a few important nearby locations are listed below, along with a very brief and non-exhaustive description of their outstanding features. Specific references are too numerous to list, but this information is largely compiled from Edge Hill and Reid (2017), discussions in April 2020 with Department of Conservation staff based in Te Anau, the DOC Bioweb Database, and personal observations of the authors. Features are described geographically in a rough anticlockwise direction from Milford Sound Piopiotahi.

Lake Manapōuri – very high botanical values in Back Valley and on lake shore habitats. Long-tailed bats, northern Fiordland tokoeka, whio, kaka and mohua in Iris Burn. Kea and southern rock wren throughout alpine areas. Important wetland areas including lowland bogs. Predator free islands used for management of Haast tokoeka. Conservation management on islands and near tramping tracks.

Doubtful and Dusky Sound, and the southern fiords – predator free offshore islands with kakapo, tieke, mohua, southern Fiordland tokoeka and others. Marine mammals in fiords. Likely to have high but largely unknown herpetofauna and botanical values. Conservation management on islands and near tramping tracks.

Seaforth and Spey Rivers – Whio in the Seaforth River and mohua in the Spey River with southern rock wren in alpine areas. Conservation management via trapping near tramping tracks. Sensitive vegetation adjacent to tramping track.

Borland (Mt Titiroa to Green Lake) – rare ecosystem type (granitic boulder and screefields), likely high botanical values. Birdlife including whio, mohua, long-tailed bat and southern Fiordland tokoeka. Eyres Skink present. Wetland areas in Grebe Valley and Garnock Burn. Receives little conservation management at present.

Lake Monowai – remnant lowland podocarp forest. Modified by hydroelectricity development in early 20th century. Receives little conservation management at present.

Lake Hauroko – deepest lake in New Zealand with high values for aquatic plants. Mohua and whio in some valleys (the Rata Burn is the national southern limit for whio), mottled petrel breeding on an island in Lake Hauroko. Conservation management via aerial pesticide and trapping near tramping tracks.

Fiordland / Southland coast (Waitutu and Longwood Forests) – podocarp and beech forests. Important kaka population in Waitutu. Geologically outstanding feature of raised marine terraces that supports fertile forest (historically logged east of Port Craig). Longwoods modified by historic logging and mining, surrounded by farmland.

Southland coast (estuaries and wetlands) – large wetland complexes with RAMSAR status at Awarua Plains, and rare coastal forest types. Wetland bird species, galaxiid fish and large eel populations present.

Catlins – podocarp forest including rare coastal forest in dune slacks. Southernmost extent of beech forest in New Zealand, with mistletoes present. Tautuku gecko, long-tailed bat, kaka, mohua, wetland birds, montane bog habitats with likely high botanical values.

Eyre Mountains – mountain beech forest with mistletoes and alpine areas with Eyres skink and Southern rock wren present.

Mavora Lakes – rare vegetation types (frost hollows and ultramafics), mistletoes on mountain beech forest, alpine galaxias at the head of the Mavora River.

Takitimu Mountains – large wetlands with likely high botanical values among beech forest. Very high values for herpetofauna with Takitimu gecko, Eyres skink, green skink, and barrier skink present.

KEY ISSUES AND RISKS FOR CONSERVATION

BRIEF SUMMARY OF KEY ISSUES FOR CONSERVATION

3.15 Milford Sound Piopiotahi, the Milford Corridor and the surrounding area supports an enormous range of nationally Threatened and At-Risk plant, bird, insect, lizard, bat and marine mammal species. The area is home to a number of endemic species (e.g., Milford boulder butterfly, Awakopaka skink), as well as nationally important populations of other species (e.g., southern rock wren, whio, lesser short-tailed bat), including species considered taonga species by Ngāi Tahu. In terrestrial habitats, ongoing predation of indigenous flora and fauna by mammalian predators is the key concern, as many of these species' populations are highly vulnerable to these predators and subsequently their populations are now substantially diminished and / or in decline. In both marine and terrestrial areas, human impacts by visitors and commercial users causes ongoing pollution, physical disruption of habitats, disturbance of fauna, and further introduction of pest and weed species.

IMPACTS OF INTRODUCED SPECIES, AND IMPORTANCE OF AERIAL PEST CONTROL OPERATIONS

3.16 Many of the species present in the wider Milford Sound Piopiotahi area (e.g., whio, South Island kaka, mohua, and bat species) are highly vulnerable to mammalian predators (mice, rats, stoats, and possums) and are subsequently dependent on direct and ongoing predator control interventions. At present, aerial 1080 operations are by far the most potent and cost-effective means of controlling mammalian pests at a landscape scale. Landscape-scale pest control is the only way to protect species with large home ranges (e.g., kea, South Island kaka), to maintain populations large enough to allow successful interbreeding, and to protect cryptic species (e.g., lizards) that may not even have been discovered. On the other hand, trap networks or hand-laying of other poison baits requires the creation of substantial trap, track and hut infrastructure, ongoing extensive staff resource for physically highly demanding work in an extreme environment. In contrast to aerial 1080, trapping and use hand-laid poison is effectively limited to areas that are accessible from a road (e.g., Eglinton valley floor, sides and tributaries) or from major existing tracks (e.g., Milford Track and some side-valleys). As such, many taonga species (including those also protected by trap networks) may disappear forever without the use of aerial pest control methods like 1080.

EXOTIC WEEDS

3.17 A small number of exotic weed species are causing or have the potential to cause ongoing degradation of indigenous habitats in the Milford Sound Piopiotahi area. The main problem species and areas are Russell lupin in the Eglinton Valley, crack willow in eastern Lake Te Anau tributaries and extensive gorse, broom, and wilding conifers at the National Park boundary at Te Anau Downs station. Small numbers of weeds are present at Milford Village, and in places along SH94, but are presently kept under effective control. Ongoing control of pests within the Milford Sound Piopiotahi area and in the Eglinton Valley is particularly important because these habitats are frequently prone to disturbance, creating new opportunities for weed establishment at the exclusion of natural indigenous regeneration processes. Bringing Russell lupin under control in the Eglinton Valley would require substantial ongoing effort but would protect the ecological integrity of the river's braided floodplain (especially bare, weed-free gravel areas) that provides habitat for specialist river bird and invertebrate species.

MARINE BIOSECURITY AND OVER-FISHING

3.18 Invasion of marine pest species is single biggest threat to the marine conservation values of Milford Sound Piopiotahi. There is the potential for species to be introduced through large commercial vessels to small private craft that may introduce marine pests through biofouling of pest species already present within other areas of the country, or ballast water. Once a pest species establishes it can quickly spread, having detrimental effects on the marine habitat, food chains, fish stocks and recreational activities. To the best of our knowledge there are currently no known marine pest species within Milford Sound Piopiotahi. However, the Asian kelp *Undaria pinnatifida* is present elsewhere in Fiordland and would likely cause significant habitat modification in parts of Milford Sound Piopiotahi if were to be accidentally introduced via boat movements. In addition to biosecurity risks overfishing is of concern, especially for recreationally and commercially targeted species such as blue cod, rock lobster, and paua. To maintain populations of these species, including opportunities for mahika kai, it will remain necessary to carefully monitor populations and alter fishing quota in the area in response to change. Protection of further areas via marine reserves and taiāpure (or other appropriate customary protection methods, as desired by mana whenua) may be required in future, especially if anecdotal increases in private fishing efforts (mentioned by DOC during consultation meetings) continue.

CLIMATE CHANGE

3.19 Ongoing climate change is likely to modify habitats by increasing the severity of storms that cause forest destruction, landslides and flooding. Glacial retreat, especially in the Darrans Mountains, is likely to alter seasonal stream / river base flows and is creating new opportunities for exotic and indigenous species to travel and establish throughout previously snow-covered alpine areas. In particular, increased winter temperatures are likely to facilitate greater persistence and population

sizes of mammalian pests in alpine areas, likely affecting southern rock wren, kea, and alpine lizard species.

VISITOR IMPACTS, DISTURBANCE, AND INTERACTIONS WITH WILDLIFE

3.20 Key visitor impacts at present include littering, creation of informal trails and campsites, and disturbance of wildlife and interactions that are directly harmful. Road-kill and feeding is a serious threat to kea and weka in the area, which are both gregarious and will seek out humans to their own detriment. Disturbance of sensitive marine mammals via noise, boat movements and boat-strike is of concern in the marine environment at Milford Sound Piopiotahi and elsewhere in Fiordland. Recreational activities (tramping, climbing etc.) may cause localised disturbance to fauna and trampling damage to vegetation, but recreational users are also a source of knowledge and occasional species discoveries (e.g. lizards in Sinbad Gully and the Gertrude Saddle area).

ROAD MAINTENANCE / IMPROVEMENT ACTIVITIES

3.21 Maintenance of SH94 requires ongoing road surface repair, bridge maintenance, landslip and vegetation clearance, flood protection, and rockfall and avalanche mitigation. Essentially all these activities have adverse effects on the ecological values of the area including vegetation clearance, edge effects, habitat loss and disturbance to fauna. Road maintenance is also a key source of weed introduction into FNP. Therefore, mitigation of visitor risk or improvements to travel comfort / speed must be carefully balanced against the potential harm that may be caused by road maintenance / enhancement works. Pre-emptive blasting of potential rock-fall sources in alpine areas and pre-emptive clearance of large trees that might threaten the road are relatively new measures in terms of management of the SH94 corridor; both may cause mortality or loss of habitat for Threatened and At-Risk species.

ENSURING SUFFICIENT AND SUSTAINED FUNDING FOR CONSERVATION ACTIONS

3.22 As described above, and throughout this report, landscape-scale aerial pest control, trapping and other conservation actions (e.g., research and species translocations) are critical for the ongoing persistence of a number of Threatened and At-Risk species (including taonga species) in the area. We recognise the extraordinary efforts of DOC staff and others over many decades, and they can be credited with having saved many species in the area from local or total extinction. But, because funding for DOC is extremely limited, aerial poison operations are sporadic and generally undertaken only when additional government funds are made available in response to existential risks to species' population viability (e.g., Battle for our Birds – a response to mast seeding events that boost predator numbers 10s or 100s-fold), rather than to maintain a pest-free landscape or to promote healthy growth of indigenous fauna populations. Ongoing trapping programmes in the area supported by core DOC funding are largely focused on accessible and / or visitor-facing areas (Eglinton Valley, Milford Track area). Additional trapping efforts (e.g. in Sinbad Gully, Milford Village area, Bowen Valley, and Homer Saddle area) are only undertaken if additional government funding or private sponsorship becomes available, or if volunteer groups offer to undertake the work. Loss of core private sponsors or volunteers means that pest control activities in some areas may simply cease permanently of for several years, with the subsequent loss of vulnerable species or the erosion of any gains that pest control may have achieved. Only substantive ongoing funding for landscape pest control across the landscape will allow populations to meaningfully grow and spread – DOC's current funding allocation from central government means that in many areas of Fiordland pest control is absent, or if present is little more than an ambulance at the bottom of a cliff.

THE ASPIRATIONS OF MANA WHENUA

3.23 Ngāi Tahu are tangata whenua and eight Papatipu Rūnanga exercise mana whenua over Piopiotahi. It is their expectation that the cultural narrative, recognising Tū te Rakiwhanoa and Hine Tītama, is the context in which to consider appropriate and inappropriate development and management.

3.24 Manawhenua is defined in Te Tangi a Tauira and its predecessor, Te Whakatau Kaupapa o Murihiku, as meaning:

"traditional/customary authority or title over land, and the rights of ownership and control of usage on the land, forests, rivers etc. Manawhenua is held by an iwi or hapū rather than individuals. Also, the land area (and boundaries, rohē) within which such authority is held".[8]

3.25 Ngāi Tahu has always maintained that Fiordland was not to be included in the Murihiku Purchase and the purchase became one of the 'Nine Tall Trees' in the historical Ngāi Tahu Treaty Claim alongside mahinga kai. There are many provisions from the Treaty Settlement that refer directly to Fiordland, including the Right of First Refusal for Milford Airport and a statutory acknowledgement over the coastal area.

3.26 The 'Mana Whenua Aspirations and Values report' has compiled the aspirations and values of mana whenua for Piopiotahi and provides a cultural context and criteria in which to evaluate options for the Master plan. This direction informs the consultant team in the selection and development of options and governors in their decision making.

3.27 The report collates values alongside the statement of manawhenua and aspirations form the basis of the Ngāi Tahu specific evaluation criteria. Mana whenua are supportive of considered, sustainable development in Piopiotahi and the Milford Corridor to recognise the mana of the place and to enable everyone to experience its wairua.

3.28 Many of the options and aspirations sought by Mana whenua in the Master plan are already provided for in existing regulatory documents but for reasons not considered in this report, they have not been realised to date. Therefore, the Master plan provides an opportunity to fill this gap as well as historical misalignments with management plans and Ngāi Tahu 2025.

3.29 Refer to the Mana Whenua Aspirations and Values report (Kauati 2020) for an over-arching directive from the Treaty Partner.

3.30 Key mana whenua aspirations identified by Kauati (2020) that relate closely to conservation and the environment are that:

- The visitor should be enabled to view the landscape through a Ngāi Tahu cultural lens and understand its broader connections across the whenua and moana to Aoraki and the Pacific.
- Ngāi Tahu Whānui and manuhiri should feel the wairua of the place and be energised by the experience of visiting Piopiotahi and Te Rua o te Moko / Fiordland.
- Ngāi Tahu Whānui and manuhiri are to be immersed in te taiao, the environment.

These aspirations align closely well with the conservation and environmental vision for Te Rua o te Moko / Fiordland and the Project Area.

[8] Ngai Tahu ki Murihiku (2008), p. 312

4 CONSERVATION INPUT INTO THE LONG-LISTING PROCESS

4.1 The Conservation Analysis workstream provided input into the creation of long-list ideas and evaluated and provided commentary on all of the (approximately 200) long-list ideas that were relevant to conservation, biodiversity and the natural environment. The initial long-list refinement process involved:

- Providing an overarching rationale for, and commentary on, the "main idea" in the long listing spreadsheet that relates to the conservation workstream.
- Grouping the ideas that sit under each main idea in the spreadsheet into consolidated "sub-ideas" where they are similar.
- Providing a consolidated rationale for each sub-idea.
- Consolidating the comments from other workstreams and linking these to each sub-idea.

4.2 The long-list "main ideas" that were evaluated were as follows:

1. Develop new transport models to manage visitor flows.
2. Develop a compelling suite of experiences in Piopiotahi to encourage visitors to stay longer and contribute to the local economy.
3. Redesign Milford Village to lift the quality of the built environment and reflect its world-class status.
4. Enhance the Milford corridor experience to expand the options available to visitors.
5. Develop Te Anau as a sub-regional visitor hub to encourage more visitors to stay overnight.
6. Strengthen the visitor offering around Te Anau to extend the visitor network.
7. Use tourism to improve conservation and environmental outcomes.
8. Establish new governance and management structures to support implementation of the master plan.

In response to the part of the scope in the RFP "*An understanding of the benefits to conservation outcomes that additional funding investment could provide is also important." The* Conservation Analysis Team developed several long-list ideas under Main Idea 7; "Using tourism to improve conservation and environmental outcomes". This involved consideration of the following:

- Inputs / ideas developed during Stage One of the project.
- Information and ideas obtained during the desktop assessment.
- Feedback from the Project Team.
- The views and ideas expressed during consultation / engagement with DOC staff, the Environment Reference Group and other stakeholders.

4.3 The 'sub-ideas' ideas proposed under Main Idea 7 were:

1. Visitor revenue is used for landscape-scale control of introduced mammalian predators.
2. Reintroduction of native fauna (following the elimination of introduced mammalian predators from areas).

3. Funding weed management.

4. Funding conservation research into key ecosystems and species.

5. Eglinton Valley catchment-wide conservation restoration.

6. Creating (or enhance existing) outdoor education centre(s) for schools in Fiordland National Park.

The description and rationale for each of each of the ‘sub-ideas’ ideas proposed under Main Idea 7, along with the comments from the Project Team and stakeholder feedback are provided in Table 2.

While Table 2provides recommendations for how tourism revenue could be used to improve conservation and environmental outcomes, how this revenue is proposed be generated, managed and allocated is outlined in the Governance, Management and Legislation and Tourism reports. When available, the draft Cost Benefit Analysis will provide guidance into the likely revenue pools available for funding conservation management and growth.

Table 2: Long-list items for Main Idea 7; using tourism to improve conservation and environmental outcomes.

Item	Description	Rationale	Project Team and Stakeholder Feedback
Main Idea 7: **Use tourism to improve conservation and environmental outcomes**	Use tourism revenue to fund conservation management and improve environmental outcomes in the project area. This will in turn, also improve the experience for visitors.	The rationale for Main Idea 7 is that it directly aligns with one of the seven pillars that are the fundamental basis for the project: "Tourism funds conservation and community" – "The visitor experience will become an engine for funding conservation growth and community prosperity". Funding for conservation management in the area is currently primarily from DOC baseline funding as well as sporadic initiatives (Tia Kina Nga Manu), and short-lived local sponsorship arrangements. Using tourism revenue to fund conservation could provide a solution to the long term funding shortage for effective conservation management in the area. Improving conservation and environmental outcomes then in turn improves the experience for visitors.	N/A
Sub-idea 7.1: Visitor revenue is used for landscape-scale control of introduced mammalian predators (Ref IDs 168, 169, 170, 171)	Use visitor revenue to provide funding for landscape-scale predator control. Landscape-scale predator control could be achieved at a number of scales, including for example, Sinbad Gully, the Piopiotahi / Milford catchment or northern Fiordland. Initially the scale of this control may be dependent on a number of factors, including the level of funding available, but could then increase in scale following the successful elimination of predators from 'core areas'.	The control of introduced mammalian predators (predators) is the highest priority conservation management tool for northern Fiordland. Sinbad Gully is well-known as an extremely intact habitat and 'natural sanctuary' that has very high conservation values (Nicol 2001, Loe 2016) that would benefit from the removal of predators. An existing predator control programme is already in place (DOC 2019). Elimination of predators at this scale is a more realistic short term outcome, and there are natural barriers to reinvasion. However, reinvasion by predators would continue to be an ongoing issue without wider scale predator management. Removing predators from the Piopiotahi / Milford catchment is an achievable short-medium term goal as natural barriers to reinvasion exist and the area is already largely free from some predators (cats, deer). The removal of predators from northern Fiordland should be the long-term goal beyond Predator-free Piopiotahi / Milford catchment. The technology to control most predators at a landscape-scale is already available and limited only by funding. This idea aligns with Predator Free 2050 as well as other initiatives being considered in this area and would replace the need for numerous, small scale, less effective, ongoing predator control programmes currently being undertaken. Removal of predators would have major benefits for the environment and provide an example of what New Zealand would have been before humans – a compelling 'Jurassic Park' - like visitor experience.	**Comments from Project Team:** Cultural values and aspirations: • In keeping with manawhenua aspirations for whanau and manuhiri in Piopiotahi. • Different interpretation of conservation by manawhenua. Tourism Development: • Provides for branding, advocacy and active conservation opportunities. • Provides visitor experience opportunities. • Would require investments, partnerships etc. **Feedback from Environment Reference Group:** • Supported by the members of the Environment Reference Group
Sub-idea 7.2: **Reintroduction of native fauna** **(Ref ID 172)**	Following the elimination of introduced mammalian predators, re-introduce fauna that previously occurred in the area (i.e. kakapo, tieke).	Re-introduction of fauna that previously occurred in the area would increase the natural range and populations sizes of the re-introduced species, support conservation objectives and return the ecological functions these species once played (e.g. seed dispersal / pollination etc). Would provide an exciting opportunity to make these species visible to visitors in their natural (historical) habitat (i.e. provide an example of what New Zealand would have been before humans) and be used to showcase conservation success in New Zealand. Re-introduction of fauna that are vulnerable to introduced predators is risky until it can be guaranteed that predators have been eliminated from an area long-term (and preferably in perpetuity).	**Comments from Project Team:** Cultural values & aspirations: • In keeping with manawhenua aspirations for whanau and manuhiri in Piopiotahi. • Different interpretation of conservation by manawhenua. Tourism Development: • Provides for branding, advocacy and active conservation opportunities. • Provides visitor experience opportunities. • Would require investments, partnerships etc. **Feedback from Environment Reference Group:** • Supported by the members of the Environment Reference Group
Sub-idea 7.3: **Funding weed management** **(Ref ID 173)**	Use visitor revenue to fund the control of pest plant species (weeds).	This idea is generally of a lower priority than predator control, but is of merit, particularly if undertaken in conjunction with other conservation management activities. Funding pest plant control would take advantage of existing low-level / manageable problems within Fiordland National Park, would reduce the potential for future pest plant issues and assist the broader goal of restoring and enhancing restoring natural ecological values over a large area. A long-term control strategy would be required for some species (e.g. Russell lupin in Eglinton River).	**Comments from Project Team:** Cultural values and aspirations: • In keeping with manawhenua aspirations for whanau and manuhiri in Piopiotahi. • Different interpretation of conservation by manawhenua. Tourism Development: • Provides for branding, advocacy and active conservation opportunities. • Provides visitor experience opportunities. • Would require investments, partnerships etc.

Item	Description	Rationale	Project Team and Stakeholder Feedback
			Feedback from Environment Reference Group: • Supported by the members of the Environment Reference Group
Sub-idea 7.4: **Funding conservation research into key ecosystems and species** **(Ref ID 174)**	Use visitor revenue to fund conservation research into key ecosystems such as lowland mixed southern beech forest and alpine ecosystems and indigenous species such as long-tailed bat and the data deficient Awakopaka skink.	The area is already a focal point for conservation research (e.g. the Eglington Valley is a long-term study site and research is being carried out there to conceptualise this lowland beech forest ecosystem type and DOC is undertaking research on alpine ecosystems in the Gertrude Valley) (DOC project team *pers. comm.* 2020). Funding conservation research would improve scientific knowledge of ecosystems and species in the area. Improved knowledge and understanding would lead to improved conservation outcomes for these ecosystems and species. Findings could also be applied to other areas / species. Conservation research in the area has been, and is, generally piecemeal and underfunded. There is an opportunity to establish, or support existing long-term, well-funded research. This could be undertaken by DOC, Crown Research Institutes and universities. Conservation research could be linked with the visitor experience, for example at Knobs Flat in the Eglington Valley.	**Comments from Project Team:** Cultural values and aspirations: • In keeping with manawhenua aspirations for whanau and manuhiri in Piopiotahi. • Different interpretation of conservation by manawhenua. Tourism Development: • Provides for branding, advocacy and active conservation opportunities. • Provides visitor experience opportunities. • Would require investments, partnerships etc. **Feedback from Environment Reference Group:** • Supported by the members of the Environment Reference Group
Sub-idea 7.5: **Eglinton Valley catchment-wide conservation restoration** **(Ref ID 176)**	Use visitor revenue to undertake catchment-wide conservation restoration in the Eglinton Valley.	This idea aligns with one of DOC's stretch goals: "50 freshwater ecosystems are restored from 'mountains to the sea" (DOC 2015b). The Eglington Catchment has been identified by DOC as one of the 50 sites for restoring freshwater ecosystems. The Eglington Valley is one of the only road-accessible valleys in Fiordland National Park. This means it is accessible for conservation management purposes (there are already a number of conservation management and research programmes being undertaken in the valley. This accessibility also means that visitors can experience the benefits of conservation management. Although the valley is already a focal point for visitors, conservation management is limited by funding and currently piecemeal and not well co-ordinated and there is currently limited visitor engagement with conservation / natural environment despite the areas very high conservation values.	**Comments from Project Team:** Cultural values and aspirations: • In keeping with manawhenua aspirations for whanau and manuhiri in Piopiotahi. • Different interpretation of conservation by manawhenua. Tourism Development: • Branding, advocacy and active conservation opportunities. • Visitor experience opportunities. • Could be linked to hub at Knobs Flat. • Would require investments, partnerships etc. **Feedback from Environment Reference Group:** • Supported by the members of the Environment Reference Group
Sub-idea 7.6: **Creating (or enhance existing) outdoor education centre(s) for schools in Fiordland National Park** **(Ref ID 175)**	Upgrade / enhance existing outdoor education centres or create a new outdoor education centre in Fiordland National Park (i.e. in the Eglington Valley or at Milford Sound Piopiotahi) for schools to use.	Would provide quality outdoor education for local school children and New Zealanders, separate from the tourism context. There are existing outdoor education centres and programmes at Patea / Doubtful Sound and Borland Lodge that are underutilised. Upgrading / enhancing these facilities and experiences would link well with Main Idea 4: Develop Te Anau as a sub-regional visitor hub and Main Idea 5: Expand the visitor offering around Te Anau to extend the visitor network.	**Comments from Project Team:** Cultural values and aspirations: • In keeping with manawhenua aspirations for whanau and manuhiri in Piopiotahi. Hazards and visitor risk: • Can be also be used in conjunction with websites and visitor info centres around the area to provide / interpret information on hazards. Tourism Development: • Links to the Te Anau / Manapōuri hub idea. Potential for enhancements to the Borland Valley area (e.g. utilisation of Borland Lodge, Borland Road and neighbouring areas / connections). • Would require investments, partnerships etc. **Feedback from Environment Reference Group:** Supported by the members of the Environment Reference Group, , particularly if local schools are involved in the process / consulted.

5 CONSERVATION ANALYSIS EVALUATION CRITERIA AND GUIDING PRINCIPLES

ECOLOGICAL PRINCIPLES

5.1 The following guiding ecological principles were developed by the Conservation Analysis Team to inform the development of the Master Plan in order to ensure that Master Plan options were appropriate from a conservation perspective:

1. Prioritise Master Plan options that protect and enhance the natural environment and conservation values of Milford Sound Piopiotahi and Fiordland.

2. Prioritise Master Plan options that enable ecological enhancement or restoration.

3. Recognise that visitor revenue must be re-invested into conservation management in order to maintain and enhance the natural environment.

4. Prioritise Master Plan options that place appreciation and understanding of the natural environment and indigenous species at the forefront of the visitor experience.

5. Consolidate visitor activities at a small number of locations rather than dispersing visitor impacts.

6. Prioritise Master Plan options that consolidate infrastructure within existing modified / built areas[9].

7. Ensure any visitor facilities, including infrastructure, are sensitively located and designed, constructed and / or operated in a way that is sympathetic to the natural environment.

8. Prioritise Master Plan options that reduce carbon emissions and promote the sustainable use of resources.

9. Ensure activities that diminish natural quiet and / or increase disturbance to fauna are confined to existing areas and are preferably minimised.

10. Prioritise Master Plan options that avoid:

    a. Permanent loss of indigenous vegetation and habitats of indigenous fauna (including terrestrial, freshwater and coastal / marine habitats) especially rare ecosystem types and habitats for Threatened, At Risk and taonga species.

    b. Habitat fragmentation, including edge effects, and impacts on habitat connectivity.

    c. Impacts on nationally Threatened, At Risk, locally uncommon, locally endemic, taonga and marine mammal species.

    d. Adverse effects to water quality, including those that adversely affect mahinga kai, kai moana and mauri.

    e. Alteration of natural hydrology patterns.

    f. The potential for the spread and / or establishment of pest plants or animals.

    g. Impacts on habitats that play an important role in the life cycle and ecology of indigenous species.

[9] Refer to Appendix 1: Figures 1 - 16.

EVALUATION CRITERIA (LONG-LIST TO SHORT-LIST)

5.2 The evaluation process involved refining the long-list ideas to develop the short-list. As part of this process the Conservation Analysis workstream evaluated each of the longlist ideas using a simplified set of criteria as an evaluation framework.

1. Idea will result in extensive or unacceptable adverse effects on conservation / biodiversity values that cannot be avoided or minimised (red).

2. Idea acceptable, but careful design and / or management required to avoid or minimise adverse effects on conservation / biodiversity values (amber).

3. Idea upholds the World Heritage status, national park and conservation values of the area and will result in overall benefits for conservation / biodiversity values (green).

5.3 Each long-list idea was assigned a colour code using these criteria along with commentary provided by the Conservation Analysis Team. This information was then considered in conjunction with the evaluations undertaken by other workstreams and used to create a proposed shortlist for Governance Group review and confirmation. This process also took into consideration the seven pillars, the objectives agreed with the Governance Group and the Project Purpose Statement.

6 RECOMMENDATIONS AND SUMMARY OF ASSESSMENT OF SHORT-LIST OPTIONS

6.1 Throughout the short-listing process the Conservation Analysis workstream provided comprehensive advice and recommendations to the project team (including the Master Planning Team) to refine the short-list.

6.2 As part of the option refinement process, input from the Conservation Analysis team involved assessing the potential effects of proposed ideas on the respective ecological values in various locations. For some locations and / or proposed ideas the potential effects were considered too high to be pursued further, while some of the proposals received full support. This applied in particular to ideas that either had a beneficial outcome for conservation and landscape values (e.g., predator control) or were within existing modified / resilient locations (e.g., within Te Anau's urban environment).

6.3 The proposed ideas that received most detailed scrutiny in the shortlisting process were those that were potentially supportable from a conservation perspective if they were designed and implemented in a way that avoided substantial adverse effects. For some of these visitor destination options, the detailed design and micro-siting of buildings, structures and other modifications will be crucial to determine whether effects are acceptable with regard to ecological and landscape values. In particular, this applies to proposed initiatives in locations (e.g., Knobs Flat) that are within an existing modified footprint, but are in close proximity to, or surrounded by, rare or sensitive ecosystem types and / or indigenous fauna. For this project, conservation values were documented during the baseline reporting process. Subsequently, the long- and short-list ideas were cross-checked against the values that are known to occur in the proposed areas. This led to amendments to the location or design of proposed site-specific ideas, and in some instances removal of options through the short-listing process.

6.4 A summary of the short-list ideas that were evaluated by the Conservation Analysis team is listed in Table 3. A general discussion of these ideas is provided below, and Table 4 provides a high level summary of the evaluation outcome. Those short-list ideas that are not relevant to Conservation are not discussed below.

Table 3: Short-list options.

Main Short-List Idea	Sub-ideas
1. Develop new transport models to manage visitor flows	a) Mixed access model
2. Develop a compelling suite of experiences in Milford Sound Piopiotahi to encourage visitors to stay longer and contribute to the local economy	a) Develop new walking tracks and observation points in Milford Sound Piopiotahi b) Establish an interpretive Marine Centre in Milford Sound Piopiotahi c) Incorporate the commercial port (Deep Water Basin) into the visitor experience* d) Develop multi-media experience before and/or during exploration (augmented with supporting hands-on experiences)*
3. Re-design Milford Village to lift the quality of the built environment and reflect its world-class status	a) Create a compelling sense of arrival into Milford Sound Piopiotahi* b) Establish a new Milford Sound Piopiotahi visitor hub (including visitor safety features and new residential and visitor accommodation) c) Redevelop Freshwater Basin tourist boat terminal and enhance Deepwater Basin commercial / recreational wharf, including optimising boat ramp management* d) Review policy regarding cruise liners in Milford Sound Piopiotahi

Main Short-List Idea	Sub-ideas
	e) Remove fixed wing runway from Milford Sound Piopiotahi
4. Enhance the Milford corridor experience to expand the options available to visitors	a) Create a strong National Park entry threshold b) Develop Knobs Flat Hub c) Upgrade short stop options along corridor d) Enhance Cascade Creek campsite e) Develop Mistake Creek track and install large new hut f) Create 'Whakatipu Super Track Head' in the Hinepipiwai Lake Marian track carpark area[10]
5. Develop Te Anau as a sub-regional visitor hub to encourage more visitors to stay overnight	a) Develop a Milford corridor and Milford Sound Piopiotahi experience visitor hub/conservation HQ in Te Anau* b) Develop a transport interchange / terminal in Te Anau* c) Development of new family friendly experiences close to Te Anau in areas such as Brod Bay and the Hidden Lakes

* Idea not specifically discussed below, either because proposal is unlikely to have direct beneficial or adverse ecological effects, and / or because the proposal requires further refinement to enable evaluation from a conservation perspective.

6.5 The following sub-sections provide a high level assessment and recommendations on the short list ideas. However, if the Master Plan recommendations are adopted, the ideas are expected to be further refined and developed through more detailed studies (which may influence the shape or scale of some Master plan recommendations), detailed site investigations and detailed design.

DEVELOP NEW TRANSPORT MODELS TO MANAGE VISITOR FLOWS

6.6 Of the transport models considered, a 'mixed access model' has been recommended. This transport model is focused on a mix of tour bus, hop-on-hop-off and non-stop buses designed to support a more immersive experience on the Milford Road and in Milford Sound Piopiotahi. It is envisaged that low or zero carbon buses would be phased in. Some limited, priced and rationed visitor parking is likely to be retained in Milford Sound Piopiotahi. A transport interchange / terminal will be located in Te Anau.

6.7 This transport model would involve a large decrease in overall vehicle numbers, and a substantial reduction in self-driven visitors using the Milford Corridor.

The key benefits of this proposal from a conservation perspective are:

- Consolidation of visitor impacts at a small number of 'nodes' which provides an improved ability to better manage issues such as litter and the creation of informal trails, campsites, or carparks by self-driven visitors.
- The ability to more easily manage harmful interactions with fauna (e.g., feeding of kea at Monkey Creek), and a potential reduction in road-kill of fauna (especially at night, when bus trips would be less likely compared to current private car use).
- A reduction in the area required at each stopping point due to the proposed hop-on hop-off approach that does not require large numbers of buses and private vehicles to park at points of interest.
- Allows for the reduction in the area of car-parking at Milford Sound Piopiotahi.

[10] Note: this shortlist item requires additional viability testing. If it is not viable a multi-track head approach is possible as a fallback position if required.

- A likely reduction in net carbon emissions per visitor, by reducing the number of vehicles, and by phasing-in low or zero-carbon buses.

A key recommendation from the Conservation Analysis Team in relation to this sort-list option was that:

- Nodes / stopping points (stopping points) along the route should utilise existing modified areas rather than developing new stopping / parking areas. Creation of new visitor facilities would likely have ecological impacts in terms of vegetation clearance, loss of habitat, and disturbance or mortality of fauna.

DEVELOP A COMPELLING SUITE OF EXPERIENCES IN MILFORD SOUND PIOPIOTAHI TO ENCOURAGE VISITORS TO STAY LONGER AND CONTRIBUTE TO THE LOCAL ECONOMY

6.8 The goal for the redesign of Milford Village is to lift the quality of the built environment and reflect its world-class status. By developing a compelling suite of experiences in Milford Sound Piopiotahi the goal is to encourage visitors to stay longer and contribute to conservation and the local and regional economy. The preferred concept for Milford Village is shown in Figure 16. Sub-ideas relating to this main idea include the following suite of initiatives:

- Develop several new walking tracks and observation points in Milford Sound Piopiotahi in with observation points for 20-40 people (with formal viewing area and shelter). These would be potentially located:
    - At the rear of the proposed visitor hub behind the existing hotel site up onto the spur lookout track, with two elevated viewing platforms at different elevations (at around 25 metres above sea level (masl), and 100 masl).
    - Within the Cleddau Delta forest.
    - Towards Bowen Falls via a pontoon walkway, linking-up with an existing walkway at Bowen Falls Delta.
    - Within the Cleddau Delta forest.
    - At the top of Bowen Falls (referred to as a ‘Top Falls Link’) with access via by elevator, gondola, or similar means from the Village following the penstock of the existing hydro scheme.
- Establish an interpretive Marine Centre in Milford Sound Piopiotahi as part of the visitor hub.

Figure 16: Milford Sound Piopiotahi 50 year plan

6.9 Key recommendations in relation to this short-list option that relate to conservation are:

- Construction of new walking tracks would require vegetation clearance, the extent of which is dependent directly on the track grade and standard. Track creation can create edge effects (particularly if canopy trees are cleared – see Section 4.11), increase the likelihood of weed establishment and spread and can cause loss / fragmentation of habitats. Some plant and bird species inhabiting the estuarine area are sensitive to disturbance and are of high conservation value (Threatened and At-Risk species). Recommendations in relation to walking tracks are:
    - Fewer walking tracks means less vegetation clearance, less fragmentation and less disturbance to indigenous fauna.
    - Wherever possible, reinstate or utilise existing tracks (e.g., using the existing lower Bowen Falls Walkway[11], predator trapping tracks in Cleddau Delta forest, an existing lookout track behind the existing hotel site) rather than creating new tracks (see above).
    - Tracks must avoid estuarine and wetland ecosystems because they are of high conservation value, and because new rules under NES Freshwater 2020 means works in wetlands are a prohibited activity.
    - Walking tracks should be designed and constructed sensitively to minimise effects on conservation values, e.g., avoiding canopy trees and minimising the width of the construction footprint.
    - Walking tracks should be designed to discourage straying from the track e.g., further into forests, or onto sensitive estuarine habitats at low tide.

[11] To avoid hazards / safety issues a pontoon walkway connecting the Ferry Terminal to the lower Bowens Falls Walkway is proposed. Provision of a pontoon walkway from the northern most jetty will provide a separation distance from the existing rock face.

- Specifically, with regard to the 'Top Falls Link':

    - This proposal would likely involve significant vegetation clearance to construct new infrastructure with resulting major adverse impacts to fauna and habitats that cannot be avoided, including habitat fragmentation and edge effects.

    - Inclusion of this idea in the Master Plan is not supported by the Conservation Analysis team as it is not appropriate from a conservation perspective.

- Specifically, with regard to the proposed walking track network throughout Cleddau Delta:

    - The Cleddau Delta forest is an area of very high ecological value. While some walking tracks through this area may be acceptable in the context of this project, the number / extent of tracks needs to be limited.

    - Walking tracks in this area should, wherever possible, utilise tracks used for existing predator trapping.

6.10 The key benefits of these initiatives (from a conservation perspective) are:

- The opportunity to shift focus from high impact activities e.g., cruise ships, adventure tourism, and use of powered craft / aircraft in favour of higher quality more environmentally sensitive attractions.

- Establishment of an interpretive Marine Centre in Milford Sound Piopiotahi would increase the level of public understanding of marine environments and conservation values, which is considered a high-priority by DOC for engagement / education / research, and provides an opportunity to utilise the existing marine reserve at Milford Sound Piopiotahi as a natural focal point for research / education.

- In general, development of high quality and compelling attractions linked to the landscape and natural environment (such as walking tracks to outstanding viewpoints) are more likely to provide opportunities for re-investment back into conservation.

RE-DESIGN MILFORD VILLAGE TO LIFT THE QUALITY OF THE BUILT ENVIRONMENT AND REFLECT ITS WORLD-CLASS STATUS

6.11 Sub-ideas relating to this main idea include the following suite of initiatives:

- To create a compelling sense of arrival into Milford Sound Piopiotahi better landscaping will be implemented, framing the key viewshafts. In addition, the existing visual clutter will be removed and sculptural elements potentially introduced in appropriate locations.

- A new Milford Sound Piopiotahi visitor hub will be developed, including visitor safety features. This will centralise visitors in the safest location and direct them from here. The hub will serve as the main transport, education and orientation hub, as well as a place where people can relax and shop. New visitor accommodation will be developed in combination with the visitor hub (established above the visitor hub). Resident accommodation will be moved adjacent to the west of the new visitor hub as one consolidated three-storey building. The existing resident village is to be redeveloped for carparking. Tsunami shelters / refuges will be built within the proposed hub facility with two smaller shelters adjacent to the airport runway and at Deepwater Basin.

  Re-develop the Freshwater Basin tourist boat terminal (within the existing structure) and enhance Deepwater Basin commercial / recreational wharf, including optimising boat ramp management.

- Remove fixed wing runway from Milford Sound Piopiotahi (phased withdrawal).

- Review the policy regarding cruise liners in Milford Sound Piopiotahi.

6.12 Because advice from the Conservation Analysis Team to locate infrastructure in existing modified areas was followed[12] (refer to the Ecological Principles in Section 6), many of the sub-ideas relevant to this short-list idea are of less concern to conservation.

6.13 Key recommendations in relation to this short-list option that are relevant to conservation are:

- Built infrastructure (visitor hub, resident accommodation, marine centre) should be co-located / consolidated to confine the extent of infrastructure related and human impacts.
- New infrastructure should be located in already modified areas to avoid vegetation and habitat clearance and fragmentation.
- Mature indigenous vegetation between the airport / foreshore and road provides important connecting habitat for forest birds and should be retained.
- One of the long-list project ideas suggested in conjunction with the recommendation to remove the fixed-wing runway was to relocate rotary services to Little Tahiti, located up-valley from Milford Lodge. Rotary services should not be relocated to Little Tahiti for the following reasons:
    - Forest edges at Little Tahiti are one of only two known locations globally that support the Milford boulder butterfly (*Lycaena ianthina*, Threatened – Nationally Critical). This species is only otherwise found on roadside and open areas at Deepwater Basin Road (Patrick 2017). This species is entirely dependent on open areas that support its host plant creeping pohuehue.
    - Due to the available size of existing cleared vegetation at Little Tahiti relocation of rotary services to this location would require clearance of surrounding existing mature silver beech forest that has high ecological values for fauna.
    - The northern part of the site supports wetland vegetation. Under the NES for Freshwater 2020, the loss of extent of natural inland wetlands must be avoided.
    - Re-locating rotary services to Little Tahiti spreads the ecological effects of human infrastructure (notably rotary aircraft noise, but also human activity, lighting etc.) to a new area, rather than consolidating it as recommended.
- If cruise ship visits to Fiordland are to continue, Milford Sound Piopiotahi is the most appropriate location, because of existing impacts. Other fiords are less modified and there are increasing concerns about visitor interactions with wildlife elsewhere including on some predator-free islands.

6.14 The key benefits of these initiatives (from a conservation perspective) are:

- Removal of the runway will potentially have several benefits for the environment / conservation including:
- Enabling greater flexibility in the way Milford Village is configured and optimised.
- Significantly reducing the total area of impervious surfaces (the current total area of impervious surfaces associated with the runway is 33,911 m2). Impervious surfaces do not support vegetation or provide habitat for fauna and increase stormwater runoff.
- Providing opportunities to revegetate the runway with potential opportunities to expand areas of open habitat that are of importance for species such as the Threatened - Nationally Critical

[12] We note that a primary recommendation from the DOC Conservation Team was that development be located outside Fiordland National Park. However, not developing new infrastructure within the National Park, and particularly at Milford Sound Piopiotahi, would not provide the infrastructure required for visitors and would not meet the objectives of the MOP.

Milford boulder butterfly (Patrick 2017) or revegetate with the aim of restoring indigenous shrubland, scrub or forest whilst being mindful of retaining view shafts towards Mitre Peak.

- The extent to which cessation of fixed wing aircraft services is likely to result in a change in carbon emissions is dependent on the extent of the corresponding increase in helicopter flights.

- A new consolidated Milford Sound Piopiotahi visitor hub will reduce existing human impacts (e.g., by consolidating building footprints, upgrading the sewerage system, reducing impervious surfaces, and limiting light pollution and noise disturbance etc.).

- Providing opportunities to enhance ecological values by allowing for regeneration of indigenous vegetation and habitats within what are currently built areas.

- Reviewing the current policy regarding cruise liners in Milford Sound Piopiotahi has the potential to:

    - Improve current environmental issues including concerns including discharges to air and water, marine biosecurity, noise, and the potential for oil spills or a maritime disaster in, or immediately outside, Milford Sound Piopiotahi.

    - Provide a good opportunity to reclaim regulation / control over industry and to increase the quality of other visitors' experience.

ENHANCE THE MILFORD CORRIDOR EXPERIENCE TO EXPAND THE OPTIONS AVAILABLE TO VISITORS

6.15 The wider Project Team identified that the Milford Corridor has the potential to play a more significant role in the visitor experience. Currently most visitors undertake a “race to the boat” in their coaches, campervans, and rental cars. For many, the corridor is not an immersive experience and represents nothing more than a short series of photo opportunities at a handful of roadside stops. To slow visitors down and create a more immersive experience the Project Team identified that visitor experiences needed to be provided at a number of key locations to lift the standing of the corridor as a destination in its own right. Fundamental to this idea is the provision of a wider spectrum of walking opportunities (and biking opportunities where appropriate). It is proposed that visitors will be able to undertake these experiences by staying overnight within the National Park (at the improved accommodation nodes such as Cascade Creek or Knobs Flat) or by making day trips from external accommodation locations such as Te Anau Downs or Te Anau itself.

6.16 During the decision-making process for proposed visitor experiences / destination enhancements advice from the Conservation Analysis, Land Analysis and Natural Hazards work streams was to consolidate or cluster development in areas that have already been modified to avoid further modification[13]. In response, the Project Team developed a conceptual approach that focuses visitor activity and the development of new destinations at ‘Key Nodes’ located at existing modified areas where conservation, landscape and recreation effects can be managed more effectively.

6.17 In addition to developing visitor experiences at the Key Nodes, short-stop bus stops are currently proposed at some locations along the route. It is proposed that these sites that offer key visitor experiences and interpretation opportunities. The locations of the short stop bus stops is proposed to largely include existing formal or informal stopping areas at the ‘Eglinton Reveal’ (grass flats north of Mackay Creek), Mirror Lakes, Cascade Creek, Monkey Creek, Gertrude Valley, ‘Loop 2’ (the western Homer Tunnel Portal), and the Chasm. Some existing stopping points on the route may no longer be as accessible or signposted, to consolidate visitor impacts.

[13] We note that a primary recommendation from the DOC Conservation Team was that development be located outside Fiordland National Park. However, not developing new infrastructure within the National Park would not provide the infrastructure required for visitors and would not meet the objectives of the MOP.

Figure 17: Hubs, Nodes & Short Stop Experiences along the Milford Corridor

6.18 The initiatives currently proposed at, or in the vicinity of, the Key Nodes along the Milford Corridor are:

- Creating a strong entry threshold at the current National Park boundary to clearly define the transition into Fiordland National Park.
- Develop Knobs Flat Hub.
- Develop Mistake Creek track and install large new hut.
- Enhance Cascade Creek campsite.
- Create a 'Whakatipu Super Track Head' in the Hollyford Valley (Hinepipiwai Lake Marian carpark area).
- Upgrade short stop options along corridor including:
  - Adding basic visitor facilities to existing Monkey Creek carpark.
  - Upgrading the Gertrude Valley walking track and providing mid-standard facilities
  - Creating a 'Cleddau Cirque' short stop viewing area at 'loop 2' (Homer Tunnel western portal).

- Re-instating the existing damaged track at The Chasm and adding mid-standard visitor facilities.

6.19 In addition to this, several walking track upgrades or new walking tracks have been considered:

- Enhancing and / or create additional walking / cycling tracks or network connections enabling new recreational opportunities in the Knobs Flat - Cascade Creek area.
- Develop U Pass track connecting existing Mistake and Hut Creek tracks.
- Create three loop tracks at the 'Whakatipu Super Track Head'.

6.20 Key recommendations in relation to this short-list option that relate to conservation are:

- Any infrastructure at Key Nodes is within existing modified areas (refer (Figure 3 and 5 – 16, Appendix 1).
- Any short-stop bus stops are located within existing modified areas. There is little opportunity to expand the road footprint in most places beyond Knobs Flat (due to the proximity of intact forest ecosystems, lakes, rivers and other geographical constraints).
- Any new infrastructure (i.e., Knobs Flat / Kiosk Creek) is sensitively located and carefully designed to minimise environmental effects including, for example effects of light pollution, human disturbance, and reflective surfaces on indigenous fauna, any increases in impervious surfaces, runoff and discharges, waste management, etc.
- Red beech forests in the vicinity of Knobs Flat are core habitat for a range of nationally Threatened species. Development of accommodation infrastructure in this area that facilitates a substantial increase of bed nights in the area will likely be followed by increased pressure to provide additional walking tracks and other visitor opportunities. Assessment of this potential risk would need to be carefully considered during refinement and assessment of the accommodation proposal(s).
- Creation of walking tracks, while relatively low impact compared to other infrastructure, does have ecological effects such as edge effects and disturbance to fauna that need to be considered. This is especially the case where tracks are built for high use and all-abilities (wider tracks, more bridges, more earthworks). Red beech forests in the Eglinton are nationally important for several nationally threatened species and further ecological impacts to this forest should ideally be avoided.
- Management approaches are adopted to prevent or minimize kea interaction with visitors. Current management of kea interactions at the Homer Tunnel portals and at Monkey Creek is inadequate, leading to serious impacts on the local kea population. Management may require dedicated staffing resource to educate visitors, enforce no-kea-feeding rules, and to deter kea from congregating near vehicles.
- Walking tracks should:
  - Avoid ecosystems that are sensitive or of high conservation value).
  - Be designed and constructed to minimise effects on conservation values, e.g., avoiding canopy trees and minimising the width of the construction footprint.
  - Be limited to narrow widths in forest (no more than 1.5 m), to avoid loss of canopy trees, to minimise vegetation removal and to reduce fragmentation and edge effects; but may be:
    - Built to a higher (wider) standard (if necessary) in grassland habitats that are more substantially modified.
    - Further, consider carefully whether track construction to an acceptable standard for general visitors is appropriate for the landscape. For example, construction of a formal

track over U Pass was initially considered in the short-list options but would require substantial construction works due to the steep topography and dynamic environment that experiences frequent storms, avalanches, rockfalls, washouts etc. The level of effect on sensitive sub-alpine and alpine environments would likely to be substantial. Inclusion of this track in the Master Plan was not supported by the Conservation Analysis Team.

- Specifically, with regard to the proposed walking track network at the 'Super Track Head' at the Hinepipiwai Lake Marian track carpark:
    - Tracks in this area would need to cater to a large number of visitors, including family groups and visitors with a wide range of physical ability. The tracks would need to provide links to adjacent Great Walk track (the Routeburn) and other high-use tracks (Greenstone / Caples, Hollyford). Construction of tracks to an accessible or Great Walk standard would occur in intact silver beech forest in a dynamic environment, likely leading to a large construction footprint (even if constructed without loss of canopy trees). Reducing the extent of new track infrastructure and utilising existing tracks is generally the preferred approach.
    - While some walking tracks through this area may be acceptable in the context of this project, the number / extent of tracks needs to be limited to reduce adverse effects, including cumulative effects.
    - In particular, the relatively large construction footprint and resulting ecological effects of an upgraded and looped Hinepipiwai Lake Marian track is not preferred by the Conservation Analysis team and a one-way track is preferable.
    - Two tracks are currently proposed to enable access from the 'Super Track Head' to the Routeburn Track: one linking at Lake Howden and one at Key Summit. In consideration of the above, we recommend only one track is pursued, the most logical of which being the direct link to Key Summit.
- Cycling tracks should:
    - Avoid ecosystems that are sensitive or of high conservation value.
    - Utilise grassland areas dominated by exotic vegetation where possible (although these habitats do have conservation values such as providing skink and insect habitat, wetland habitat, feeding habitat for indigenous fauna such as black-fronted terns etc.).
    - Avoid routes that place the cycleway in grasslands alongside the immediate forest edge for long stretches (these are important feeding areas for fauna).
    - Where possible avoid forest areas (especially tall stature red beech forest).
    - Where located in forests, be constructed in a way that is sensitive to potential indirect effects to forest integrity, i.e., cycleways are limited to narrow widths (< 1.5 m) and follow a route that allows construction in a way that avoids loss of canopy trees (as above).
    - Where constrained by topography, rivers / lakes or particular features that must be avoided (e.g., wetlands), utilising the road corridor would limit ecological effects (but is likely to be a less preferred option from a visitor perspective).

6.21 The key benefits of these initiatives (from a conservation perspective) are:

- Developing a small network of stopping points rather than having a large number of informal stopping points is preferable, so that visitor impacts (e.g., rubbish, wildlife interactions) can be minimised and managed.

- Short stop bus stops provide an opportunity to provide a range of high-quality interpretation signage / education facilities that explain conservation values, threats, and management in a range of habitats and locations.

DEVELOP TE ANAU AS A SUB-REGIONAL VISITOR HUB TO ENCOURAGE MORE VISITORS TO STAY OVERNIGHT

6.22 It is recommended that Te Anau is supported to become a more dominant visitor hub and the starting point of visitors' Fiordland experience. This will require a number of investments within the town and its surrounding area. Increasing visitors' length of stay within Te Anau will also be dependent on implementing a range of initiatives in and around the town that enable visitors to undertake shorter duration activities on either side of longer visits into Doubtful Sound and Milford Sound Piopiotahi. Recommendations for developing Te Anau as a sub-regional visitor hub include:

6.23 The initiatives currently proposed at, or in the vicinity of Te Anau include:

- The redesign of the Te Anau waterfront and town centre,
- The creation of new walking and cycling tracks connecting into Te Anau,
- The optimisation and development of new family friendly experiences close to Te Anau in areas such as Brod Bay and the Hidden Lakes.

6.24 Key recommendations in relation to these short-list options that relate to conservation are:

- Developing some visitor opportunities (tracks / campsites) in the vicinity of Te Anau may have a relatively low level of ecological impact if existing track and campsite areas at Brod Bay and Hidden Lakes are utilised (most are formal, some are informal).
- Developing visitor infrastructure east / north east of Te Anau along the SH94 corridor should ideally avoid or minimise impacts to regenerating forest / scrub located between SH94 and the lake. Further, infrastructure must avoid impacts to wetland areas such as the large regionally significant wetland complexes at Lake Te Aroha and lakeshore turf vegetation communities.

6.25 The key benefits of these initiatives (from a conservation perspective) are:

- Providing a small number of tracks camping areas would provide opportunities to consolidate visitor impacts on the lake shore in the vicinity of Te Anau and allow for improved visitor / waste management.
- Walkways and cycleways in the generally more modified habitats / farmlands in the vicinity of Te Anau would generally have lesser ecological impacts than providing similar infrastructure within the more intact habitats of Fiordland National Park.

6.26 The re-design of the Te Anau waterfront and town centre is all accommodated within the existing urban environment and no substantial impacts on conservation / biodiversity values are anticipated. However, further assessment and appropriate impact management measures may be required if redevelopment of the waterfront involves development within, or adjacent to, the lakeshore or outside the existing urban environment of Te Anau.

HIGH-LEVEL SUMMARY OF SHORT-LIST IDEAS

6.27 Table 4 provides a high-level summary of Conservation Analysis team comments and evaluation of the sub-ideas / specific proposals. Note that all sub-ideas / specific proposals have been included, as some are less relevant to the scope of the Conservation Analysis team. This summary and the comments below are intended to be a very high level summary and are made in the context of this project only (i.e., ideas may be 'supportable' below as part of a coherent strategy to redesign the overall suite of visitor facilities, even if an idea might otherwise be unsupportable if carried out in other circumstances). This summary does not replace the need for ecological input and assessment at all further stages of each's proposal's design and development, if pursued.

Table 4: Short list ideas and high-level summary of Conservation Analysis team comments on sub-ideas / specific proposals.

Main short list idea	Sub-idea / general description	Specific sub-proposal (if applicable)	Conservation Analysis – key points	Conservation Analysis – overall comment
Develop new transport models to manage visitor flows	**Transport model focused on a mix of tour bus, hop-on-hop-off and non-stop buses**	n/a	• Consolidation of visitor impact • Improved management of wildlife interactions • A likely reduction in net carbon emissions per visitor	• Support idea
Develop a compelling suite of experiences in Milford Sound Piopiotahi to encourage visitors to stay longer and contribute to the local economy	**Develop several new walking tracks and observation points in Milford Sound Piopiotahi**	Spur lookout track at rear of hotel site	• Utilises existing track in area already modified with water supply infrastructure	• Support idea subject to careful design and appropriate construction methods that minimise vegetation clearance, edge effects and adverse effects to fauna
		Pontoon walkway to Bowen Falls	• Utilises existing track on land • Pontoon may have relatively limited ecological effect	• Support idea
		Cleddau Delta walking tracks	• Cleddau Delta is a high ecological value forest type with fringing estuarine wetlands • Impacts to forest should be minimised by limiting the extent of new tracks and utilising existing predator trapping tracks where possible • Impacts to wetland and estuarine areas must be avoided as per NPS - Freshwater 2020	• Support idea subject to careful design and appropriate construction methods that minimise vegetation clearance, edge effects and adverse effects to fauna • Would likely not support unless tracks were limited in extent
		Top Falls Link - establish a lookout at the top of Bowen Falls (by elevator or gondola from the Village, or similar means)	• Significant vegetation clearance likely required to construct new infrastructure with resulting major adverse impacts to habitats that cannot be avoided, including habitat fragmentation and edge effects	• Do not support. Idea not appropriate from a conservation perspective
	Establish an interpretive Marine Centre in Piopiotahi / Milford Sound Piopiotahi as part of the visitor hub	n/a	• Opportunity to highlight conservation values of area and potentially to support ongoing research etc.	• Support idea
Re-design Milford Village to lift the quality of the built environment and reflect its world-class status	**New Milford Sound Piopiotahi visitor hub**	Includes visitor accommodation, tsunami shelters, redeveloped boat terminal, enhanced Deepwater Basin wharf, etc.	• Current proposals utilise and consolidate built footprint within the existing modified area • Opportunity to restore / revegetate some areas	• Support idea
	Remove fixed-wing runway	n/a	• Opportunity to revegetate runway to enhance habitat for Milford boulder butterfly and other fauna • Rotary services should remain at existing airport and not be shifted elsewhere (e.g. Little Tahiti) • Reduction in noise / CO_2 emissions a potential benefit, dependent entirely on assumption that helicopter flights would not simply increase concomitant with the loss of fixed-wing flights	• Support idea
Enhance the Milford Corridor experience to expand the options available to visitors	**Create a strong National Park entry threshold**	Create National Park Entry / Departure structure at park boundary or 'Eglinton Reveal' (grass flats north of Mackay Creek)	• Both park boundary and 'Eglinton Reveal' area modified exotic grassland • Direct impacts of structure likely to have limited ecological effect	• Support idea
		Create shelter and small carpark at Eglinton Reveal	• Road verge area already highly modified as a de facto stopping point • Minor encroachment into modified exotic-dominated grassland likely to have limited ecological effect	• Support idea
	Develop Knobs Flat experience node	Accommodation cabins, interpretive building / structures and Kiosk Creek accommodation	• Utilises existing modified open areas but is adjacent to exceptionally high value habitat for threatened fauna. Structures should completely avoid further clearance of forest • Red beech forest edges are an important habitat for fauna (e.g. bat feeding) and appropriate siting of structures, careful management of lighting effects and early input from ecological experts will likely be required during further development of proposal	• Idea likely supportable subject to further refinement of proposal and ensuring that proposal would entirely utilise existing modified (open) areas
		Flood protection / maintenance	• Difficult to assess without understanding the extent and location of works required • In-stream works will require management of construction effects (avoiding fish mortality, erosion and sediment control etc.) and maintenance of fish passage	• Idea likely supportable subject to further refinement of proposal
		Walking track at Knobs Flat and linking Kiosk Creek to Knobs Flat	• Impacts to red beech forest should be minimised by limiting the extent of new tracks and utilising existing predator trapping tracks where possible • Track design and construction should avoid any clearance of mature trees (or damage to their roots) as these provide important habitat for threatened fauna (e.g. bats, kaka, mohua), and to avoid causing edge effects	• Support idea subject to careful design and appropriate construction methods that minimise vegetation clearance, edge effects and adverse effects to fauna • Would likely not support unless tracks were limited in extent
		Cycleway from Knobs Flat to Cascade Creek	• Tracks / cycleways should be designed and constructed to minimise effects on conservation values, including limiting track width in forest (no more than c.1.5 m), avoiding loss of canopy trees and minimising vegetation removal to reduce edge effects • Compared to tracks in forests, tracks in grassland habitats may be built to a higher (wider) standard (if necessary) where these are more substantially modified by exotic plant species	• Idea may be supportable subject to feasibility study / detailed ecological assessments to enable appropriate track siting • Would not support construction of a highly engineered 2 way / accessible standard cycle track in red beech forest areas
		Cycleway from Knobs Flat to National Park boundary	• Similar concerns to the proposal above • Some sections constrained by river and bluffs (e.g. near Tōtara Flat) or by extensive wetland features in open areas – may require engineering solutions / bridges that cause greater ecological impact • Utilising existing road corridor would reduce effects	• Do not support, especially on basis of cumulative effects of all proposals above, unless road corridor is utilised through constrained sections and areas of high conservation value • Additional similar concerns to proposal above
	Enhance Cascade Creek campsite	n/a	• Proposed upgrades minor with no direct adverse effects on conservation values • DOC Biodiversity team and Conservation Analysis team share concern that area is becoming a hotspot for predators (especially cats) attracted to high rodent numbers induced by litter / food scraps	• Support idea if litter / waste management and pest control improved
	Develop Mistake Creek track and install new large hut	Upgrade existing Mistake Creek to 'Great Walk' standard, construct new 80-bunk hut near head of valley, add new 'tramping track' standard tracks to a waterfall near U Pass and to a glacier cirque, add linking track (Great Walk standard) to Cascade Creek	• Partially utilises existing track but would require substantial works to bring to Great Walk standard • Inclusion of U-Pass / Hut Creek in a loop track proposal was not supported by Conservation Analysis team due to likely substantial impacts to alpine habitats and fauna. Proposal has been refined to limit extent of new Great Walk standard track development	• Support idea subject to careful design and appropriate construction methods that minimise vegetation clearance, edge effects and adverse effects to fauna

Main short list idea	Sub-idea / general description	Specific sub-proposal (if applicable)	Conservation Analysis – key points	Conservation Analysis – overall comment
	Upgrade short stop options along corridor	Add basic visitor facilities to Monkey Creek carpark	• Existing modified area small - would require clearance of forest / shrubland to increase facilities • Key site of harmful kea interactions and human waste issues • Maintains sprawl of visitor offerings / stopping points – consolidation is preferable	• Do not support, as idea does not consolidate stopping sites or make use of already modified areas • Gertrude Valley node proposal more appropriate
		Upgrading the Gertrude Valley walking track and providing mid-standard facilities	• Utilises existing track and large modified area at existing carpark • Management of wildlife interactions (kea), pests and litter important if area becomes main node (existing issues likely to shift from Monkey Creek) • Management of visitor impacts in sensitive alpine environments would be important (e.g. at Gertrude Saddle)	• Support idea • Opportunity to consolidate impacts in already modified area and to better manage existing issues
		Enhancement of 'Loop 2' parking area (Homer Tunnel Western Portal)	• Utilises existing modified area • Management of wildlife interactions (kea), pests and litter will become important if area becomes the focal point for visitors	• Idea likely supportable because of low direct impacts, but idea does not consolidate existing stopping points
		Re-instate existing damaged track at The Chasm and add mid-standard visitor facilities	• Utilises existing modified area and track Management of visitor impacts (litter, waste management) would be important	• Support idea • Opportunity to consolidate impacts in already modified area and to better manage existing issues
	Create 'Whakatipu Super Track Head'	Upgrade Hinepipiwai Lake Marian track to 'Great Walk' track standard, add similar track on true left of Marian Creek and convert to loop track	• Partially utilises existing track but would require substantial works to bring to Great Walk standard and to add loop track • Will have cumulative effects in conjunction with other track proposals in 'Super Track Head' area	• Prefer upgrade of existing one-way track rather than loop track • Support idea subject to careful design and appropriate construction methods that minimise vegetation clearance, edge effects and adverse effects to fauna
		Enhance short walk to waterfall / viewing gantry (first part of existing Hinepipiwai Lake Marian track) and convert to highly accessible loop track	• Partially utilises existing track, would require reconstruction of Hollyford River bridge	• Support idea subject to careful design and appropriate construction methods that minimise vegetation clearance, edge effects and adverse effects to fauna
		Construct new track linking to Key Summit	• Does not utilise existing track but considered more acceptable than proposal below • Would require substantial works to construct new track to Great Walk standard • Will have cumulative effects in conjunction with other track proposals in 'Super Track Head' area	• Support idea subject to careful design and appropriate construction methods that minimise vegetation clearance, edge effects and adverse effects to fauna
		Upgrade Pass Creek track to Lake Howden and link to 'Super Track Head' (would form loop track with the above)	• Partially utilises existing track but would require construction of a new section of track and substantial upgrade to bring exiting track to Great Walk standard • In conjunction with other track proposals has unacceptable cumulative effects	• Do not support • Existing track already provides access to Lake Howden
		Construct walking track from 'Super Track Head' to Hollyford Track	• Would require substantial works to construct new track to Great Walk standard	• Do not support • Existing road (currently under repair) already provides access to Hollyford Track
Develop Te Anau as a sub-regional visitor hub to encourage more visitors to stay overnight	**Development of new family friendly experiences close to Te Anau in areas such as Brod Bay and the Hidden Lakes**	n/a	• Partially utilises existing track and campsite areas (formal and informal), habitat values somewhat less high than elsewhere in Fiordland NP due to history of visitor usage of lakeshore areas • Formalising and consolidating camping areas possible benefit in terms of visitor / waste management	• Idea likely supportable subject to further refinement of proposal

7 RECOMMENDED OPTION

7.1 As discussed in the Master Plan report, the project's recommended option has been developed through the multi-disciplinary inputs from various workstreams. The project team have engaged with a wide range of stakeholders, iwi, Southland District Council, Department of Conservation, Environment Southland, Waka Kotahi and many more national, regional and local stakeholders. Ideas in development have been shaped and cross-examined by the Project Team, Reference Groups, the Project Working Group and the Governance Group.

7.2 At the current time, the recommended option has yet to be confirmed by the Governance Group. Furthermore, being at master plan level, if the Master Plan is implemented (i.e., following the completion of the Master plan phase of the Project), the ideas are expected to be further refined and evidenced through more detailed studies (which may influence the shape or scale of some Master plan recommendations), detailed site investigations and detailed design.

7.3 The Recommended Option is a suite of interventions that collectively add value to the visitor experience whilst also improving visitor safety and creating revenue opportunities to help fund the project (conservation management and capital and operational costs, including experiential and risk management).

7.4 With regard to the Project Pillar: "*Tourism funds conservation and community: The visitor experience will become an engine for funding conservation growth and community prosperity":* all of the ideas to utilise tourism revenue to improve conservation and environmental outcomes described in Section 5 will benefit conservation. When available, the draft Cost Benefit Analysis (CBA) will provide guidance into the likely revenue pools available for funding conservation management and growth. Important next steps will be to prioritise and confirm the sub-ideas developed during the option refinement process in consultation with DOC and other stakeholders.

7.5 Direct human / visitor impacts to species and habitats are of concern but are largely restricted to the immediate vicinity of the road corridor and Milford Sound Village. However, in terms of conservation management, the impacts of introduced mammalian predators are widespread and of most concern. For this reason, landscape-scale control of introduced mammalian predators is the highest priority conservation management action for northern Fiordland and is recommended as a priority for additional investment. The advantages of funding landscape-scale control of introduced mammalian predators in the area include:

- The technology to control most introduced mammalian predators at a landscape scale is already available and limited only by funding.
- The approach aligns with Predator Free 2050 as well as other initiatives being considered in this area.
- It would replace the need for numerous, small scale, less effective, and often sporadic predator control programmes currently being undertaken.
- Removal of introduced mammalian predators would allow for the recovery of populations of indigenous fauna currently being impacted by introduced mammalian predators which would have positive ecological effects for wider ecosystems.
- It would allow for the re-introduction of indigenous fauna that previously occurred in the area. This would have several benefits including increasing the natural range and populations sizes of the re-introduced species, supporting existing conservation objectives and returning the ecological functions these species once played to the area (e.g., seed dispersal / pollination etc).
- Re-introduction of indigenous fauna would improve the visitor experience and provide an exciting opportunity to make these species visible to visitors in their natural (historical) habitat and provide an example of what New Zealand would have been like before humans.

8 SUMMARY AND CONCLUSIONS

8.1 Milford Sound Piopiotahi, the Milford Corridor and Fiordland are nationally and internationally important for the conservation of many ecosystems and species. The area supports a wide range of highly intact ecosystems that are important for a very high diversity of indigenous species including many nationally Threatened and At-Risk plant, bird, insect, lizard, bat and marine mammal species. Some of the ecosystems and species present in the area are globally unique. This is recognised by the area's status as a National Park (Fiordland National Park) and its UNESCO World Heritage status (as part of Te Wāhipounamu).

8.2 Conservation values are threatened by the impacts of introduced animal and plant pests throughout and are dependent on ongoing control efforts. Direct human / visitor impacts to species and habitats are also of concern, although they are largely restricted to the immediate vicinity of the road corridor and Milford Sound Village. Other key challenges for the area's outstanding conservation values are climate change, marine biosecurity and over-fishing, road maintenance / improvement activities and ensuring there is sufficient and sustained funding for conservation management.

8.3 The Conservation Analysis workstream provided input into the creation of long-list ideas and evaluated and provided commentary on all of the long-list ideas that were relevant to conservation, biodiversity and the natural environment. As part of the long-listing process, several long-list ideas were developed to identify how tourism revenue could be used to benefit conservation. All of the ideas to utilise tourism revenue to improve conservation and environmental outcomes described in Section 5 will benefit conservation. However, the impacts of introduced mammalian predators are the greatest issue for conservation in the area. For this reason, landscape scale control of introduced mammalian predators is the highest priority conservation management action for northern Fiordland and is recommended as a priority for additional investment.

8.4 This report provides a high level assessment and recommendations on each of the proposed short-list ideas. The potential effects of some ideas were considered too high to be pursued further, some were supported subject to a number of recommendations being met, and others received full support. A number of recommendations were made for those short-list ideas that are relevant to conservation. Key recommendations were to:

- Consolidate infrastructure within existing modified / built areas (mapped as part of the process)
- Consolidate visitor activities at a small number of locations rather than dispersing visitor impacts.
- Ensure any visitor facilities, including infrastructure, are sensitively located and are designed, constructed and / or operated in a way that is sympathetic to the natural environment.

8.5 The short-list ideas are expected to be further refined and developed through more detailed studies (which may influence the shape or scale of some Master plan recommendations), detailed site investigations and detailed design.

8.6 The Master Plan is likely to be a suite of interventions that collectively add value to the visitor experience whilst also improving visitor safety and creating revenue opportunities to help fund the project (conservation management and capital and operational costs, including experiential and risk management).

9 REFERENCES

Ausseil, A-G.; Gerbeaux, P.; Chadderton, W. L.; Stephens, T.; Brown, D. and Leathwick, J. (2008). *Wetland ecosystems of national importance for biodiversity: Criteria, methods and candidate list of nationally important inland wetlands*. Landcare Research Contract Report: LC0708/158. Prepared for the Department of Conservation.

Baker, C.S.; Boren, L.; Childerhouse, S.; Constantine, R.; van Helden, A.; Lundquist, D.; Rayment, W.; Rolfe, J.R. (2019). *Conservation status of New Zealand marine mammals, 2019*. New Zealand Threat Classification Series 29. Department of Conservation, Wellington. 18 p.

Bell, T. P., Patterson, G., Jewell, T. (2008). *Alpine lizard research in Fiordland National Park: February–March 2007*. DOC Research & Development Series 304. Department of Conservation, Wellington. 18 p.

Boffa Miskell (2017). *Conservation HQ - Development opportunity study*. Report by Boffa Miskell Limited on behalf of Real Journeys Limited. 55 p.

Burrows, C. J., Dobson, A. T. (1972). *Mires of the Manapōuri - Te Anau lowlands*. Proceedings of the New Zealand Ecological Society 19, 75-99.

Burrows, L., Brownstein, G., Monks, A., Hayman, E., Johnson, P., Ford, K., Meurk, C. (2015). *Monitoring of Shoreline Vegetation at Lakes Manapōuri, Te Anau and Hauroko 2015*. Report prepared for Meridian Energy Limited by Landcare Research, Contract Report LC2304. 86 p.

Contract Wild Animal Control New Zealand (2019). *Application Form for predator control in the Arthur Sinbad Cleddau. Tiakina Nga Manu Battle for our Birds Programme 1 May 2019 – 30 April 2020*. Released under the Official Information Act. 37 p.

Cromarty, P., Scott, D.A. (eds). (1995). *A Directory of Wetlands in New Zealand*. Department of Conservation, Wellington.

Cunningham, S., Laurel, T., Brunton, J., McLeod, R., Bowman, R., Richards, D., Kinsey, R. and Matthews, F. (2019). *Mitigation the threat of invasive marine species to Fiordland: New Zealand's first pathway management plan*. Management of Biological Invasions, 10(4), 690-708.

de Lange, P.J.; Rolfe, J.R.; Barkla, J.W.; Courtney, S.P.; Champion, P.D.; Perrie, L.R.; Beadel, S.M.; Ford, K.A.; Breitwieser, I.; Schonberger, I.; Hindmarsh-Walls, R.; Heenan, P.B.; Ladley, K. (2018). *Conservation status of New Zealand indigenous vascular plants, 2017*. New Zealand Threat Classification Series 22. Department of Conservation, Wellington. 82 p.

DOC (2013). *Threatened species protection in the Eglinton Valley Annual Report 2011/2012*. 25 p.

DOC (2015a). *Cleddau Delta Restoration Project - Milford Sound. Summary report and recommendations July 2012 - September 2015*. 26 p.

DOC (2015b). *Department of Conservation: Statement of Intent 2015 – 2019*. 25 p.

DOC (2018). *Milford Sound Piopiotahi Ecosystem Restoration Concept Plan*: A Partnership Project. 13 p.

DOC (2018b). *Murchison Mountains lesser short-tailed bat survey 2018*. 9 p.

DOC (2019). *The Sinbad Sanctuary Project. Sinbad Gully, Milford Sound 2018/2019 Annual Report*. 21 p.

DOC. (2020). *Milford Sound Piopiotahi Marine Reserve*. Retrieved 5 May 2020 from https://www.doc.govt.nz/parks-and-recreation/places-to-go/fiordland/places/fiordland-marine-reserves/fiordland-marine-reserves-a-z/piopiotahi-milford-sound/.

Edge Hill, K-A., Reid, R. (2017). *Conserving Fiordland's biodiversity 1987- 2015: The Challenges, the Achievements, the Knowledge. Te Tiaki I te Taiao ki Tu Rua o te moko: Nga wero, nga haumauiui, nga mātauranga*. Department of Conservation. 130 p.

Edmonds, H. (2015). *Taxon plan for northern and southern Fiordland tokoeka (Apteryx australis australis): strategic plan for the recovery of northern and southern Fiordland tokoeka, for the period 2015–2025 and beyond*. Department of Conservation, Te Anau. 25 p.

Fiordland Marine Guardians. (2017). *Beneath the Reflections: A users guide to the Fiordland (Te Moana o Atawhenua) Marine Area*. 148 p.

Fiordland Marine Guardians. (2019). *Annual Report 2018/19*. 44 p.

Hitchmough, R.; Barr, B.; Lettink, M.; Monks, J.; Reardon, J.; Tocher, M.; van Winkel, D.; Rolfe, J. (2016). *Conservation status of New Zealand reptiles, 2015*. New Zealand Threat Classification Series 17. Department of Conservation, Wellington. 14 p.

Holdaway, R. J., Wiser, S. K., Williams, P. A. (2012). *Status assessment of New Zealand's naturally uncommon ecosystems*. Conservation Biology 26 (4), p. 619-629.

Jackson, B., Lee, E. (2017). Department of Conservation, *Cleddau Biodiversity Management Unit, Fiordland National Park - 2016/2017*. 7 p.

Jacobs (2019). *Southern Discoveries Staff Accommodation Project. Environmental Impact Assessment* prepared for Southern Discoveries Ltd (Document reference: IZ121500-NP-RPT-0001 | 1). 56 p.

Johnson P. N. (1979). *Rare and endemic plants in Fiordland*. DSIR Botany Division, 8 p.

Johnson, P. N. (1977). *Dome Mire, Te Anau: report on proposed botanical reserve*. DSIR Botany, Dunedin, 8 p.

Johnson, P. N., Timmins S. M. (1985). *Milford Sound Development Plan: Botanical Report*. DSIR Botany Division, Wellington. 11 p.

Lee, W. G. (1981). *Botanical report on vegetation exclosures in the Eglinton Valley, Fiordland National Park.* DSIR Botany, Dunedin. 24 p.

Kauati (2020). Milford Sound Piopiotahi / Milford Opportunities: Manawhenua Aspirations and Values. Prepared by Kauati for Southland District Council.

Mattern, T., Long, R. (2017). *Survey and population size estimate of Fiordland penguin (tawaki;* Eudyptes pachyrhynchus*) in Milford Sound Piopiotahi, New Zealand*. Notornis 64: 97-101.

Mattern, T., Seed, R. (2020). *NZ Penguin Initiative Q1 2020 Report*. 18 p.

Ministry for the Environment. (2018). *Role of the Fiordland Marine Guardians*. Retrieved 11 May 2020 from https://www.mfe.govt.nz/marine/we-all-have-role-play/fiordland-marine-guardians.

Moar, N. T., Burrows, C. J., Dobson, A. T. (1972). *Wetlands in Lands and Survey Development blocks. Te Anau - Manapōuri area*. Botany Division, DSIR. 14 p.

Mohua Charitable Trust (2017). *'Melodic Mohua on the move*.' Press release 10 October 2017. 2 p.

Morris, S. J. (2003). *Two new species of* Sigaus *from Fiordland, New Zealand (Orthoptera: Acrididae)* New Zealand Entomologist, 26 (1): 65-74

Nicol, R. (2001). *Ecological evaluation of the Sinbad Gully, Fiordland*. Contract report to the Department of Conservation. 14 p.

NIWA. (2017). *Fiordland (Te Moana o Atawhenua) Marine Area Monitoring 2016*. Reported prepared for the Department of Conservation. Contract Number Rfx:ID: 11995121. 68 p.

Patrick, B. H. (2017). *Two reports on the effects of proposed works on the Milford boulder butterfly*. Report prepared by Wildland Consultants Ltd. 11 p.

Robertson, H. A., Baird, K., Dowding, J. E., Elliott, G. P., Hitchmough, R. A., Miskelly, C. M., McArthur, N., O'Donnell, C. F. J., Sagar, P. M., Scofield, R. P., & Taylor, G. A. (2017). *Conservation status of New Zealand birds, 2016*. New Zealand Threat Classification Series No. 19. Department of Conservation, Wellington. 27 p.

Ryder Consulting (2009). *Cleddau River Flood Protection Works – Unnamed Cleddau River tributary water quality and fish community survey*. Report prepared for the Department of Conservation. 15 p.

Sedgeley, J. A., O'Donnell C. F. J. (1999). *Roost selection by the long-tailed bat, Chalinolobus tuberculatus, in temperate New Zealand rainforest and its implications for the conservation of bats in managed forests*. Biological Conservation 88: 261-276.

Sirota, P. 2006. *The effects of commercial sea-surface activity in Milford Sound: An initial scoping and information gathering report*. Prepared for Environmental Southland. 33 p.

Stanton, B.R. and Pickard, G. L. (1981). *Physical Oceanography of the New Zealand Fiords*. New Zealand Department of Scientific and Industrial Research. New Zealand Oceanographic Institute Memoir 88. 37 p.

Weston, K., O'Donnell, C., Monks, J. (2019). *Development of effective predator control techniques to restore threatened alpine biodiversity. Project update August 2019*. Department of Conservation. 23 p.

Wildland Consultants (2009). *Ecological Assessment of a Proposed Burrow Site, Cleddau Valley, Fiordland*. Report number 2306 prepared for Opus International Ltd. 21 p.

Wildland Consultants (2013). *Ecological Assessment of the proposed 2013 redevelopment, at Milford Sound Lodge, Cleddau Valley, Fiordland*. Report prepared for Milford Sound Lodge.

Wildland Consultants (2019). *Survey for the data deficient Awakopaka skink, Fiordland National Park*. Report prepared for Department of Conservation. 10 pp

Williams, C. (2007). *Doubtful Sound Bottlenose Dolphin - Threat Management Discussion Paper*. Prepared for the Department of Conservation. 42 p.

Williams, P. A., Wiser, S., Clarkson, B. R., Stanley, M. C. (2007). *New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework*. New Zealand Journal of Ecology, 31(2): 119–128.

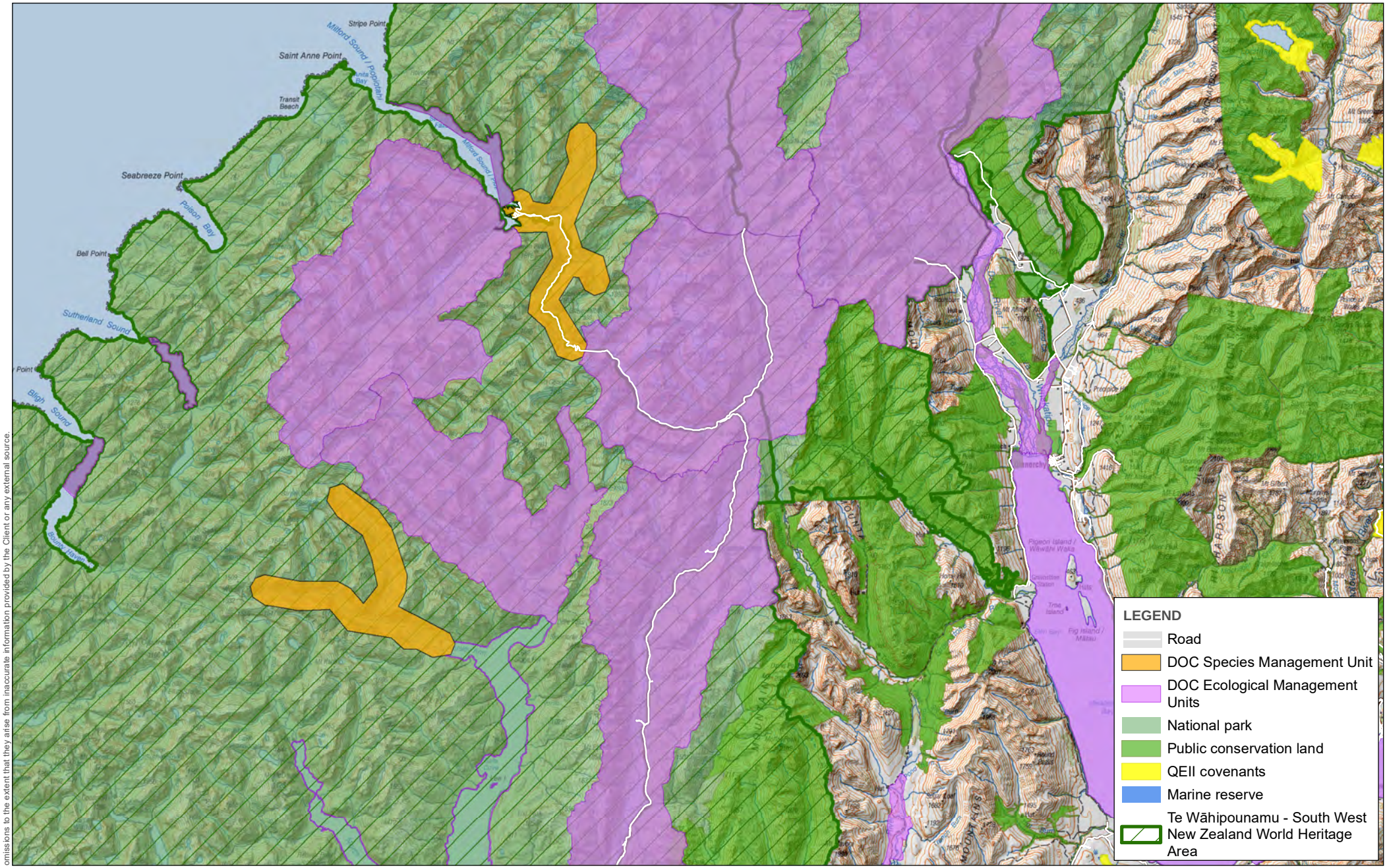
Wing, S. (2006). *Biological Monitoring of the Fiordland Marine Area and Fiordland's Marine Reserves – 2006*. Report prepared for the Department of Conservation. 78 p.

Wing, S., and Jack, L. (2007). *Biological Monitoring of the Fiordland (Te Moana o Atawhenua) Marine Area and Fiordland's Marine Reserves – 2007 (2 of 2)*. Report prepared for the Department of Conservation. 194 p.

WSP Opus (2018). *Milford Opportunities Project. Phase 1 Gap Analysis*. Report prepared for Milford Opportunities Project. 104 p.

APPENDIX 1: MAPS

File Ref: BM19772A_006_A4L_LandStatusNorth.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 10 km

1:350,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Road sourced from LINZ Topo 50 map series
Conservation\protected layers sourced from DOC
QEII covenants sourced from QEII National Trust
EMU and SMU sourced from DOC

PIOPIOTAHI / MILFORD OPPORTUNITES

Land Status of Milford Sound and the Milford Road Corridor

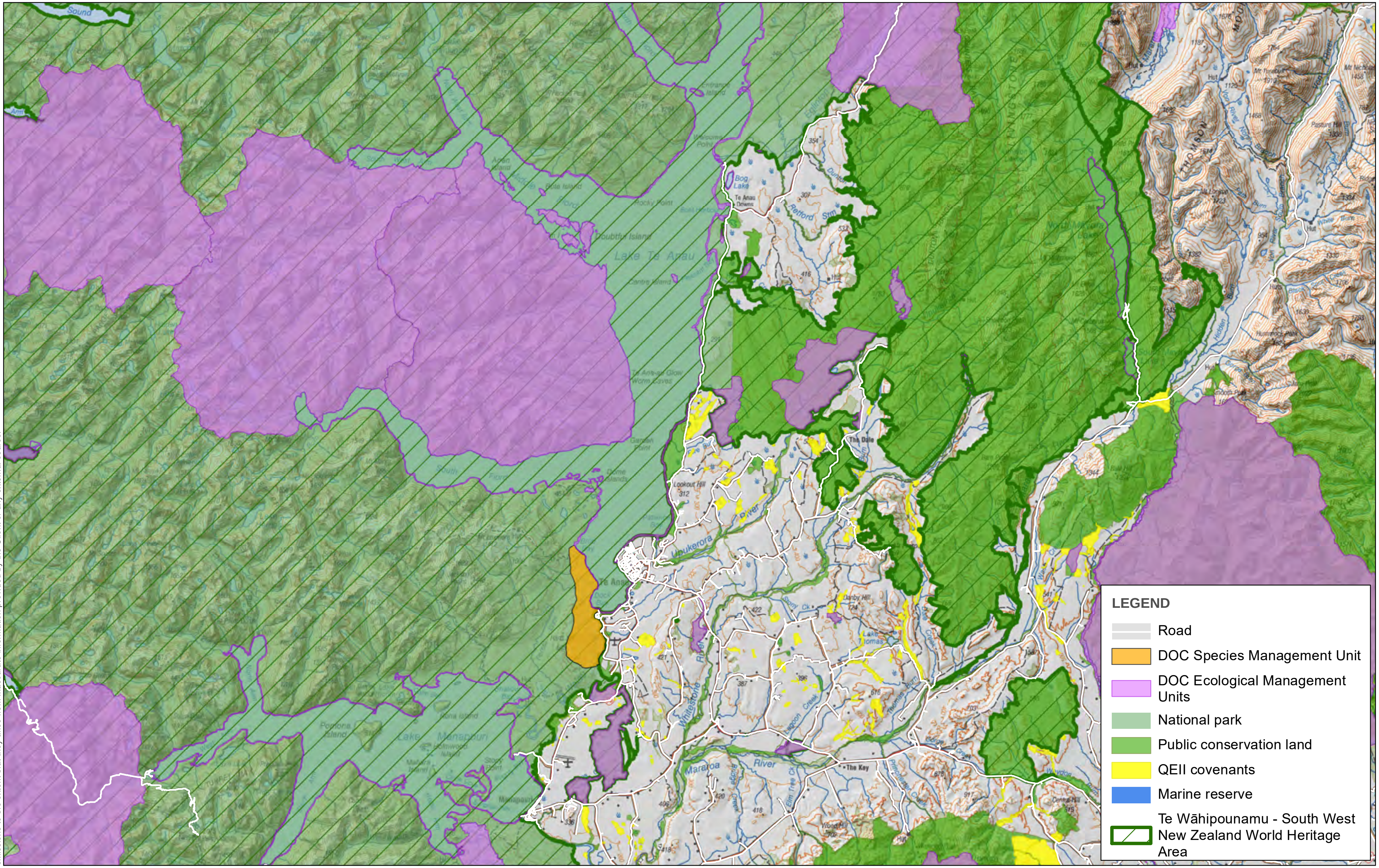
Date: 28 January 2021 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Figure 1

File Ref: BM19772A_006_A4L_LandStatusSouth.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 — 10 km

1:350,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Road sourced from LINZ Topo 50 map series
Conservation\protected layers sourced from DOC
QEII covenants sourced from QEII National Trust
EMU and SMU sourced from DOC

PIOPIOTAHI / MILFORD OPPORTUNITES

Land Status of Milford Sound and the Milford Road Corridor

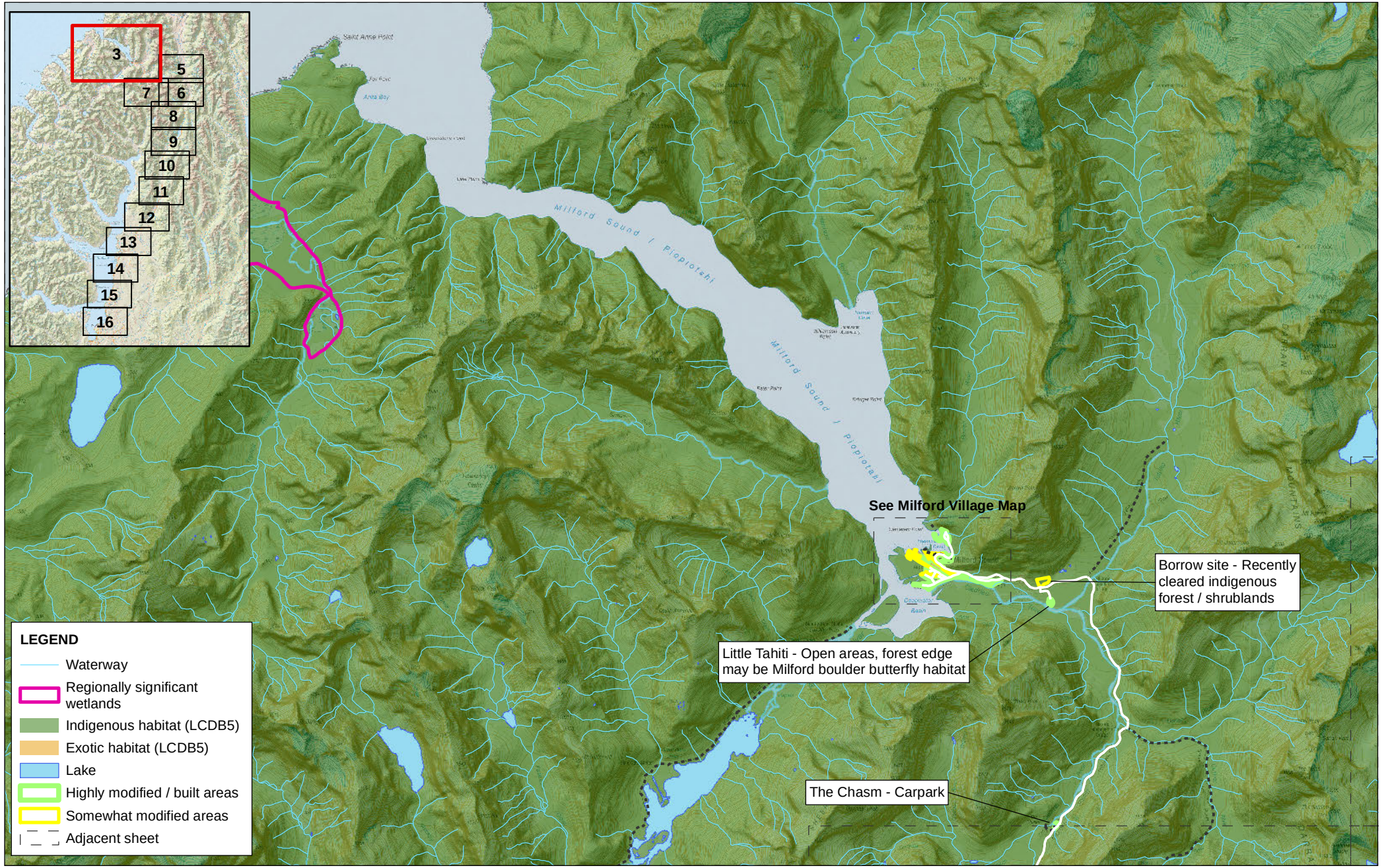
Date: 28 January 2021 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: SHo

Figure 2

File Ref: BM19772A_004_A4L_MLLM_MilfordCorridor.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 2 km

1:100,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

Areas of Specific Conservation Value or Habitat Modification

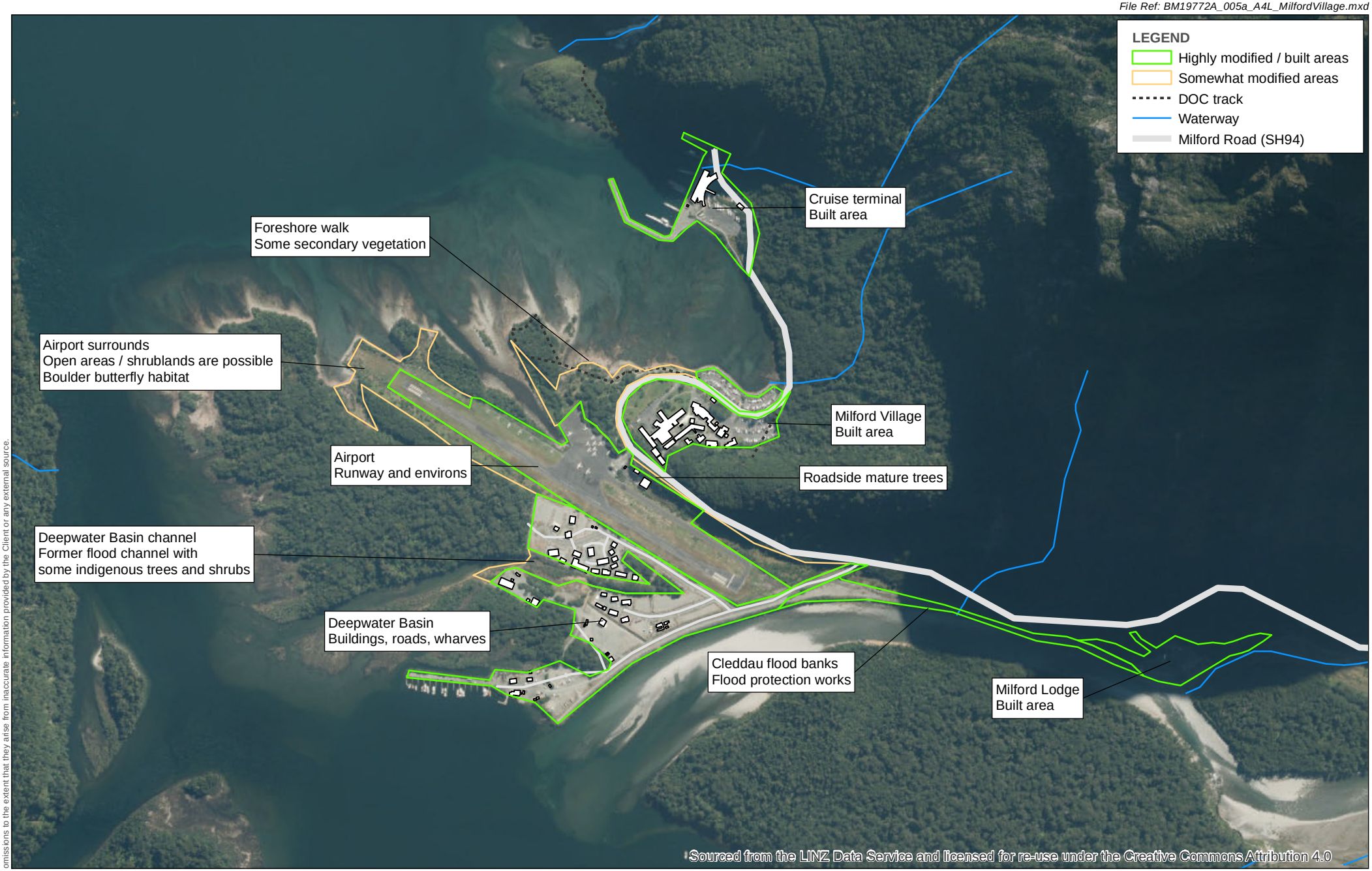
Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 3

File Ref: BM19772A_005a_A4L_MilfordVillage.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 200 m

1:10,000 @ A4

Data Sources:

Projection: NZGD 2000 New Zealand Transverse Mercator

PIOPIOTAHI / MILFORD OPPORTUNITES PROJECT

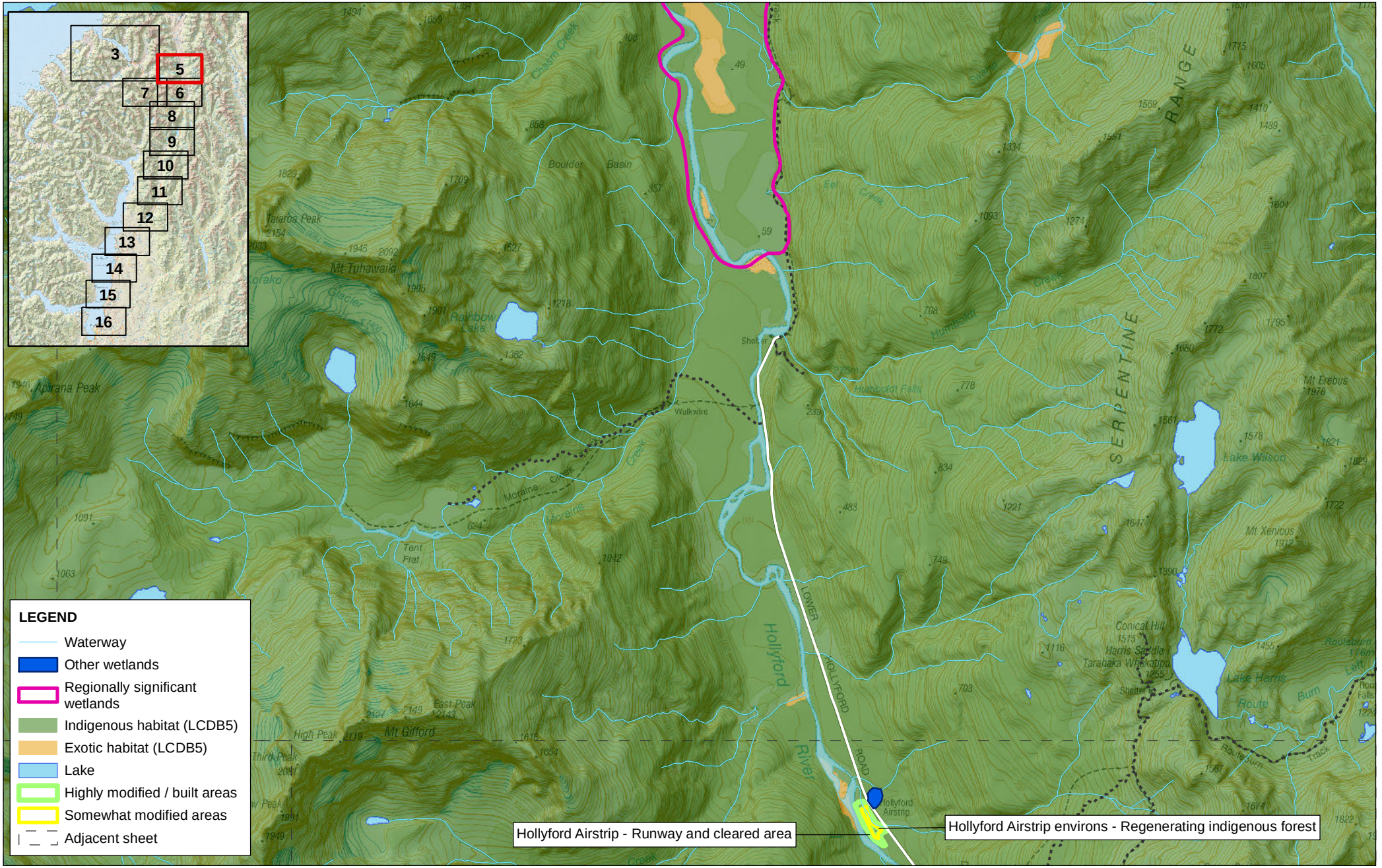
Level of habitat modification at Milford Sound Village

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: JMo | Checked: SHo

Figure 4



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

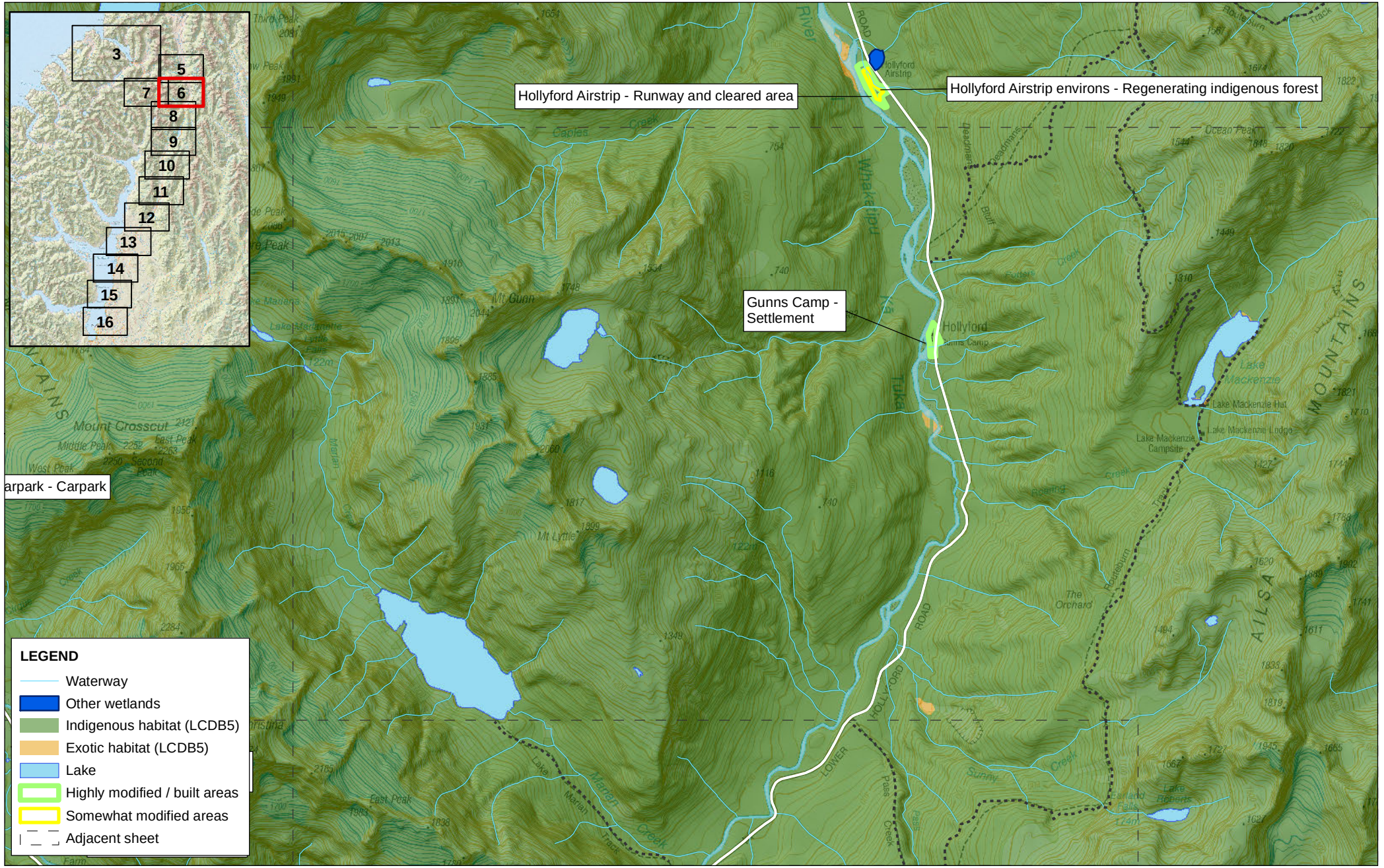
Areas of Specific Conservation Value or Habitat Modification

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 5



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

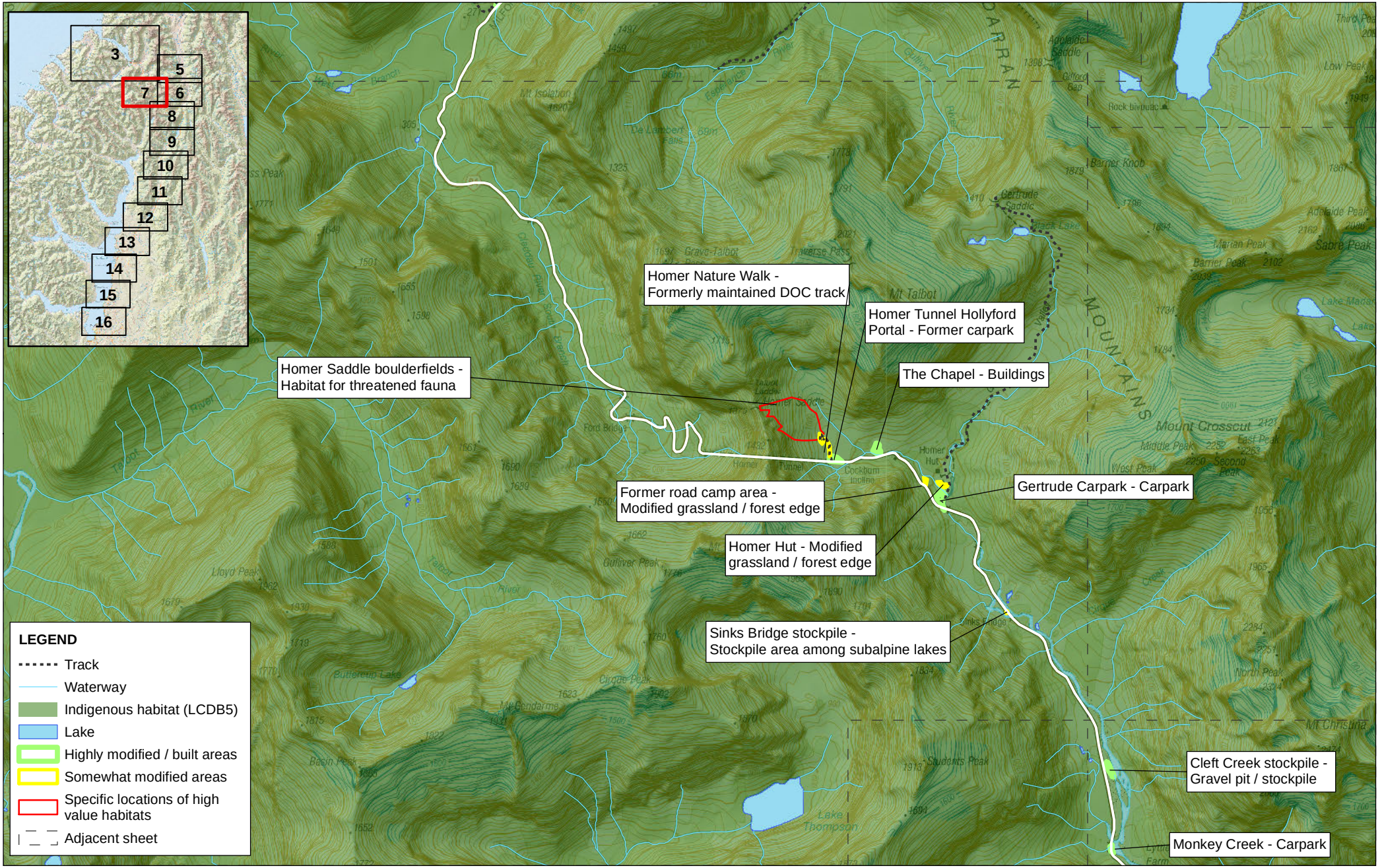
Areas of Specific Conservation Value or Habitat Modification

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 6



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

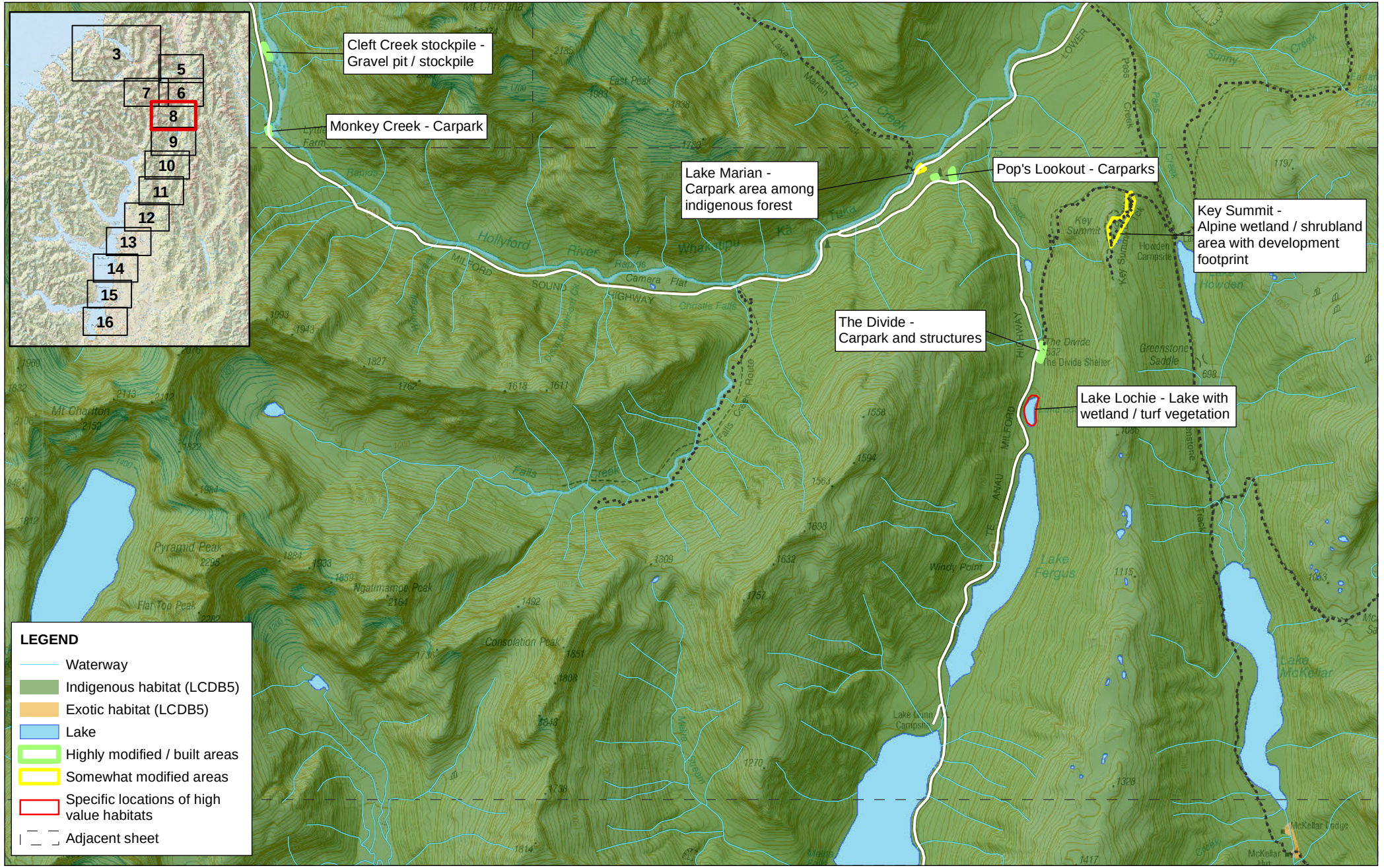
Areas of Specific Conservation Value or Habitat Modification

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 7



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

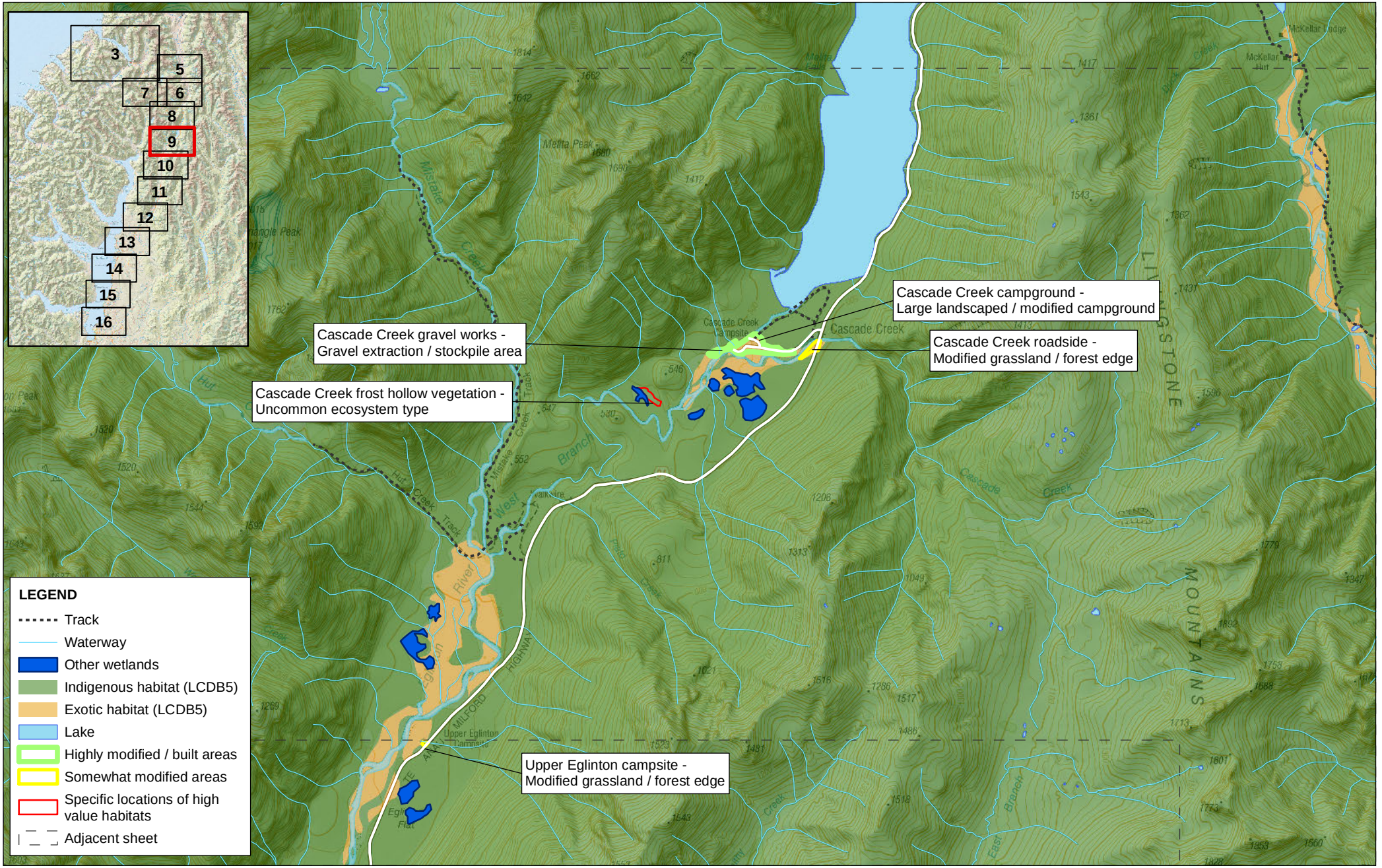
Areas of Specific Conservation Value or Habitat Modification

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 8



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

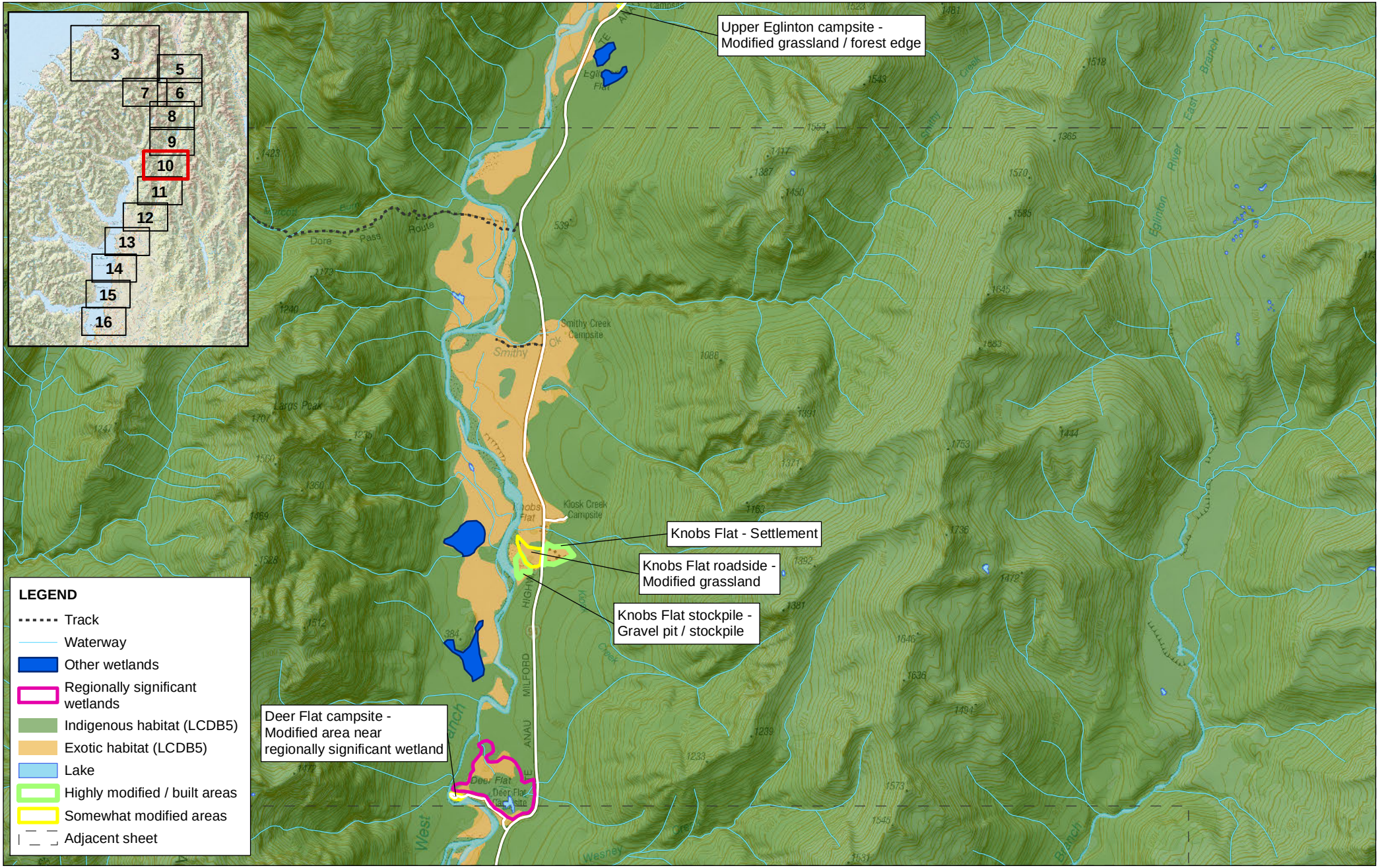
Areas of Specific Conservation Value or Habitat Modification

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 9



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

Areas of Specific Conservation Value or Habitat Modification

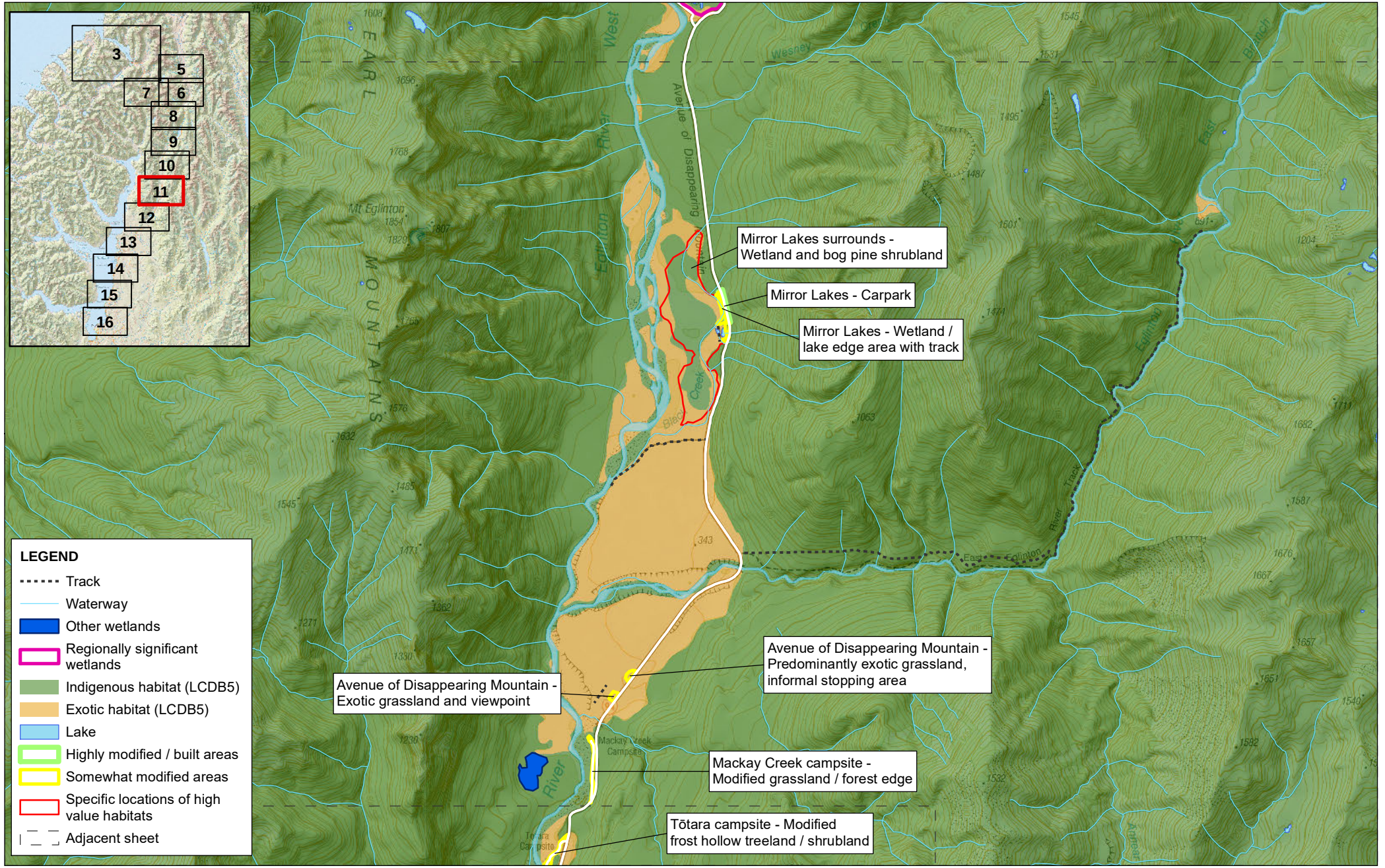
Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 10

File Ref: BM19772A_004_A4L_MLLM_MilfordCorridor.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

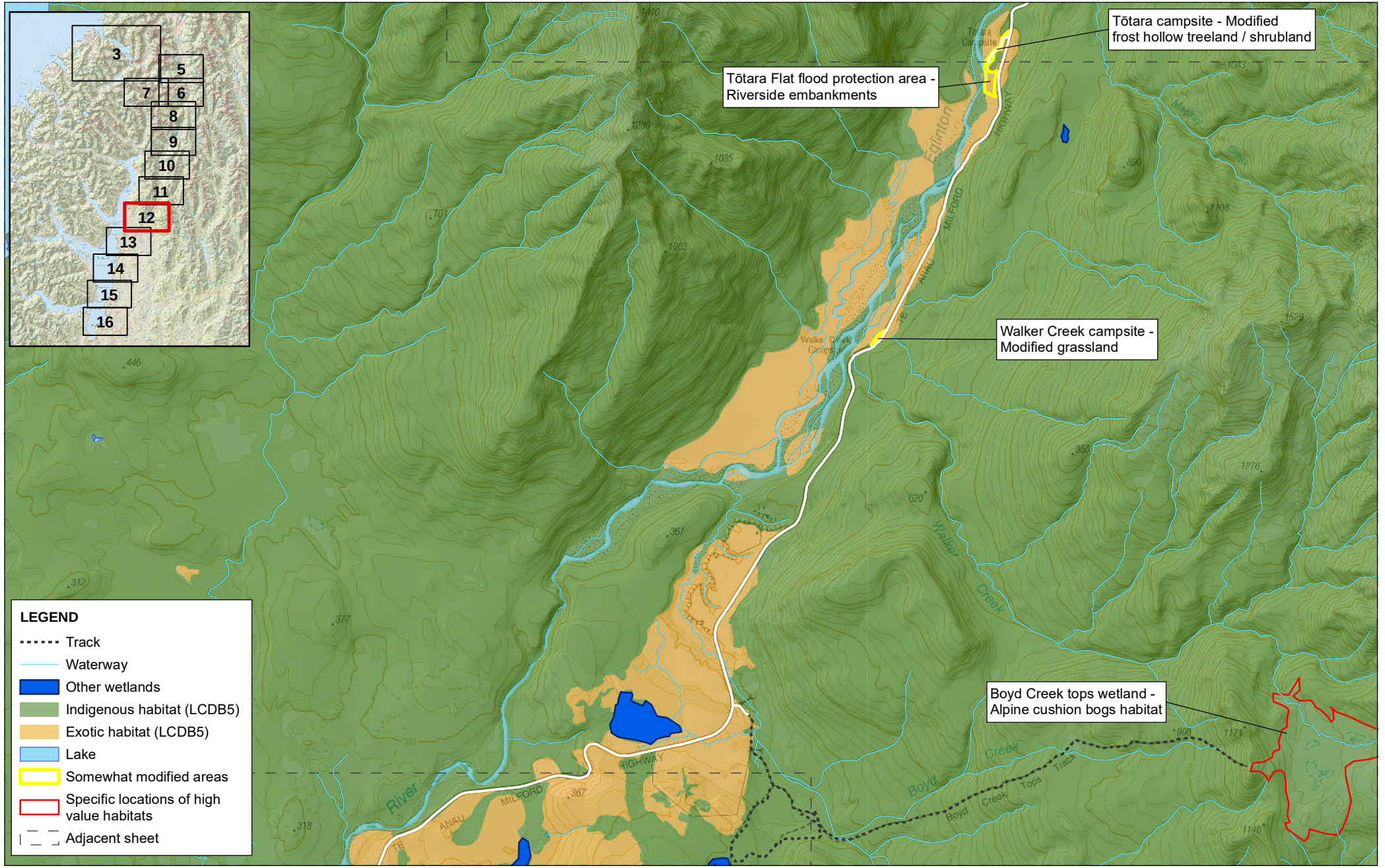
Areas of Specific Conservation Value or Habitat Modification

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 11



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

Areas of Specific Conservation Value or Habitat Modification

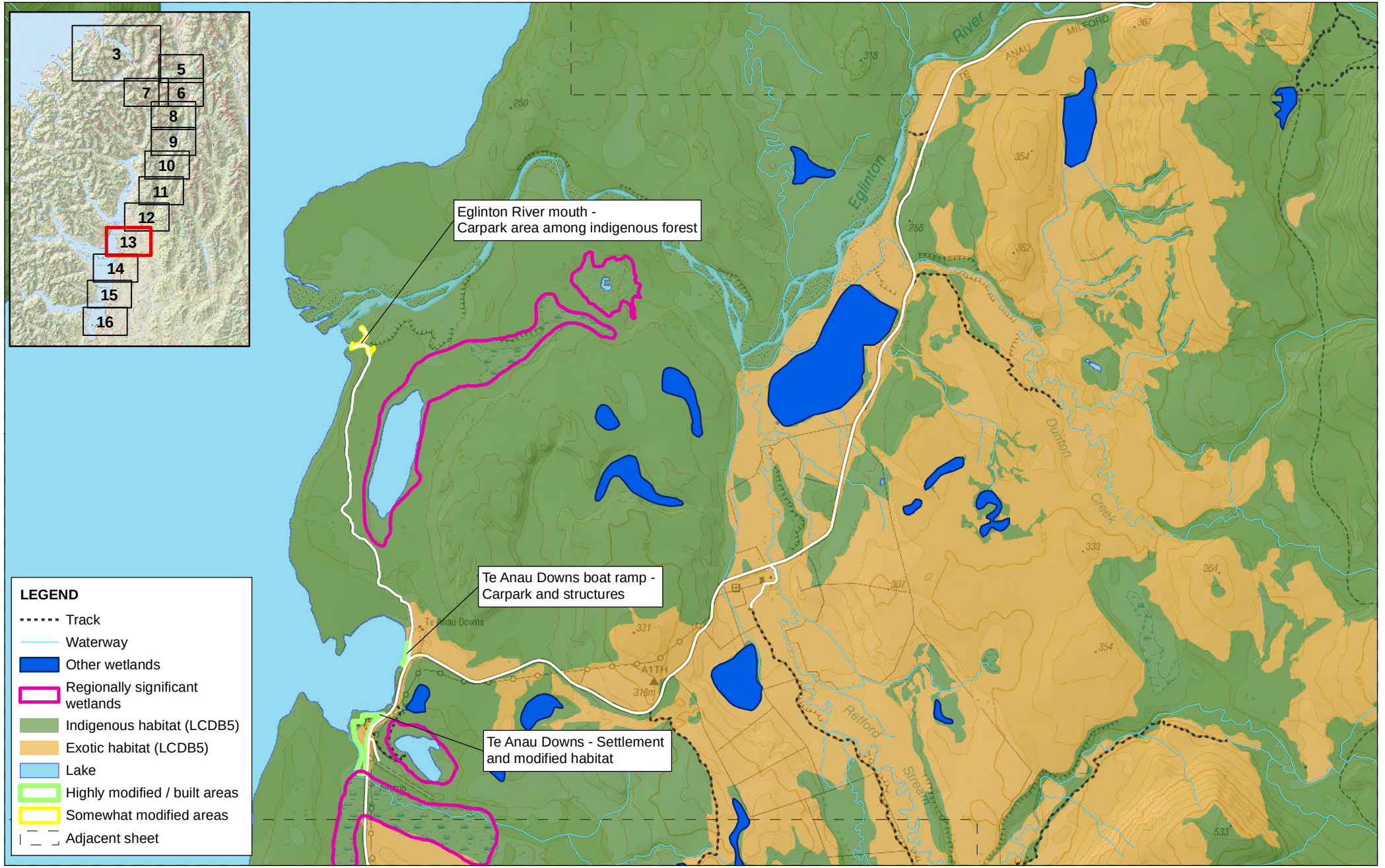
Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 12

File Ref: BM19772A_004_A4L_MLLM_MilfordCorridor.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

Areas of Specific Conservation Value or Habitat Modification

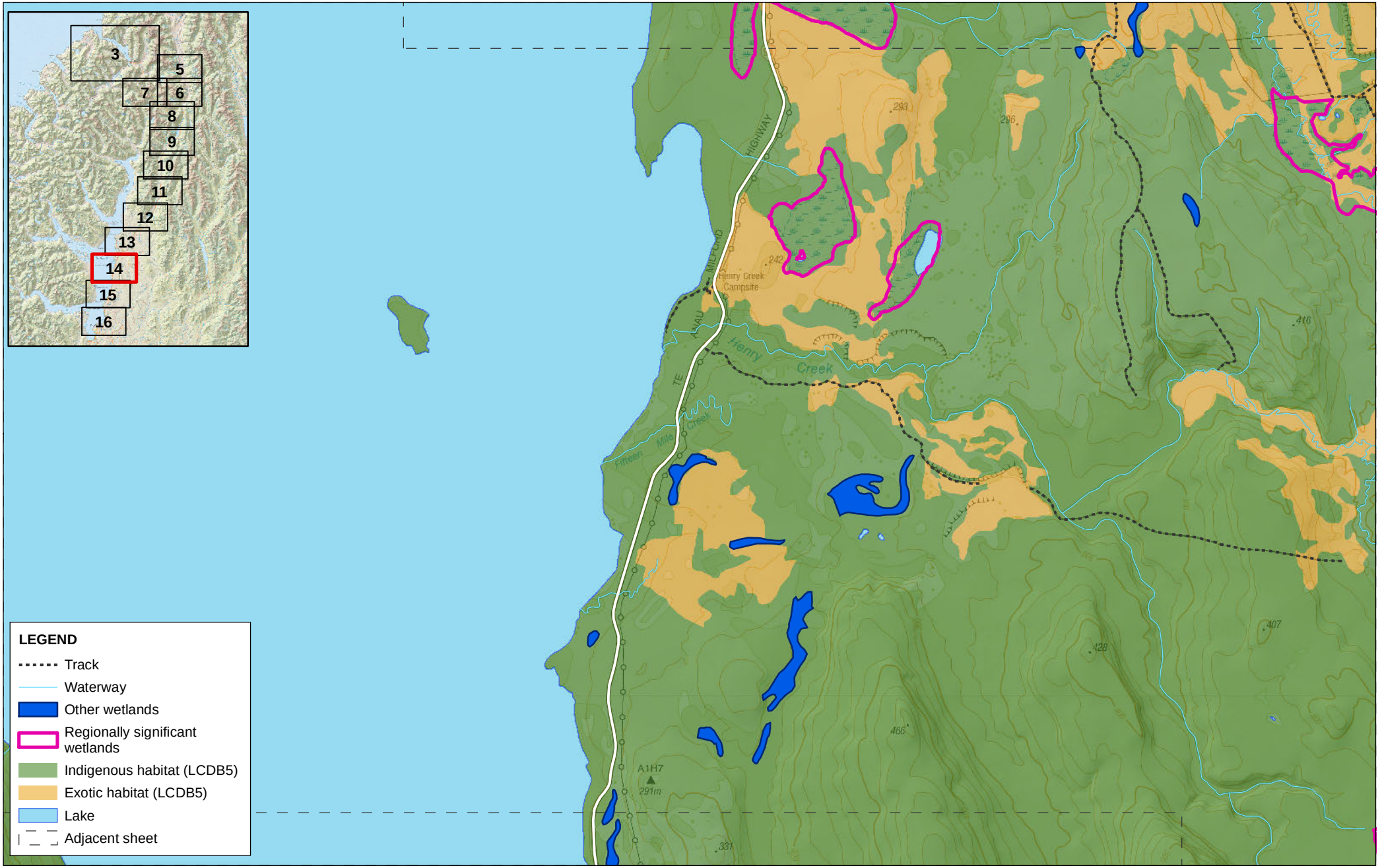
Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 13

File Ref: BM19772A_004_A4L_MLLM_MilfordCorridor.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

Areas of Specific Conservation Value or Habitat Modification

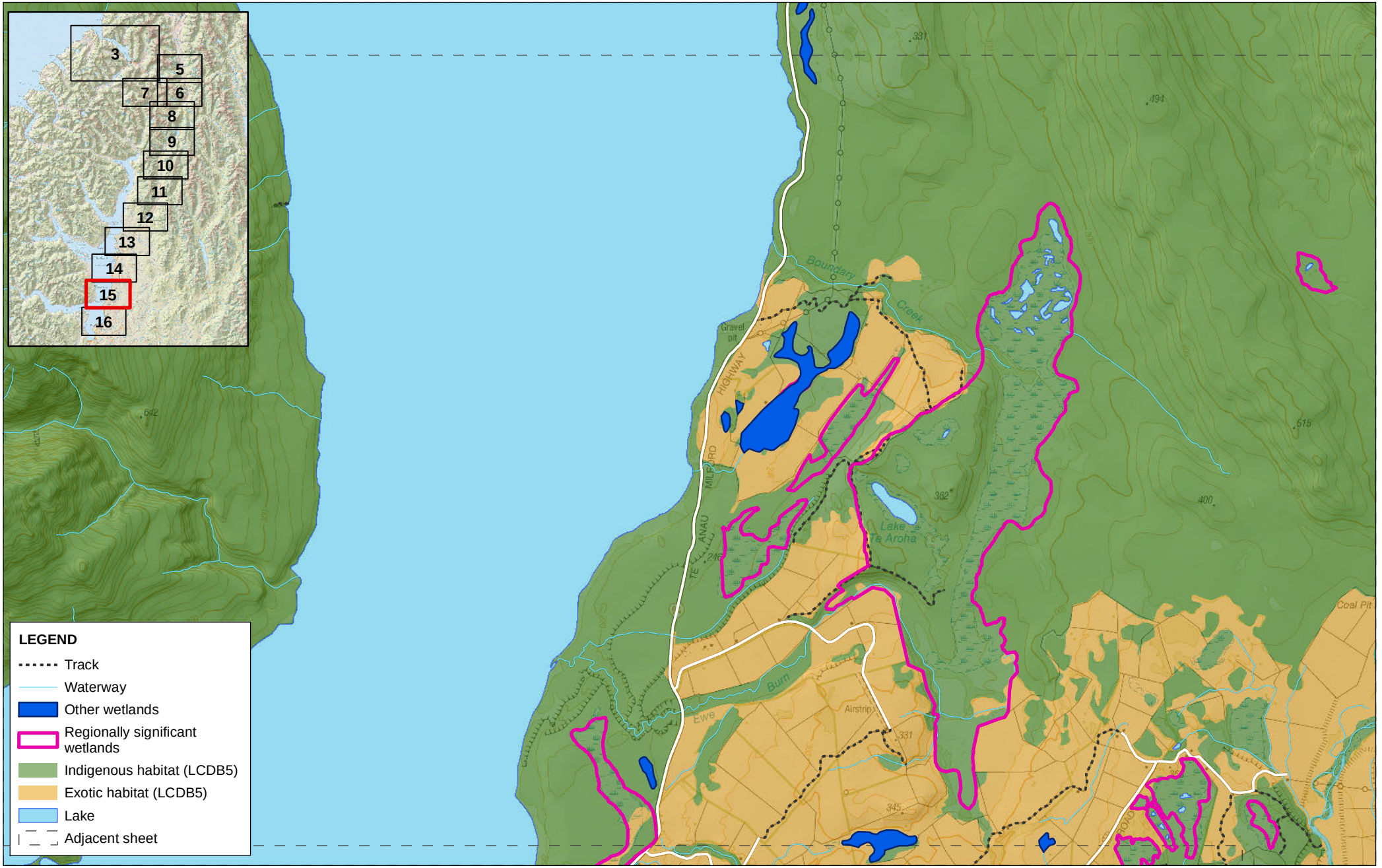
Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 14

File Ref: BM19772A_004_A4L_MLLM_MilfordCorridor.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

Areas of Specific Conservation Value or Habitat Modification

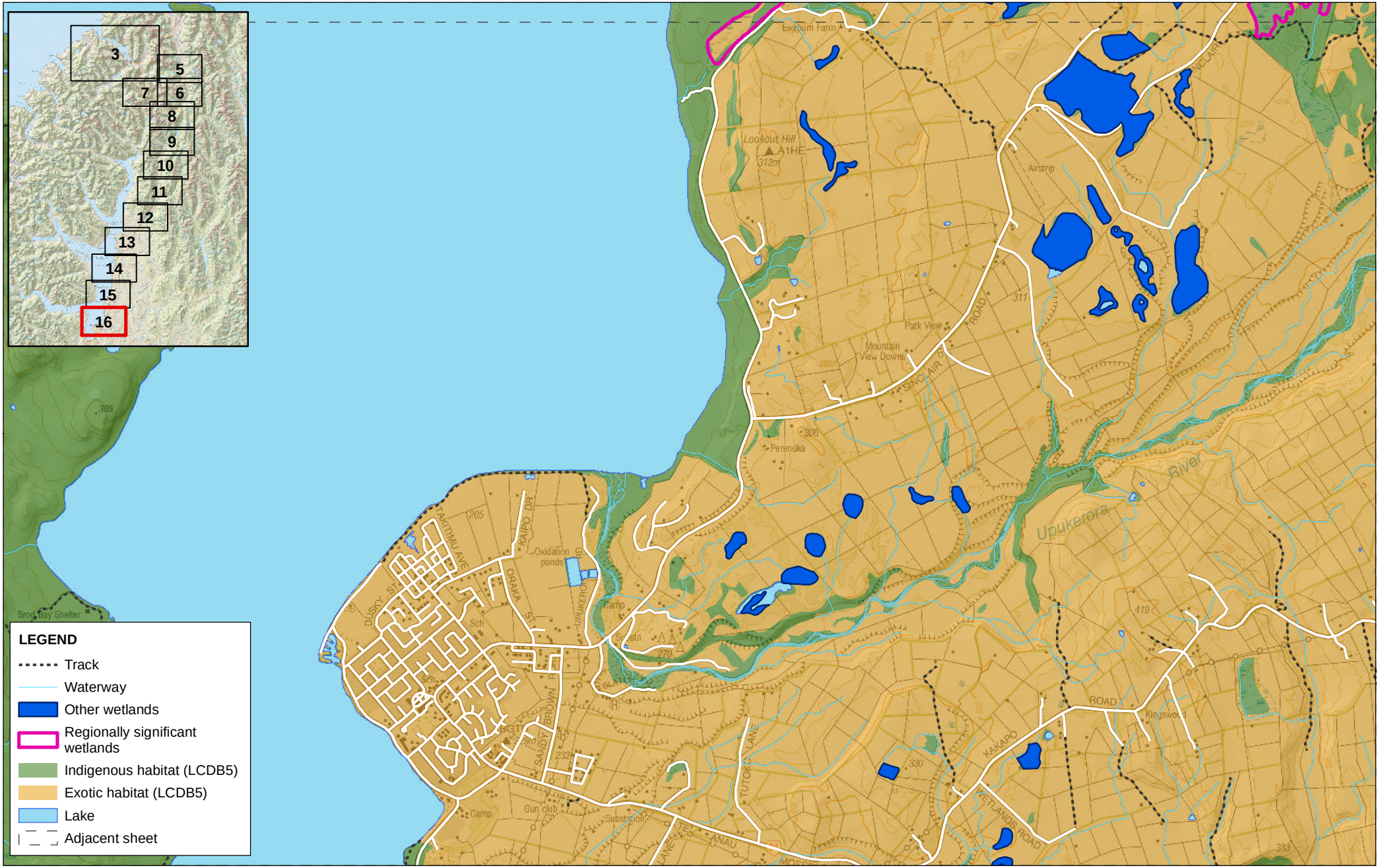
Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 15

File Ref: BM19772A_004_A4L_MLLM_MilfordCorridor.mxd



Boffa Miskell

www.boffamiskell.co.nz

0 1 km

1:50,000 @ A4

Projection: NZGD 2000 New Zealand Transverse Mercator

Data Sources:
Tracks sourced from DOC and LINZ Topo 50 map series
Land Cover database sourced from Ministry for the Environment
Lakes , Waterways sourced from LINZ Topo 50 map series
Wetlands sourced form Environment Southland and LINZ Topo 50 map series, Boffa Miskell

PIOPIOTAHI / MILFORD OPPORTUNITIES PROJECT

Areas of Specific Conservation Value or Habitat Modification

Date: 04 December 2020 | Revision: 0

Plan prepared for Southland District Council by Boffa Miskell Limited

Project Manager: scott.hooson@boffamiskell.co.nz | Drawn: BMc | Checked: JMo

Figure 16