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TASMAN AND NELSON COASTAL MARINE ENVIRONMENTS: HABITATS AND INDIGENOUS BIODIVERSITY

TASMAN AND NELSON COASTAL MARINE ENVIRONMENTS: HABITATS AND INDIGENOUS BIODIVERSITY

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EXECUTIVE SUMMARY

Tasman District Council (TDC) and Nelson City Council (NCC) are currently reviewing their regional coastal plans (RCPs). As part of this process, the councils are required to review the provisions that protect sites of significant indigenous biodiversity within the coastal environment. To support the RCP reviews and to give effect to Policy 11 and other policies in the New Zealand Coastal Policy Statement 2010 (NZCPS; DOC 2010), NCC and TDC want to gather information regarding the indigenous biodiversity values of the coastal environment and the effects of activities on those values, as well as develop a policy response for the RCPs. To this end, NCC and TDC have initiated a marine and coastal indigenous biodiversity project, with four stages (Stage 1: Literature and data review, Stage 2: Assessment, Stage 3: Management, and Stage 4: Maintenance).

Cawthron Institute (Cawthron) and three collaborators (Salt Ecology, National Institute of Water and Atmospheric Research [NIWA], and Davidson Environmental Ltd) were contracted to carry out Stage 1. This report is one of five (relating to seven topics) that represent the outputs from Stage 1:

- Bathymetry (Report 1)
- Hydrosystems (Report 1)
- Habitats (Report 2a)
- Indigenous biodiversity (Report 2a)
- Historical data (Report 2b, TDC only)
- Publicly available sites of significance to iwi (Report 3, TDC only)
- Effects of activities (Report 4, TDC only).

The current report (2a) considers the topic of indigenous biodiversity for the Nelson and Tasman Regions. In summary, the scope was to collate information found during a literature and data search into a spatial data inventory as geographic information system (GIS) layers. Unavailable data and information gaps for habitat and indigenous biodiversity spatial data were also to be summarised. High-level assessment of the significance of (based on Policy 11 and Key Ecological Area [KEA] criteria), and threats in respect to, habitats and biodiversity was also carried out.

Key information for mapped data relating to habitats and indigenous biodiversity in the Nelson and Tasman Regions are presented. This includes group and layer names, data source, format and description. The group and layer names relate directly to those in the spatial data inventory.

Key data collated for habitats and indigenous biodiversity relate to:

- Coastal environment
- Natural character

- Significant natural areas
- Outstanding natural landscapes and features
- Protected areas
- Broadscale estuarine habitats – substrates, water, estuary, intertidal, seagrass, saltmarsh, zootic habitats
- Nelson Bays ecosystems map: saltmarsh, seagrass, duneland, refugia, sponge garden, reef, bryozoans, tubeworms, rhodoliths, shell bank, oysters, mussels, sediments
- Marine reserve habitat maps and seabed survey
- Other significant marine communities / areas
- Wetlands
- Land cover data
- National-scale benthic habitat maps
- Biodiversity: New Zealand seagrass database, horse mussels, other bivalves, bryozoans, macroalgae, marine mammals, birds, Back Beach beetle, fish, crayfish, pāua, sea sedge, tubeworms.

Unavailable data or other relevant information identified include:

- Those related to multibeam survey of shipping lanes entering Nelson Haven
- Data on fishing effort and resources from Fisheries New Zealand, which for reasons of commercial sensitivity are generally restricted or available only at a coarse spatial or temporal resolution.

A range of other data that are (potentially) available but were not mapped in this project are also outlined.

Information gaps include mapping for most invertebrates as species or assemblages. Gaps also include ground-truthed modelling based on environmental data properties to provide indications of likely distribution of plants and animals, although some data are included in the spatial data inventory. While surveying all habitats systematically in the Tasman and Nelson Regions is ideal, prioritisation of areas based on the probability that they support important habitats and associated communities / species is suggested as a practical solution to the issue of information gaps and funding availability. We therefore score survey prioritisation for nine key biogenic habitats based on a variety of criteria.

In general, all habitats and indigenous biodiversity assessed are considered significant (or potentially significant) in respect to Policy 11 and KEA criteria. Multiple threats are also identified for all habitats and biodiversity assessed.

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1.1. Context

Tasman District Council (TDC) and Nelson City Council (NCC) are currently reviewing their regional coastal plans (RCPs). As part of this process, the councils are required to review the provisions that protect sites of significant indigenous biodiversity within the coastal environment.

To support the RCP reviews and to give effect to Policy 11 and other policies in the New Zealand Coastal Policy Statement 2010 (NZCPS; DOC 2010), NCC and TDC want to gather information regarding the indigenous biodiversity values of the coastal environment and the effects of activities on those values, as well as develop a policy response for the RCPs. To this end, NCC and TDC have initiated a marine and coastal indigenous biodiversity project, with the following four stages.

Stage 1: Literature and data review – collate existing marine and coastal indigenous biodiversity information, including spatial data; categorise the existing literature and data against the requirements of Policy 11 (NZCPS); and prepare reports based on the gathered data. The scope of the project includes assessing the quality of the literature and data and identifying any gaps in information. As part of the review, some information relevant only to TDC is reported and mapped for use in separate NZCPS work streams.

Stage 2: Assessment – determine the assessment criteria to identify sites of significance and assess the sites against these criteria, with the assistance of an expert panel and an iwi working group established by NCC and TDC. Field investigations may be required as part of this stage.

Stage 3: Management – determine locations for management, activities significantly affecting the sites of significance, and methods of protection.

Stage 4: Maintenance – add and assess new information as it becomes available. The project will continue and evolve beyond Stages 1–3.

Cawthron Institute (Cawthron) and three collaborators (Salt Ecology, National Institute of Water and Atmospheric Research [NIWA], and Davidson Environmental Ltd) were contracted to carry out Stage 1. This report is one of five that represent the outputs from Stage 1. We understand that Stages 2, 3 and 4 will follow on from this.

1.2. Stage 1 reports

The Stage 1 literature and data review is organised into seven topics that are presented in five reports:

- Bathymetry (Report 1)

- Hydrosystems (Report 1)
- Habitats (Report 2a)
- Indigenous biodiversity (Report 2a)
- Historical data (Report 2b; TDC only)
- Publicly available sites of significance to iwi (Report 3; TDC only)
- Effects of activities (Report 4; TDC only).

Key reference information for data sources, reports and publications is provided in each of the above reports.

1.3. This report and its associated spatial layers

This report, 2a in the series, considers two topics: habitats and indigenous biodiversity. For the habitats and indigenous biodiversity topics, we undertook a literature and data search and summarised the information (including spatial information) for the Nelson and Tasman Regions (see also additional details on scope in Sections 1.31 and 1.32). The spatial geographic information system (GIS) layers obtained have been collated into a spatial data inventory and provided to NCC and TDC as an output of the overall project (Appendix 1). The spatial boundaries for our study relate to polyline features delineating the coastal environment for each council; these are included in the map data and were used to subset larger datasets to the coastal area where this was possible. We have also included some fine-scale environmental monitoring data (in relation to both habitats and indigenous biodiversity), although these are not exhaustive given that this was beyond the scope of the project. Unavailable data and information gaps for habitat and indigenous biodiversity spatial data were summarised. Information relevant to NZCPS Policy 11 (Appendix 2), and criteria for assessing Key Ecological Areas (KEA) for marine protected area planning in Aotearoa New Zealand (KEA; Appendix 3) and identifying threats (Appendix 5), are also provided (see methods Section 1.3.3). Reference information can be found in the Data sources section (Appendix 4) and the References section (Section 6).

Historical information on Tasman coastal and marine environments is presented in Report 2b of this project (Handley et al. 2023a).

1.3.1. Habitats

Information on habitats found in the literature and data search is presented in GIS layers in the spatial data inventory (Appendix 1) and relates to the following (where availability allows):

- Extent of important marine and estuarine habitats (from broadscale habitat mapping)

- Habitats that are important during the vulnerable life stages of indigenous species (Policy 11(b)(ii) NZCPS)
- Habitats of indigenous species that are important for recreational or commercial purposes (Policy 11(b)(iv) NZCPS)
- Habitats of indigenous species that are important for cultural or traditional purposes (Policy 11(b)(iv) NZCPS)
- Habitats, areas and routes that are important to migratory species and linking corridors (Policy 11(b)(v) and (iv) NZCPS)
- Areas of predominantly indigenous vegetation in the coastal environment (Policy 11(b)(i) NZCPS)
- Indigenous ecosystems that are particularly vulnerable to modification (Policy 11(b)(iii) NZCPS).

Information on Policy 11 relevance to habitat data in the spatial data inventory is shown in Appendix 4.

1.3.2. Indigenous biodiversity

Information on indigenous biodiversity found in the literature and data search is presented in GIS layers in the spatial data inventory (Appendix 1) and relates to the following (where availability allows):

- The location of areas used by Threatened and At Risk taxa (New Zealand Threat Classification System [NZTCS], International Union for Conservation of Nature [IUCN] classification system[1]), including marine mammals, birds, saltmarsh vegetation, marine invertebrates and algae (Policy 11(a)(iii) NZCPS)
- The location of indigenous ecosystems and vegetation that are threatened or naturally rare or contain nationally significant examples (Policy 11(a)(iii) and (v) NZCPS)
- The location and prevalence of marine mammals, seabirds and other migratory species in the region
- The location of all marine reserves, taiāpure, mātaitai, marine mammal sanctuaries and any other area under some form of protection (Policy 11(a)(iv) NZCPS)
- Habitats that are important during the vulnerable life stages (Policy 11(b)(ii) NZCPS)
- Any other matter identified in Policy 11 of the NZCPS and not listed elsewhere.

Information on Policy 11 relevance to indigenous biodiversity data in the spatial data inventory is shown in Appendix 4.

[1] The NZTCS lists more taxa than the IUCN Red List because effort has been made to include as many species as possible and there are regular triennial updates when new species can be added (Department of Conservation 2019). Therefore, we focused only on Policy 11(a)(i), rather than Policy 11(a)(ii) (see Appendix 2) in our assessment.

1.3.3. Assessment of significance of, and threats to, identified areas or values

This report provides detail on the ecological values of, and threats to, the habitats and biodiversity (to the extent possible) (Appendices 4 and 5, respectively), to enable further, more detailed assessment of significance under Stage 2 of this project.

In our Stage 1 assessment, significance was assessed in terms of the criteria in NZCPS Policy 11 and in the KEA approach (Appendices 2 and 3, respectively). The KEA criteria were developed by the Department of Conservation (DOC), the Ministry for Primary Industries (MPI) and the Ministry for the Environment (MfE) at a workshop in 2016 to identify sites for marine protected areas (Freeman et al. 2017 cited in Stephenson et al. 2018). Our preliminary assessment of significance was made at a high level using the information at hand (largely information in Appendix 4), as well as expert opinion, and therefore inevitably involved some subjectivity. A more detailed assessment of significance will be possible when sites of significant indigenous biodiversity have been identified (Stage 2). Additional details and / or comments on our approach to this are as follows:

- Policy relating to protected areas was indicated specifically only for those protected areas, not for other layers that may have overlapped with a protected area.
- A question mark was used to indicate potential significance in respect to policy and / or criteria relevance but that this is currently unknown based on high-level assessment. More detailed future assessment is required, noting that data gaps to inform this may be present in some cases.
- It was considered beyond the scope of this project to assess fine-scale monitoring data for Policy 11 and KEA relevance.

In our Stage 1 assessment of threats, we evaluated threats at a general, broadscale level for each individual (or group) data layer in the spatial inventory (Appendix 1) and in more detail in Report 4 (Handley et al. 2023b). Our general-level assessment in this report uses the threats to coastal marine and coastal terrestrial areas identified by Boffa Miskell (2015a, 2022) for values in the Nelson and Tasman Regions, respectively. Boffa Miskell (2015a) identified likely possible threats to coastal marine and coastal terrestrial areas in Nelson that hold high and very high levels of natural character. Boffa Miskell (2022) relates to coastal natural character assessment (NCA) and includes comments on threats to Tasman Region coastal marine areas. The threat information obtained from these reports was joined to natural character polygons generated by these studies and supplied by each council. Where these polygons intersected spatial data representing habitats or biodiversity, the threats considered relevant to each data layer were extracted to a table. This exercise could not be conducted at individual location level for all the data layers within the scope of this project, so a compiled list of threats for each layer is provided with some additional information about specific areas in some cases.

Although Boffa Miskell (2015a, 2022) give a general overview of threats, a limitation of their reports is that they have not identified all key threats – for example, some of those related to climate change, such as marine heatwaves and ocean acidification. Our approach identified some additional threats from the literature, as well as relying on expert opinion, and in some cases also identified threats from GIS layers, including those outlining fishing restrictions (see Appendix 4); however, note that these are not based on an exhaustive literature search.

Additional details and / or comments on our approach to assessing threats are as follows:

- Based on our approach above, we could assess threats to habitat and biodiversity only within areas classed as having high or very high natural character. We were not able to assess threats within some areas – for example, parts of Waimea, Motueka and Moutere estuaries; coastline between Māpua and Moutere; Tāhunanui to Nelson Haven; parts of Nelson Haven; some terrestrial areas.
- Many of the threat polygons are large scale (e.g. Golden Bay / Mohua nearshore and estuaries), so not all threats may be relevant for smaller-scale locations within these greater areas.
- Some threats may not be relevant for specific species or habitats. Using our expert opinion, we therefore removed those not considered relevant.

More detailed assessment of threats to specific sites of significant indigenous biodiversity will be possible when these sites have been identified (Stage 2). There are likely to be a large number of reports containing more detailed threats information for habitats and biodiversity in the Tasman and Nelson Regions. Examples of such reports include vulnerability assessments of key estuary stressors in the Tasman and Nelson Regions (Robertson and Stevens 2008, 2012; Stevens and Robertson 2010, 2017b), effects of selected activities on shorebirds in Tasman District (Melville and Schuckard 2013) and previous NCC reports on Significant Natural Areas (SNAs). See also report 4 of this project (Handley et al. 2023b) for more detailed information regarding effects of activities for the Tasman Region.

1.3.4. Note on mapping

Species distributions overlap, and there is a lack of certainty regarding these and habitat distributions. As a result, from an ecological perspective it is unrealistic to attempt to map all relevant habitats and species ranges at a fine scale, and it is not advisable to strictly define areas in the Nelson coastal marine area that should be included in, or excluded from, categorisation as important to the protection of coastal indigenous biodiversity. Mapping should therefore not be the primary tool used to identify areas important to the protection of indigenous biodiversity. Nonetheless, mapping is widely used by councils to identify biodiversity and other natural values, and so it may complement the descriptive approach.

Some areas are easily spatially delineated and mapped – most obviously those whose boundaries are already described in legislation, such as marine reserves. Many other parts of the coastal area have also been mapped – for example, broadscale surveys of estuaries usually involve mapping the extent of estuarine habitat types such as unvegetated substrates and vegetated habitats (e.g. Stevens and Robertson 2017a), substrate imaging and descriptive transects have been conducted in and around the Horoirangi Marine Reserve (McLean and Grange 1995; Grange and Cole 1996; Cole et al. 2003; Davidson 2006), and estuarine sponge gardens have been mapped in Waimea Inlet (Asher et al. 2008). Known habitats of some individual species (e.g. roosting sites of threatened species) have also been identified (although areas have not necessarily been delineated) at some sites (e.g. Schuckard and Melville 2013). Inclusion of such maps in plans may be appropriate. However, care should be taken to avoid any implication that mapped habitats are necessarily of higher importance to the protection of indigenous biodiversity than habitats that do not appear on maps. Maps also represent a point in time and may no longer represent current habitats.

The extent to which maps are incorporated into planning documents warrants consideration, as mapping of information available at one point in time may limit the accuracy and longevity of the information incorporated into the plan. This is due to some of the challenges of mapping, including that:

- Habitats may move (e.g. seagrass and shellfish beds)
- Knowledge of species and habitat distribution may be limited (e.g. coastal sponge and bryozoan gardens)
- Historical habitat that has been degraded or lost cannot be mapped (e.g. shellfish reefs, seaweed communities, more extensive seagrass beds)
- Some species use nearly the whole coastal marine area (e.g. seabirds, marine mammals)
- Presence of threatened species is indicated only where observations have been made in the mapped data. Mapped information is not exhaustive with regard to species presence. This includes for mobile species that may come and go.

Although mapping provides apparent certainty, in many cases it will not be a true reflection of the state of knowledge about a habitat. It is therefore important to recognise uncertainty when mapping species distributions and habitats. While change and uncertainly are still assured with descriptive information, it is more adaptable and can reflect the true situation and capture the range of issues present in the marine environment. It also potentially allows improved knowledge to be incorporated in decision-making at a later stage.

2. DATA SOURCES

This section on data sources contains an overview of the types of information mapped, key information and maps for the spatial data, and a summary of unavailable data and other relevant information. As previously mentioned, the spatial boundaries for our study relate to polyline features delineating the coastal environment for each council; these are included in the map data and were used to subset larger datasets to the coastal area where this was possible.

2.1. Overview

Below we describe the types of data relating to habitats and biodiversity that are included in our spatial data inventory (Appendix 1).

2.1.1. Types of information mapped

Types of information mapped include the boundaries of marine protected areas, including three marine reserves, the Wakapuaka taiāpure and the Separation Point / Te Matau (hereafter Separation Point) fisheries exclusion zone. Other spatial layers contain broad habitat classes that are distributed widely through the Nelson and Tasman coastal areas – for example, subtidal soft sediments, intertidal and subtidal rocky reefs, intertidal estuarine habitats and substrates. Other types of information include community classifications, such as the national-scale map showing Aotearoa New Zealand seafloor classifications.

Habitat- or species-specific data layers include biogenic habitats and habitat classes found in limited locations (e.g. the limestone habitat and biological community at Taupō Point). Examples of biogenic habitats are horse mussel beds, rhodolith beds, red algal beds, tubeworm mounds, bryozoan beds, sponge gardens and seagrass beds. Mapping of non-habitat-forming species is restricted to larger, more easily observed taxa, namely birds and marine mammals.

A range of surveys and observations detail the composition of the subtidal seabed within Tasman Bay / Te Tai-o-Aorere (hereafter Tasman Bay) and Golden Bay / Mohua (hereafter Golden Bay). Data sources that recorded the historically more structured seabed are presented in Appendix 4 (see also Handley et al. 2023a – Tasman Region only). Areas of remnant biogenic structure do, however, occur in some areas (intertidal and / or subtidal). These include horse mussel beds, tubeworm mounds, rhodolith beds, red algal beds, bryozoan and bivalve beds, sponge gardens and seagrass beds (see Appendix 4 tables for mapped data).

2.2. Mapped data

Datasets available in spatial format (shapefiles, file geodatabase feature classes, rasters) were imported to an ArcGIS Pro (version 3.0.1) map document and geodatabase, or were added directly from source via online resources (e.g. ArcGIS Online, DOC and MPI map data portals, SeaSketch projects). In some cases, point feature classes were created from coordinates in reports (e.g. sampling sites) and polygon feature classes were created by digitising georeferenced report figures (e.g. marine reserve habitat maps). The utility of some datasets was improved by extracting information from reports and joining (appending) this to corresponding spatial data (e.g. Natural Character polygons).

Key details for mapped data are outlined in Appendix 4. These include group and individual layer names (as they appear in the spatial data inventory; Appendix 1), data format and details, description and source reference. Information on the relevance of the layers to NZCPS Policy 11 and KEA, as well as identified threats, is also given in Appendices 4 and 5, respectively. See Section 1.3.3 for details on how these significance and threat assessments were carried out, including their limitations.

The ArcGIS Pro project package (special data inventory) supplied in Appendix 1 comprises a geodatabase of data layers and a series of maps for display and exploration purposes. Data layers listed in this report are shown in the Habitats and Biodiversity map, organised into the following group layers:

- Coastal environment
- Natural Character and Significant Natural Areas
- Outstanding natural landscapes and outstanding natural features
- Protected areas
- Habitats
- Biodiversity.

The project package also contains maps presenting the data layers collated for the other reports in this overall project (Berthelsen et al. 2023a, 2023b; Handley et al. 2023a, 2023b).

In the map's contents panel (shown in Figure 1), group layers and sub-groups can be expanded to view and turn on or off individual data layers. Metadata can be accessed through layer properties and / or are provided in Appendix 4.

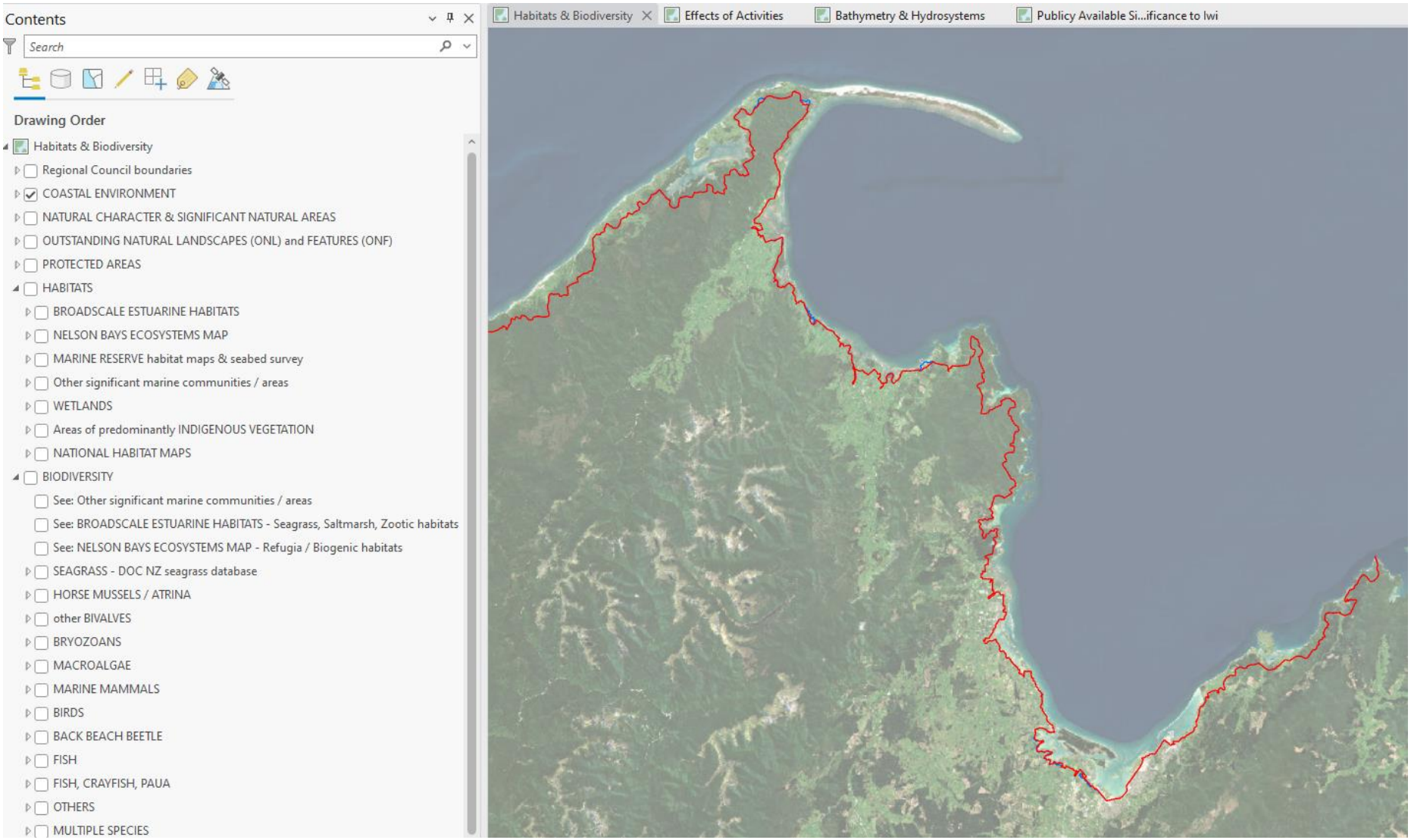

Figure 1. Screenshot of our ArcGIS Pro project package to demonstrate the layout to package users.

2.3. Unavailable data

Data sources that we are aware of, but that were unavailable to this project (either due to being incomplete or to data restrictions), include:

- Multibeam survey of shipping lanes entering Nelson Haven. Areas adjacent to the shipping lanes were added to the survey at the request of DOC,[2] and data are expected to become available in 2023.
- For reasons of commercial sensitivity, data on fishing effort and resources from Fisheries New Zealand are generally restricted or available only at a coarse spatial or temporal resolution. Relevant datasets include:
    - Historical information on density distributions of shellfish in the Nelson Bays
    - Spatial data on habitat distributions underlying the local ecological knowledge maps presented by Jones et al. (2016, 2018).

Other data that are (potentially) available but, for reasons given, were not mapped in this project are listed in the following section.

2.4. Other relevant information

2.4.1. Descriptions of Significant Natural Areas (SNAs) in the Nelson Region

Thirty-four SNAs, or Potential SNAs, within the coastal environment of the Nelson Region have been included in the spatial data inventory. The polygons contain references to individual assessments of the ecological significance of these sites, made in 1999 and / or 2007–09. Each assessment report provides a description of the characteristics of the site based on a site visit, including landscape values, geology, types of vegetation present, notable indigenous plant and animal species present, introduced plant and animal species present, the condition of the plant communities present and management issues associated with the site. The site was then assessed against primary significant criteria of representativeness, rarity, and distinctiveness and diversity. Secondary assessment criteria include the size and shape of the site; how well it is connected to, and buffered by, other natural areas; whether it provides critical resources to mobile species; and how well it can sustain itself without intervention.

These assessments contain potentially useful descriptive information on types of habitat, species diversity and ecological value. To improve the utility of the spatial data, this information would ideally be extracted from each report and appended to the corresponding SNA polygon. This process could not be completed within our project as the effort required to extract this additional information from the reports was beyond the scope. In addition, the value of the information may be limited by the fact

[2] Details can be found at https://www.linz.govt.nz/resources/strategy/hyplan-new-zealand-long-term-prioritised-hydrographic-survey-plan

that none of the data are recent and some are more than 20 years old. By agreement with NCC,[3] we have not included this information in the dataset.

2.4.2. Data used in the review of New Zealand's key biogenic habitats

The 2019 review by Anderson et al. on New Zealand's key biogenic habitats extracted data from multiple sources. We have included species- or habitat- specific data from this review in our spatial data inventory (Appendix 1), but these sources may also provide additional information relevant to this project – for example, they may be updated over time. See Anderson et al. (2019) for detailed information on these data sources.

2.4.3. Miscellaneous information on macroalgae

Nelson et al. (1992) compiled a list of marine macroalgae from collections in the National Museum in Wellington (now the Museum of New Zealand Te Papa Tongarewa), the herbarium of the DSIR Botany Division in Lincoln (now the Allan Herbarium, Manaaki Whenua – Landcare Research) and Flora Novae-Zelandiae. The list of species includes records of the original collection sites, which cover the coast from Kahurangi Point to the Marlborough Sounds. There are also brief notes on the habitat in which each species was found.

Macroalgal specialists from NIWA have made more recent collections of *Porphyra* / *Pyropia*, Gelidiales and *Ulva* in Nelson Bays, and opportunistic collecting at Whahariki in the Tasman Region in 2021. Lists of the species collected may be obtainable from NIWA (Wellington) on request (Roberta D'Archino, NIWA Wellington, pers. comm.). Records of macroalgae from the region may be obtainable from the herbarium of the Museum of New Zealand Te Papa Tongarewa.

2.4.4. Environment-based modelling of species distributions

Smith et al. (2013) used statistical models (boosted regression trees) and a suite of environmental and other variables to predict and map the occurrence and relative abundance of 72 species of rocky reef fish at a scale of 1 km^2 grid. The models identified the environmental variables that are ecologically important for these species and broadscale relationships between reef fishes and their environment. The authors highlighted the value of these spatially explicit data in the management of coastal biodiversity, including marine spatial planning and the identification of high-priority areas for conservation. Distribution maps derived from these models, and similar models for marine macroalgae, benthic invertebrates and demersal fish, are available on DOC's Marine Data Portal.[4] Given the large number of species mapped (several hundred), we have not imported the spatial data into our database, although we did provide data for one species (*Zonaria turneriana*) as an example (see Appendix 1).

[3] Email from Jane Doogue, NCC, to Don Morrisey, Cawthron, 9 December 2022.
[4] https://doc-marine-data-deptconservation.hub.arcgis.com

Petersen et al. (2020) and Stephenson et al. (2021) used Gradient Forest models to produce a numerical classification of the Aotearoa New Zealand marine seafloor environment and communities (see also Appendix 1 and key information in Appendix 4). The following provides more detailed information to that summarised in Appendix 4:

- The model combined data for 33 environmental variables (on a 250 m grid from the coast out to the 12-nautical-mile limit and a 1 km grid between 12 nautical miles and 200 nautical miles offshore) with occurrence records for demersal fish (317 species), reef fish (92 species), benthic invertebrates (958 genera) and macroalgae (349 species). The resultant 'seafloor community classification' consisted of 75 groups, four of which occurred within the Nelson Bays study area.
- These groups included an area (Group 32) on the northwest coast of the South Island continental shelf in highly productive coastal waters, characterised by moderate concentrations of oxygen and nitrate, and high temperatures at depth. Benthic invertebrate assemblages in this group were characterised by polychaetes and echinoderms; demersal fish assemblages by dogfish, barracouta and cod; and macroalgal assemblages by a red algal species.
- Another area (Group 34) in shallow coastal waters on the northern part of the South Island, including outer Tasman and Golden Bays, was characterised by moderate concentrations of oxygen, low levels of dissolved nitrate, and high temperatures associated with elevated productivity. Benthic invertebrate assemblages here were primarily characterised by sponges and brittle stars; demersal fish assemblages by barracouta, gurnard and dogfish; reef fish assemblages by wrasse and triplefin; and macroalgal assemblages by kelp and a green alga.
- Another area (Group 53), occurring partly in the shallow coastal waters of Golden Bay, was characterised by relatively high-temperature waters and low concentrations of nitrate and silicate, with elevated productivity and large seasonal differences in bottom temperature. Benthic invertebrate assemblages were characterised by cephalopods, hydrozoans and brachiopods; demersal fish assemblages by demersal cod, tarakihi and gurnard; reef fish assemblages by triplefins and wrasse; and macroalgal assemblages by several species of brown algae.
- The final area (Group 55), in the shallow coastal waters of Tasman and Golden Bays, was characterised by low concentrations of nitrate and silicate, associated with elevated productivity, had large seasonal differences in bottom temperature, and had high seabed disturbance and moderate to high tidal currents. Benthic invertebrate assemblages were characterised by sea urchins, hydrozoans, crabs and bivalves; demersal fish assemblages by gurnard, barracouta and flounder; reef fish assemblages by triplefin and wrasse; and diverse macroalgal assemblages by several species of brown and red algae.

2.4.5. Information from remote sensing (satellite images)

Several sources of information derived from satellites are publicly available and provide data relevant to this project. Because these data are constantly updated, we have not included them in the project database. They are more appropriately accessed on an as-needed basis. NASA's Ocean Colour Web[5] provides remote-sensing (satellite) data on light absorption and scatter by suspended particulate matter, water clarity, chlorophyll-*a* concentration, light energy at the seabed, photosynthetically active radiation (PAR), sea-surface temperature and total suspended solids. NIWA's SCENZ[6] GIS image service provides water quality products with information on a similar range of variables. Both use the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on NASA's Aqua satellite. The potential of satellite remote sensing for monitoring suspended sediment and its effects on water clarity is discussed by Pinkerton et al. (2022). Remote sensing can also be used for other purposes, such as to map extent of habitats over time.

2.4.6. Distributions of non-indigenous species

The Marine Biosecurity Porthole[7] is a collaboration between MPI and NIWA to provide access to information and data on non-indigenous marine species (NIMS) in Aotearoa New Zealand (Seaward et al. 2015). It is primarily an interactive mapping application that displays verified observations on the distribution of NIMS within Aotearoa New Zealand using data compiled from a range of funded surveys for NIMS, including a series of port biological baseline surveys and a continuing programme of targeted surveillance for high-risk marine pests in major shipping ports and marinas. The data also include records from specimens reported via the passive surveillance system and identified through a taxonomic clearing house service for suspect marine organisms. Additional features include a searchable catalogue of relevant reports, papers and information about NIMS and on the surveys undertaken to obtain the data. These data are referred to in Appendix 4 but were not included in our spatial data inventory due to the very large number of records and limited accessibility, and because they will be updated with information when new survey data are released. Once a specific area of interest is defined by TDC or NCC, the records within the area could be downloaded.

[5] https://oceancolor.gsfc.nasa.gov/l3
[6] https://data-niwa.opendata.arcgis.com/documents/NIWA::niwa-scenz-ocean-colour-application/about
[7] https://www.marinebiosecurity.org.nz

3. INFORMATION GAPS

Most invertebrates have not been mapped as species, or even assemblages, except in the case of habitat-forming species. Because of the very large number of species involved, and the spatially and temporally patchy data on their distribution (and the enormous effort that would be required to overcome this), using habitats (e.g. sandy sediments, seagrass) as proxies for the distribution of the organisms that live in them is the only realistic option.

Modelling based on environmental data properties can provide indications of likely distribution of plants and animals, although these need to be ground-truthed (ideally on a site-specific basis). As discussed in Section 2.4.4, this has been done for benthic invertebrates (Wood et al. 2013; Petersen et al. 2020; Stephenson et al. 2020a, 2021) and fish (Smith 2008; Stephenson et al. 2020a, 2021), and for marine mammals (Stephenson et al. 2020b, 2020c). Some of these data are included in the spatial data inventory.

It is also noted that although surveying all habitats systematically in the TDC and NCC area would be ideal, prioritisation of areas based on the probability that they support important habitats and associated communities / species is a practical solution to the issue of information gaps and funding availability. In the following section (3.1), the major biogenic habitat types are introduced, along with a list of areas and accompanying survey prioritisation score. The prioritisation score was based on the likelihood that an area could support features that would be considered a candidate as an ecologically important site – i.e. the probability of an area supporting an important habitat, community or species, where 1= high (it is very likely), 2 = moderate (the area may support features of interest) and 3 = low (area is unlikely to support such biological features). In addition, the nine major biological community types identified in the following sections were ranked relative to one another in order of priority for a survey (with 1 being highest survey priority and 9 being lowest). The survey order priority took into account aspects such as the threat of loss of biological features, habitat sensitivity and the rarity of the habitat or community in the region. These assessments were based on the expert knowledge of the report authors.

It is noted that surveys or potential sites or known sites may also lead to the discovery of other biogenic habitat types or areas supporting potentially important values. Surveys can therefore be designed to sample multiple species, community or habitat targets.

3.1. Information gaps for key biogenic habitats

At a national level, Anderson et al. (2019) identified information gaps in relation to describing key biogenic habitats, their distribution, the ecological services they provide, their current condition and the threats affecting them. Many of the

information gaps are also relevant at the regional and local scale in Nelson and Tasman Regions. These are generally summarised by type of biogenic habitat below, with additional comments.

3.1.1. Macroalgal beds (macroalgae gardens / meadows)

The distribution of macroalgal species that form low-lying beds is not well known at the regional (or national) scale. In Marlborough, red algae beds have been mapped as part of the ecologically significant marine sites programme (Davidson et al. 2011), and some monitoring has also occurred (Davidson et al. 2023).

Although low-lying macroalgae beds have been identified at particular locations in the TDC and NCC area (e.g. Davidson and Freeman 2013), there has been no systematic survey, and the size and distribution of the habitat is poorly defined even in places where it is known to occur. There is also little information on the ecological functions and properties of macroalgal beds, including productivity and associated biodiversity (Neill et al. 2012).

Abundance / distribution: Patchy and small areas, seasonal abundance variations likely.
Priority: LOW – detection of new beds during a widespread survey has a low chance of success.
Survey suggestion: Monitor known beds. Survey new areas if discovered / reported.
Methods: Drop camera, sled, percent cover estimates, species ID.
Survey order priority: 8.

3.1.2. Kelp beds

Kelp beds traditionally refer to the large brown algae species that usually form beds on nearshore rocky reef habitats. Nearshore beds have been relatively well mapped and documented for particular areas (e.g. Taupō Point, Abel Tasman National Park coast) (Davidson 1992), but detailed, systematic mapping at a local scale is often lacking and beds in deeper water are poorly known.

Abundance / distribution: Widespread on rocky coasts and relatively uniform. Small, often isolated areas are known to support a different range of species (e.g. Taupō Point) (Davidson and Chadderton 1994).
Priority: HIGH – areas likely to support a different species composition can be identified using multibeam / charts / existing surveys.
Survey suggestion: Gather data on known sites (e.g. Taupō Point, Abel Tasman National Park coast) and identify potential new sites using charts and multibeam. Monitor known beds. Survey new areas if discovered / reported.
Methods: Drop camera, divers, sonar.
Survey order priority: 7.

3.1.3. Rhodolith beds

The distribution of rhodolith beds has seldom been surveyed systematically at a local, regional or national level. Locally, Davidson and Freeman (2013) mapped rhodolith beds along the Abel Tasman National Park coast within and outside the Tonga Island Marine Reserve. The taxonomic composition, associated biodiversity and ecological functions of beds are poorly known, although biodiversity (including the presence of rare species) appears to be high in those beds that have been studied (in northern New Zealand; Nelson et al. 2012, 2014).

Abundance / distribution: Present along the Abel Tasman National Park coast. Known beds previously mapped using a drop camera.
Priority: LOW for new areas, HIGH for known areas (monitoring). It is unlikely any new beds will be found as rhodoliths inhabit a particular substrata and exposure regime. Existing areas have a high priority for ongoing monitoring.
Survey suggestion: Gather percent cover data from known sites using a drop camera and / or divers. Monitor known beds. Survey new areas if discovered / reported. Areas outside the marine reserve should have the highest priority.
Methods: Drop camera, divers.
Survey order priority: 2 (monitor known beds periodically, e.g. 5-yearly).

3.1.4. Seagrass beds (meadows)

Seagrass extent (and, more recently, percent cover) is mapped semi-regularly by broadscale habitat surveys for many of the TDC and NCC estuaries (e.g. Stevens and Robertson 2017). However, in the Abel Tasman National Park, Mārahau and smaller estuaries within the TDC region (i.e. those mapped from 1992 and 2012), data accuracy is limited or map data are old (i.e. remapping is required). No subtidal beds are known from the local area.

There is also a lack of understanding of how the distribution of seagrass beds varies naturally over time (including in response to disturbances such as storms / sedimentation) and of the factors that influence their recovery (including relative importance of sexual and asexual reproduction). However, a recent study has looked at the impact of marine heatwaves on selected seagrass meadows in the Tasman and Nelson Regions (Clemente et al. 2023).

Abundance / distribution: Present in many estuaries and also Farewell Spit. Known beds previously mapped using aerial photos and ground-truthing techniques.
Priority: HIGH for new areas, HIGH for known areas. It is likely existing beds are declining or becoming less dense. Selected existing areas have a high priority for ongoing monitoring.
Survey suggestion: Gather percent cover and aerial data from known sites using standardised techniques. Various other data can be collected to monitor seagrass ecological health (Shanahan et al. 2023). Survey new areas if discovered / reported.
Methods: See guidance on council seagrass monitoring (Shanahan et al. 2023).

Survey order priority:4 (see guidance on council seagrass monitoring; Shanahan et al. 2023).

3.1.5. Bryozoan beds

As with rhodolith beds, limited surveys have taken place to investigate bryozoan beds in areas other than a few where they relate to certain fisheries (including Separation Point – see Appendix 4).

Despite the documented value of bryozoan beds to many species of fisheries importance, and their fragility and vulnerability to physical disturbance, there is little information on recovery rates. There is also only limited or historical information on the biodiversity associated with bryozoan beds in the Nelson and Tasman Regions (e.g. Bradstock and Gordon 1983). However, biodiversity is high in bryozoan-dominated areas of seabed that have been studied off the Otago coast (Batson and Probert 2000; Wood and Probert 2013) and in Foveaux Strait (Cranfield et al. 2004). Grange et al. (2003) described a 'very diverse' fauna associated with the Separation Point bed from remotely operated underwater vehicle (ROV) videos and a single dredge tow in 2002.

Abundance / distribution: Known from one area off Separation Point. Other historical beds have been destroyed (Saxton 1980 – see Handley et al. 2023a). The chance of finding new beds is low.
Priority: LOW for new areas, HIGH for known areas. It is likely that existing beds are declining or dying. Selected existing areas have a high priority for ongoing monitoring.
Survey suggestion: Gather percent cover data from known sites using drop camera or sled video techniques. Multibeam sonar may also be useful for widespread mapping of existing beds. Survey new areas if discovered / reported.
Methods: Drop camera, sleds, multibeam.
Survey order priority: 5 (monitor periodically, e.g. 5-yearly).

3.1.6. Sponge gardens

Sponges are a diverse phylum, and their distribution and abundance as habitat-forming species are poorly known. Surveys of sponge gardens have been conducted at only one location (Waimea Inlet).

After large storm events, sponges often wash ashore in central Tasman Bay (Motueka to Te Mamaku / Ruby Bay [hereafter Ruby Bay]); however, no surveys of this area have been conducted.

Abundance / distribution: Likely to occur in shallow subtidal areas between Motueka Spit and Ruby Bay. Sponges have been described from Horoirangi Marine Reserve (Grange and Cole 1996). The chance of finding new beds with a range of other biogenic species is HIGH at particular locations.
Priority: HIGH for surveying particular sites for new beds.

Survey suggestion: Multibeam sonar may also be useful for identifying potential survey sites. Survey new areas if discovered / reported.
Methods: Drop camera, sleds, video, multibeam.
Survey order priority: 3 (survey new offshore beds along the Ruby Bay–Moutere coast, monitor Waimea sponge garden periodically).

3.1.7. Shellfish beds

The distribution of beds of shellfish species (oysters, cockles, mussels, horse mussels and scallops), including those important to fisheries, is reasonably well known in Tasman and Golden Bays, although the location and density of beds can vary over time. The distribution of shellfish such as horse mussels and surf clams is less well known. Historical changes in the abundance and distribution of scallops and oysters are described in Handley et al. (2023a). The loss of most of the beds of these species is believed to have had serious adverse ecological effects on the bays.

In the case of horse mussels, there have been some formal surveys and some opportunistic observations, but surveys to delineate known beds and record density and status of associated communities are generally lacking. The maps included in the spatial data inventory are, therefore, incomplete and some observations are several decades old. The factors affecting recruitment and population dynamics are not well known. Given that horse mussel beds are known to be ephemeral (Morrison et al. 2014), old beds may have disappeared and new beds developed since these observations were made. We (report authors) note that the recent hydrographic survey in Tasman and Golden Bays includes multibeam data that may be analysed to assist with mapping remaining horse mussel beds.

Abundance / distribution: Most beds have likely been lost due to dredging and trawling. The largest known remaining bed is offshore at Rotokura / Cable Bay (hereafter Cable Bay). There are some indications that horse mussel beds (as well as a variety of other biogenic species) may exist in shallow areas of Golden Bay (Davidson 1998) inside a non-trawling line and in areas around Tata Islands detected during biosecurity surveys (Scott-Simmonds, pers. comm.). The multibeam survey may detect dense beds, but low-density beds may be missed using this technique. Apart from inshore areas of Golden Bay, the chance of finding new beds is LOW.
Priority: HIGH for surveying the extent and attributes of the Cable Bay bed, inshore Golden Bay and Tata Islands. LOW for searching for new beds.
Survey suggestion: Multibeam sonar may be useful for mapping but this will depend on the density of the bed and the multibeam resolution. Ground-truthing using drop camera, sled and video are also suggested. Survey new areas if discovered / reported.
Methods: Drop camera, sleds, video, multibeam.
Survey order priority: 1 to survey Cable Bay, Tata Islands and inshore Golden Bay horse mussel beds, then monitor periodically, e.g. 5-yearly.

3.1.8. Calcareous tubeworm mounds

Calcareous tubeworm mounds are known from a variety of locations around Aotearoa New Zealand despite the lack of a widespread systematic survey. They are known to occur in discrete locations within the Marlborough Sounds (Davidson et al. 2011), but their distribution in the Nelson and Tasman Regions is poorly known. However, based on existing subtidal surveys they appear to be present as individuals but not as mounds (e.g. Davidson 1992). Little is known about the conditions under which the commonest species, *Galeolaria hystrix*, forms mounds or what other species may do so.

Abundance / distribution: No calcareous tubeworm beds with mounds have been found in Tasman or Golden Bays. The chance of finding new beds is LOW.
Priority: LOW priority for searching for new beds.
Survey suggestion: Survey new areas if discovered / reported. Most likely areas are headlands immediately south of Croisilles Harbour.
Methods: Drop camera, sleds, video, multibeam, divers.
Survey order priority: 9 (survey existing beds, and then monitor periodically, e.g. every 8 years).

3.1.9. Non-calcareous tubeworm beds

The distribution of the intertidal tubeworm mounds in Ruby Bay and Waimea Inlet have not been systematically surveyed. Current information is based on aerial photographs and the recollections of observers. Beds can be made up of more than one species of tubeworm, but the taxonomy and biology of the group are poorly known and some species are probably undescribed.

It is noted that the new *Chaetopterus chaetopterus* A variant is now becoming established in Tasman and Golden Bays. It is not known if this is native or introduced, and so mapping of this species at this stage is a low priority for this programme.

Abundance / distribution: Intertidal beds known from discrete locations in Tasman and Golden Bays. The chance of finding new beds is LOW.
Priority: LOW priority for searching for new beds. MODERATE priority for monitoring existing beds.
Survey suggestion: Survey existing beds and new areas if discovered / reported.
Methods: Mapping existing sites using aerial photos with ground-truthing. Photo points and percent cover estimates for monitoring purposes.
Survey order priority: 6 (survey, then monitor periodically, e.g. 8-yearly).

4. APPENDICES

Appendix 1. Tasman and Nelson coastal marine environments: spatial data inventory

This work component was led by Cawthron. Spatial data layers for the overall project (including those relevant to habitats and indigenous biodiversity) are supplied as part of an ArcGIS Pro project package (TasmanNelsonCoastalEnvironment_SpatialData.ppkx), consisting of maps where layers are displayed, and a series of geodatabases (.gdb) containing the data layers. Metadata (key details) for each data layer in the Habitats and Biodiversity map are provided in Appendix 4 and appended to the majority of layers in the geodatabases.

Appendix 2. Policy 11 of the New Zealand Coastal Policy Statement

Policy 11 of the NZCPS (Department of Conservation 2010) concerns indigenous biological diversity (biodiversity) and is reproduced in full below.

To protect indigenous biological diversity in the coastal environment:

(a) avoid adverse effects of activities on:

i. indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists;

ii. taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;

iii. indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare;

iv. habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;[8]

v. areas containing nationally significant examples of indigenous community types; and

vi. areas set aside for full or partial protection of indigenous biological diversity under other legislation; and

(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:

i. areas of predominantly indigenous vegetation in the coastal environment;

ii. habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;

iii. indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;

iv. habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;

v. habitats, including areas and routes, important to migratory species; and

vi. ecological corridors, and areas important for linking or maintaining biological values identified under this policy.

[8] It was beyond our report scope to assess against NZCPS 11(a)(iv).

Appendix 3. Criteria for assessing Key Ecological Areas (KEA) for marine protected area planning in New Zealand

This appendix is adapted from Stephenson et al. (2018, table 1-1).

	Criteria	Definition
1	Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.
2	Uniqueness / rarity / endemism	Area contains either (i) unique ('the only one of its kind'), rare (occurs in only a few locations) or endemic species, populations or communities; and / or (ii) unique, rare or distinct, habitats or ecosystems; and / or (iii) unique or unusual geomorphological or oceanography features.
3	Special importance for life history stages	Areas that are required for a population to survive and thrive.
4	Importance for threatened / declining species and habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.
5	Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.
6	Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities or species, or has higher genetic diversity.
7	Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of, or low level of, human-induced disturbance or degradation.
8	Ecological function	Area containing species or habitats that have comparatively higher contributions to supporting how ecosystems function.
9	Ecosystem services	Area containing diversity of ecosystem services, and / or areas of particular importance for ecosystem services.

Appendix 4. Key details for mapped data and significance assessment

Key details for map data include group and layer names (as they appear in the spatial data inventory, Appendix 1), data format and details, description, and source reference. This information is outlined in the following series of tables. There is one table for each individual data layer or, in some cases, multiple data layers.

Information on relevance to NZCPS Policy 11 and KEA is also outlined here in Appendix 4. As described in our methods section (1.3.3), our preliminary assessment of significance was made at a high level using the information at hand (largely information in this appendix) and inevitably involved some subjectivity. Additional details and / or comments on our approach to this are as follows:

- Policy relating to protected areas was indicated specifically only for those protected areas, not for other layers that may have overlapped with a protected area.
- A question mark was used to indicate potential significance in respect to policy and / or criteria relevance but that this is currently unknown based on high-level assessment. More detailed future assessment is required, noting that data gaps to inform this may be present in some cases.
- It was considered beyond the scope of this project to assess fine-scale monitoring data for Policy 11 and KEA relevance.

Table contents

Group name	COASTAL ENVIRONMENT
Layer name	a. TEPCoastalEnvironmentExtent b. NCC_CoastalEnvironmentExtent (PROJRevisedExtentofNelsonCoastalEnvironment_20161116)
Data format and details	Polylines, supplied by NCC and TDC as Feature classes
Description	Extent of the coastal environments of NCC and TDC regions
Source reference	a. TEPCoastalEnvironmentExtent: Supplied by TDC, sourced from Boffa Miskell Limited (2022). b. NCC_CoastalEnvironmentExtent: Supplied by NCC. Revised from: Coastal Environment 20140506 by James Bently at Boffa Miskell.
Relevance to Policy 11	NA. Note: while not relevant to Policy 11, this sets the boundary for the coastal environment and therefore for our study.
Matching KEA criteria	NA

Group name	COASTAL ENVIRONMENT
Layer name	DRAFT_RiverMouth_POINT_May2022; DRAFT_RiverMouth_LINE_May2022
Data format and details	Points and lines, supplied by TDC as feature classes
Description	The River mouths layer is taken from the draft river mouths agreement, an agreement between the Department of Conservation and Tasman District Council under Section 2 of the Resource Management Act 1991. The agreement has been drafted for inclusion in the Tasman Environment Plan which is to replace the currently operative Tasman Resource Management Plan. The agreement, as of February 2023 has been agreed to by DOC, and TDC staff and is awaiting Tasman District Council approval. The layer has no formal status until signed by both parties and notified in the Tasman Environment Plan.
Source reference	None provided
Relevance to Policy 11	NA
Matching KEA criteria	NA

Group name	NATURAL CHARACTER: NCC
Layer name	a. NCC_NaturalCharacter_Values b. NCC_NaturalCharacter_Threats
Data format and details	Polygons, supplied by NCC as Feature Class. These were joined to data extracted by Cawthron from corresponding report tables (Boffa Miskell 2015a, 2015b), to include Key Values, Additional Comments and Threats. The data are displayed in two ways in the map document: 1) VALUE (high, very high); 2) THREATS, including separate layers for each individual threat type, filtered using definition queries.
Description	The Boffa Miskell study identified the coastal environment of the Nelson Region and evaluated levels of natural character, including abiotic, biotic and human values, to map areas of high natural character as required by Policy 13 of the New Zealand Coastal Policy statement, to review the Nelson Resource Management Plan and to produce the combined district and regional Nelson Plan. See Boffa Miskell (2015a, 2015b) for list of databases included, noting that GIS databases are mapped at different scales. To improve the utility of the spatial data supplied by NCC, Cawthron extracted information about key values and threats from report tables and joined this to corresponding High & Very High value area polygons. The threats data was split into separate attributes so that layers could be generated for each individual threat type. These 'Individual Threats' layers were used to overlay habitats and biodiversity distribution data to assess threats. See Section 1.3.3 in the current report for our methods approach, including limitations, to assessing threats.
Source reference	Boffa Miskell Limited (2015a, 2015b).
Relevance to Policy 11	Layer a: 11(a)(iii),(v),(vi). 11(b)(i),(ii),(iii),(iv),(v),(vi). Layer b: not assessed as relates to threats
Matching KEA criteria	Layer a: 1, 2, 3, 4, 5, 6, 7, 8?, 9?. Layer b: not assessed as relates to threats

Group name	NATURAL CHARACTER: TDC
Layer name	TDC_CEarea_NaturalCharacter_FroudeApp3data
Data format and details	Polygons, supplied by TDC as Feature Classes. Cawthron extracted and joined Description, Ranking and Type data from report tables. This layer is displayed in three ways in the map document: 1) Natural Character Ranking (Ranking), 2) Environment Type (Type), 3) Natural Character Index (NCI).
Description	The Froude (2013) study mapped the inland boundary of the coastal environment and mapped and assessed areas of high and outstanding natural character within the coastal environment, responding to requirements specified in the New Zealand Coastal Policy Statement 2010. The original spatial data supplied by TDC contained identifiers (CoastEnvID; UniqueID), Ranking (H: high, T: below High threshold, O: Outstanding) and NCI (Natural Character Index). To improve the utility of this dataset, Cawthron extracted Description and further Ranking data (including reference to habitats, species or communities present, level of indigenous vegetation cover and modifications / threats) and Type (see report for environment type codes) from report tables and joined this to corresponding polygons. This modified layer may now be used to investigate specific threats at a more detailed level once significant sites have been selected.
Source reference	Froude (2013).
Relevance to Policy 11	11(a),(i?),(iii?),(v?). 11(b),(i?),(ii?),(iii?),(iv),(v?),(vi?)
Matching KEA criteria	1, 2, 3, 4, 5, 6, 7, 8?, 9?

Group name	NATURAL CHARACTER: TDC
Layer name	a. TDC_TEPCoastalAreas; TDC_TEPOutstandingNaturalCharacter; TDC_TEPTerrestrialNaturalCharacter; TDC_TEPMarineNaturalCharacter b. TDC_TEPCoastalAreas_Values_Threats
Data format and details	a. Supplied by TDC as Feature classes b. A selection of polygons from TDC_TEP layers, joined to Key Value and Threat information from reports. This layer is displayed in two ways in the map document: 1) Value (high, very high), 2) Threats: a layer for each individual threat type, symbolised using unique values for each Threat attribute
Description	The Boffa Miskell (2022) study identified the coastal environment of the Tasman Region and evaluated levels of natural character, including abiotic, biotic and human values, to map areas of high natural character as required by Policy 13 of the New Zealand Coastal Policy Statement. See Boffa Miskell (2022) for methodology used to map and assess areas. Information has been updated after public engagement and is still subject to revision. To improve the utility of spatial layers supplied, Cawthron extracted information about key values and threats from report tables and joined this to a selection of corresponding polygons (High and Very High value from TDC_TEP layers). Note that one set of polygons (CTA 9: Moutere / subarea: Moutere Bluff to Kina coastal cliffs) was included from Outstanding Natural Features dataset (Bridget Gilbert Landscape Architecture 2022). The threats data were split into separate attributes so that layers could be generated for each individual threat type. These 'Individual Threats' layers were used to overlay habitats and biodiversity distribution data to assess threats. See Section 1.3.3 in the current report for our methods approach, including limitations, to assessing threats.
Source reference	Boffa Miskell Limited (2022). https://hdp-au-prod-app-tasman-shape-files.s3.ap-southeast-2.amazonaws.com/8416/6813/2976/Tasman_Natural_Character_Study_Nov22_Part1.pdf https://hdp-au-prod-app-tasman-shape-files.s3.ap-southeast-2.amazonaws.com/5916/6813/2975/Tasman_Natural_Character_Study_Nov22_Part2.pdf Bridget Gilbert Landscape Architecture (2022). https://hdp-au-prod-app-tasman-shape-files.s3.ap-southeast-2.amazonaws.com/4916/6812/8529/Tasman_District_Landscape_Study_Nov22.pdf
Relevance to Policy 11	Layer a: 11(a),(i?),(iii?),(v?). 11(b),(i?),(ii?),(iii?),(iv),(v?),(vi?) Layer b: not assessed as relates to threats
Matching KEA criteria	Layer a: 1, 2, 3, 4, 5, 6, 7, 8?, 9?. Layer b: not assessed as relates to threats

Group name	SIGNIFICANT NATURAL AREAS – NCC
Layer name	Significant Natural Areas_NCC_coastal sub-set
Data format and details	Polygons supplied by NCC as Feature Class. Sub-set to the NCC coastal environment by Cawthron. Layer is displayed to show Significant Natural Areas: SNA (surveyed and meets criteria) and Potential SNAs (not tested / to be surveyed), labelled using SiteReference. Use limitation: not for public viewing.
Description	Areas within the NCC coastal environment that are being reviewed for possible inclusion in the Nelson Resource Management Plan as Significant Natural Areas (SNAs). Not for public viewing as still being consulted with property owners. Codes in the 'SiteReference' column may be used to find corresponding report(s) – note that the links to reports do not function. It would be useful to extract and join relevant information from corresponding SNA reports (i.e. Descriptions, Natural and Landscape values, Vegetation / Flora / Fauna / Introduced animals and plants, Community condition, Management Issues) or the reports themselves, but this is outside the scope / budget of this project (agreed by NCC).
Source reference	Spatial data and individual SNA reports supplied by NCC. The reports are not included in this data collation.
Relevance to Policy 11	11(a),(i?),(iii?),(iv?), (v?). 11(b),(i?),(ii?),(iii?),(iv),(v?),(vi?)
Matching KEA criteria	1, 2, 3, 4, 5, 6, 7, 8?, 9?

Group name	OUTSTANDING NATURAL LANDSCAPES (ONL) AND FEATURES (ONF)
Layer name	a. DRAFT_ONL_Aug2022; DRAFT_ONL_March2021 b. DRAFT_ONF_Aug2022; DRAFT_ONF_March2021; DRAFT_ONF_Aug2022_CoastalSub-set
Data format and details	Polygons, supplied by TDC as feature classes. DRAFT_ONF_Aug2022 was sub-set to the TDC Coastal Environment extent
Description	a. Identifies draft Outstanding Natural Landscapes (ONL) in the TDC region. March 2021 dataset includes ONL number and name (ONL_Name). Could join DRAFT_ONL_Aug2022 to DRAFT_ONL_March2021 to transfer ONL_Name. Aug 2022 dataset includes modifications after preliminary engagement (4 features amended in Aug 2022, see Notes attribute). All areas except ONL 2: Parapara-Kahurangi Ranges are fully or partially within TDC coastal extent. b. Identifies draft Outstanding Natural Features (ONF) in the TDC region (March 2021), including modifications after preliminary engagement (Aug 2022). Attributes include: NAME, ONF_NAME, SourceName, SourceDate, Change. The full dataset was sub-set using the TDC coastal extent for the purpose of the current project (DRAFT_ONF_Aug2022_CoastalSub-set). The result contains 11 ONF polygons. Note that ONF 32: West Coast and Aorere Valley Caves are a set of polygons, including some outside the coastal extent (Aorere caves). See corresponding reports for assessment methods and detailed information about each ONF and ONL, including biophysical, sensory and associative attributes; key characteristics to be protected from adverse effects and types of development that are likely to be inappropriate within the area.
Source reference	Hayward (2020); Boffa Miskell (2011, 2022); Bridget Gilbert Landscape Architecture (2022).
Relevance to Policy 11	11(a)(iii),(v),(vi). 11(b)(i),(ii),(iii),(iv),(v),(vi)
Matching KEA criteria	1, 2, 3, 4, 5, 6, 7, 8?, 9?

Group name	PROTECTED AREAS
Layer name	FarewellSpitNatureReserve_LINZProtectedAreas
Data format and details	Feature class, extracted from Protected Area dataset
Description	Nature Reserve; Shorebird Network Site. A 30km-long sand spit, and intertidal area. Exposed to the Tasman Sea on the north and with a dune complex giving way to mudflats on the south. Particularly important as a staging area for shorebirds. Many wader species forage in this area (5 threatened, 8 at risk). Supports several notable plant species as well. Ramsar Site of International Importance, no. 103. Largest single area of seagrass in Nelson / Marlborough (see: Nelson Bays ecosystems map: Seagrass layer).
Source reference	Polygons extracted from Protected Areas dataset: https://data.linz.govt.nz/layer/53564-protected-areas Information about the Nature Reserve: https://rsis.ramsar.org/ris/103, https://rsis.ramsar.org/RISapp/files/RISrep/NZ103RIS.pdf Relevant reports: Davidson et al. (1993); Battley et al. (2005); Schuckard and Melville (2013).
Relevance to Policy 11	11(a),(i?),(iii?),(v?),(vi). 11(b),(i?),(ii?),(iii?),(iv),(v?),(vi?)
Matching KEA criteria	1, 2, 3, 4, 5, 6, 7, 8?, 9?

Group name	PROTECTED AREAS
Layer name	Mātaitai_Taiāpure
Data format and details	Polygon Feature classes, downloaded from online resource
Description	Marine areas protected by mātaitai and taiāpure: a. Te Tai Tapu (Kaihoka) and Te Tai Tapu (Anatori) Mātaitai b. Wakapuaka Taiāpure: established in 2002 to allow local management by a trust; objectives include conservative management of fisheries to allow recovery of species including pāua, lobster, flounder, snapper, kina, oysters and scallops.
Source reference	a. Ta Tai Tapu Mātaitai: https://doc-marine-data-deptconservation.hub.arcgis.com/datasets/6ad1543b243b43539b707618450e8fe6_0/explore?location=-40.697411%2C172.610012%2C10.50; www.mpi.govt.nz/fishing-aquaculture/maori-customary-fishing/customary-fisheries-management-areas-rules-and-maps b. Wakapuaka Taiāpure: www.legislation.govt.nz/regulation/public/2002/0020/latest/DLM110875.html, www.beehive.govt.nz/release/new-taiapure-nelson%E2%80%99s-delaware-bay, https://doc-marine-data-deptconservation.hub.arcgis.com/datasets/7d23e9063a2f44988d94902a26cbe207_0/explore?location=-41.134757%2C173.447782%2C12.10
Relevance to Policy 11	11(a),(i?),(iii?),(v?),(vi). 11(b),(i?),(ii?),(iii?),(iv),(v?),(vi?)
Matching KEA criteria	3, 4, 7

Group name	PROTECTED AREAS
Layer name	MarineReserves_DOC
Data format and details	Polygon feature class extracted from national dataset of DOC marine reserves (see source)
Description	Marine areas protected by marine reserve regulations: • Horoirangi Marine Reserve is located 12 km north of Nelson and extends approximately 5 km north from Glenduan to Ataata Point, Cable Bay. The reserve encompasses variety of shallow subtidal and intertidal habitats offshore to 1.85 km. • Tonga Island Marine Reserve (1,835 ha, established in 1993), central coast of Abel Tasman National Park. Wide variety of shallow subtidal and intertidal habitats. It contains a fur seal rookery, breeding blue penguins and sooty shearwater colonies (both At Risk: Declining), a broadleaf forest and shrublands, including coastal peppercress (Endangered: Nationally Critical). • Te Tai Tapu Marine Reserve (536 ha), northwest coast. Includes tidal sandflats and channels south of a line between Melbourne Point (Pah Point) and the closest headland of Kahurangi National Park on the opposite shore, and the tidal areas upstream of causeways along Dry Road, southwest of and including the Wairoa River. The marine reserve encompasses a variety of shallow subtidal habitats but largely comprises intertidal habitats. The estuary is in a relatively natural state compared to many estuaries in the region.
Source reference	Spatial data source: https://koordinates.com/layer/6026-doc-marine-reserves
Relevance to Policy 11	11(a)(i),(iii),(vi). 11(b),(i),(ii),(iii)
Matching KEA criteria	3, 4, 7

Group name	PROTECTED AREAS
Layer name	ProtectedAreas_TDCNCC_CoastalExtent_Intersect
Data format and details	Polygon feature class extracted from national dataset of Protected Areas (see source) and sub-set to NCC and TDC coastal environment extent.
Description	This Protected Area Layer contains land and marine areas, most of which are administered by DOC and are protected by the Conservation, Reserves, National Parks, Marine Mammal and Marine Reserves Acts. See source for further information. Sub-set by Cawthron to include only polygons contained within or intersecting the TDC and NCC coastal environments.
Source reference	https://data.linz.govt.nz/layer/53564-protected-areas
Relevance to Policy 11	11(a),(i?),(iii?),(v?),(vi). 11(b),(i?),(ii?),(iii?),(iv?),(v?),(vi?)
Matching KEA criteria	7

Group name	PROTECTED AREAS
Layer name	ProtectedAreas_WhanganuiWesthavenWMR
Data format and details	Polygon feature class, extracted from Protected Area dataset (see: source)
Description	Boundary of the Whanganui / Westhaven Wildlife Management Reserve
Source reference	Polygons extracted from Protected Areas dataset: https://data.linz.govt.nz/layer/53564-protected-areas Information about the Wildlife Management Reserve: https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-protected-areas/westhaven-mr-brochure.pdf Davidson (1990).
Relevance to Policy 11	11(a),(i?),(iii?,)(vi). 11(b),(i?),(ii?),(iii),(iv?),(v?),(vi)
Matching KEA criteria	7

Group name	PROTECTED AREAS
Layer name	SeparationPoint_ExclusionZone
Data format and details	Polygon feature class, extracted from: TDC_CoastalEnvironment_NaturalCharacter_FroudeAppendix3data
Description	Separation Point exclusion zone. This area was closed for commercial fishing in 1980 to protect biogenic habitat created by bryozoans, for the purpose of maintaining habitat for juvenile fish. See polygon description attribute for further details.
Source reference	Froude and Smith (2004); Froude (2013).
Relevance to Policy 11	11(a),(i? or ii?[9]),(vi). 11(b),(ii),(iii),(iv?),(v?),(vi?)
Matching KEA criteria	1, 2, 3, 5?, 6?, 7, 8?, 9?

[9] According to Newcombe et al. (2015), the Separation Point bryozoan beds are internationally recognised (Wells et al. 1983).

Group name	PROTECTED AREAS
Layer name	Fishing restrictions: All Commercial Fishing Prohibitions; Set netting prohibitions; Drag netting restrictions or prohibitions; Trawl prohibitions; Dredge netting restrictions or prohibitions
Data format and details	Feature Service Feature Classes (see: Source reference)
Description	Boundaries of national fishing restriction areas. Note that recreational and commercial set netting restrictions were amended in October 2022 to include area out to 4 nautical miles in Tasman and Golden Bays. Also see: Closed Areas and Special Restrictions / Set netting restrictions section of this webpage: https://www.mpi.govt.nz/fishing-aquaculture/recreational-fishing/fishing-rules/challenger-fishing-rules/#twisties, and information about the threat management plan for Hector's and Māui dolphins: https://www.mpi.govt.nz/fishing-aquaculture/sustainable-fisheries/managing-the-impact-of-fishing-on-protected-species/protecting-hectors-and-maui-dolphins
Source reference	https://doc-marine-data-deptconservation.hub.arcgis.com/pages/map-viewer, https://maps.mpi.govt.nz/wss/service/ags-relay/arcgis1/guest/arcgis/rest/services/MARINE/MARINE_Restrictions_CommercialFishingRegulations/MapServer
Relevance to Policy 11	11(a),(i?),(iii?),(iv?),(v?), (vi). 11(b),(ii?),(iii?),(iv?),(v?),(vi?)
Matching KEA criteria	1?, 2?, 3?, 4?, 5?, 6?, 7, 8?, 9?

Group name	BROADSCALE ESTUARINE HABITATS – SUBSTRATES, WATER, ESTUARY, INTERTIDAL, (MASTER)
Layer name	a. TDC_NCC_SitesofMarineSignificance_Substrate b. TDC_NCC_SitesofMarineSignificance_Water c. TDC_NCC_SitesofMarineSignificance_EstuaryExtent d. TDC_NCC_SitesofMarineSignificance_IntertidalExtent e. TDC_NCC_SitesofMarineSignificance_2022MASTER
Data format and details	Polygon feature classes. Geodatabase containing all layers was supplied by Salt Ecology. SUBSTRATE data are organised by SubClass: Artificial; Boulder / Cobble / Gravel; Sand (0–10% mud); Muddy Sand (>10–25% mud); Muddy Sand (>25–50% mud); Sandy Mud (>50–90% mud); Mud (>90% mud); Zootic, and symbolised using dominant habitat data (DomHab). Dataset also contains fields for up to four subdominant habitats (SubDom), estuary name (ESTUARY) and year of survey (YEAR). The extent polygons for WATER (subtidal), INTERTIDAL and ESTUARY (sub- and intertidal areas), along with the MASTER dataset, are included. USE LIMITATIONS: Data have been collated for the specific use of TDC and NCC. The data may be used only by members of the project team for the purpose of delivering data outputs to TDC and NCC. No copies of the supplied data are to be retained by members of the project team following delivery of the project outputs to TDC and NCC. Any use of the data should include the following acknowledgement: Broadscale mapping data and GIS files were collated by Salt Ecology for the exclusive use of Tasman District Council and Nelson City Council.
Description Description	Collation of existing broadscale habitat mapping of the most recent surveys of dominant SUBSTRATE features, and the spatial extent of WATER (subtidal) / INTERTIDAL AREA / ESTUARY (which includes both intertidal and subtidal) of the estuaries of Nelson and Tasman Regions. Surveys were undertaken by Salt Ecology from Sep 2022 to Jan 2023, with mapping covering the period from 1991 to 2022. Original features were recorded at the dates specified in the attribute tables and digitised directly onto colour aerial photos supplied by council or sourced from Land Information New Zealand (LINZ) Online Data Service available at the time (see individual source reports for specific details). Mapping was supported by the use of georeferenced field photos collected during ground-truthing undertaken by Wriggle Coastal Management or Salt Ecology between 2012 and 2022. Maps of Abel Tasman National Park were digitised in Jan 2023 by Salt Ecology based on hard-copy maps in Davidson (1992). For data collation, each digitised feature was ascribed a field code recorded in a master layer combining all estuary data. Field codes were standardised across estuaries and in-house scripting was used to validate field codes and check for any errors in geometry or typology. Validated codes were then used to produce individual summary output layers. Spatial accuracy is variable and reflects the individual surveys undertaken. For example, the 2012 survey of Tasman District was constrained by relatively low-resolution imagery and limited ground-truthing (estuaries on the

Group name	BROADSCALE ESTUARINE HABITATS – SUBSTRATES, WATER, ESTUARY, INTERTIDAL, (MASTER)
	West Coast were assessed as a desktop only with no site visits). Consequently, spatial accuracy is often ~50 m depending on the extent of ground-truthing undertaken. For more recent surveys, e.g. Waimea Inlet 2020, spatial accuracy is ~2–10m for features easy to distinguish on aerial photos.
Source reference	Abel Tasman National Park – Davidson (1991), redrawn by Salt Ecology in January 2023; Ōmōkau and Ōananga – Forrest et al. (2022); Moutere Delta / Wainui / Waitapu / Waikato / Pākawau / Puponga / Onetaua / Billy King Creek / Matakota / Taupata / Tākaka River / Onehau / Parapara Inlet / Onekaka Inlet / Onahau / Puremāhaia / Little Kaituna / Grants Road / Tukurua / Pariwhakaoho – Robertson and Stevens (2012), with minor edits to spatial data made by Salt Ecology in January 2023; Wainui – Robertson and Stevens (2012), with minor edits to spatial data made by Salt Ecology in January 2023; Battery Road / Big River / Ruakawa / Green Hills Stream / Kaihoka / Lagoon Creek / Anaweka / Turimawiwi / Te Rata Creek / Anatori River / Sandhills Creek / Paturau River / Ngūroa South and North / Whararikī / Ligar Bay / Mārahau / Kaiteriteri / Ngaio Stream / Otūwhero – Robertson and Stevens (2012), redrawn by Salt Ecology in January 2023; Tapu Bay – Scott-Simmonds (2022, unpublished TDC data); Kokorua – Scott-Simmonds et al. (2022); Delaware – Stevens and Forrest (2019a); Nelson Haven – Stevens and Forrest (2019b); Ruataniwha Inlet – Stevens and Robertson (2015c), with minor edits to spatial data by Salt Ecology in January 2023; Motupipi East and West – Stevens and Robertson (2015b), with minor edits to spatial data by Salt Ecology in January 2023; Whanganui Inlet – Stevens and Robertson (2017a); Moutere Inlet – Stevens et al. (2020b); Motueka River Delta and Motueka Estuary / Riuwaka / Ferrer Creek – Stevens et al. (2020a); Waimea / Tāhunanui – Stevens et al. (2020c). Also see Appendix 6 in this report for data relating to estuary broadscale habitat mapping.
Relevance to Policy 11	11(b),(ii),(iii),(iv),(v),(vi)
Matching KEA criteria	1, 2, 3, 4, 5, 6, 8, 9

Group name	BROADSCALE ESTUARINE HABITATS: SEAGRASS & SALTMARSH
Layer name	a. TDC_NCC_SitesofMarineSignificance_Seagrass b. TDC_NCC_SitesofMarineSignificance_SaltMarsh
Data format and details	Polygon feature classes. Geodatabase containing all layers supplied by Salt Ecology. a. SEAGRASS data are symbolised using percent cover data (CrsPctCov). Categories: Complete (>90%), Dense (70 to <90%); High-Moderate (50 to <70%); Low-Moderate (30 to <50%); Sparse (10 to <30%); Very sparse (<1%); Trace (<1%). b. SALTMARSH data are symbolised based on SubClass: Estuarine Shrub; Grassland; Herbfield; Reedland; Rushland; Sedgeland; Tussockland. SubstrCode contains information about underlying substrate type for seagrass and saltmarsh patch area has been calculated in hectares (Area_ha).Dataset also contains fields for up to four subdominant habitats (SubDom), estuary name (ESTUARY) and year of survey (YEAR). See BROADSCALE ESTUARINE HABITATS – MASTER for Use limitations.
Description	Collation of existing broadscale habitat mapping of the most recent surveys of dominant SEAGRASS & SALTMARSH features of the estuaries of Nelson and Tasman Regions. See BROADSCALE ESTUARINE HABITATS – MASTER for general Description of data.
Source reference	See BROADSCALE ESTUARINE HABITATS – MASTER for list of corresponding reports.
Relevance to Policy 11	11(a),(i),(iii?). 11(b),(i),(ii),(iii),(iv),(v),(vi?)
Matching KEA criteria	a) and b) 1, 2, 3, 4, 5, 6, 8, 9

Group name	BROADSCALE ESTUARINE HABITATS: ZOOTIC HABITATS
Layer name	a. COCKLE BEDS: TDC_NCC_SitesofMarineSignificance_CockleBed; TDC_NCC_SitesofMarineSignificance_CockleBed_SubDom1; b. SHELL BANKS: TDC_NCC_SitesofMarineSignificance_ShellBank; TDC_NCC_SitesofMarineSignificance_ShellBank_SubDom1; c. TUBEWORM REEFS: TDC_NCC_SitesofMarineSignificance_TubewormReef; TDC_NCC_SitesofMarineSignificance_Tubeworms_SubDom1; d. OYSTER REEFS: TDC_NCC_SitesofMarineSignificance_OysterReef; TDC_NCC_SitesofMarineSignificance_OysterReef_SubDom1; e. MUSSEL REEFS: TDC_NCC_SitesofMarineSignificance_MusselReef; TDC_NCC_SitesofMarineSignificance_MusselReef_SubDom1
Data format and details	Polygon feature classes. Geodatabase containing all layers supplied by Salt Ecology. Sub-sets of the original dataset were extracted where each zootic habitat is dominant (DomHab) and also where it is the first subdominant habitat (SubDom1). Datasets contain additional information about subdominant habitats (SubDom2 to SubDom 3), name of estuary (ESTUARY), year of survey (YEAR) and area in hectares (Area_ha). See BROADSCALE ESTUARINE HABITATS – MASTER for Use limitations.
Description	See BROADSCALE ESTUARINE HABITATS – MASTER for general description of data. ZOOTIC substrates, including cockle beds (live), shell banks (dead) and tubeworm / oyster / mussel reefs, have been sub-set here to represent potential high value or refugia / biogenic habitats, replicating the Refugia classification in the Nelson Bays ecosystems map (Clark 2014). Salt Ecology notes that mapping of shellfish reefs is not comprehensive as they are often a subdominant habitat, and that councils and stakeholders are cautious about publishing locations of reefs in the interest of protecting them from harvesting.
Source reference	See BROADSCALE ESTUARINE HABITATS – MASTER for list of corresponding reports.
Relevance to Policy 11	11(a),(i?),(iv?),(v?),vi?). 11(b),(ii),(iii),(iv),(v),(vi?)
Matching KEA criteria	1, 2, 3?, 4, 5, 6, 7?, 8, 9

Group name	NELSON BAYS ECOSYSTEMS MAP
Layer name	NelsonBaysEcosystemsMap
Data format and details	Polygon, feature class. Data compiled from multiple sources or varying age and accuracy (see Description). Displayed in two ways in map document, based on 1) Category and 2) Structural class.
Description	The aim of this project was to map habitats and ecosystems within Nelson Bays to underpin the development of a robust framework to characterise, quantify, map and value coastal marine ecosystem services. MAPPING WITHIN ESTUARIES: Areas within estuaries incorporate previous / older broadscale habitat maps. Please see the collation of recent maps: BROADSCALE ESTUARINE HABITATS (supplied by Salt Ecology) for updated data within estuaries. OTHER DATA SOURCES: 1) Habitats digitised from maps in Davidson's (1992) report for the ABEL TASMAN area, which were based on 1988 aerial photographs and ground-truthing in 1990–91. Classifications include soft sediments, seagrass, saltmarsh, boulders, bedrock, cliffs, bryozoan beds, rhodolith beds, macroalgal communities. Note that the BROADSCALE ESTUARINE HABITATS dataset contains recently redrawn polygons (January 2023, within estuaries only) to represent this data source. 2) Region between WAIMEA INLET and the top of the WEST COAST (excluding Abel Tasman National Park region and Farewell Spit): mapped from 2008 aerial photographs and ground-truthed in 2010–11, combined with earlier broadscale mapping (Robertson and Stevens 2012), using classifications according to the Estuarine Monitoring Protocol. Clark indicates that the resolution and accuracy of habitat data were usually higher within estuaries than outside them. Note that BROADSCALE ESTUARINE HABITATS dataset contains broadscale maps for the smaller estuaries in this region, including some minor edits made by Salt Ecology in January 2023. The areas mapped outside estuary extents remain the only available data for these areas. 3) Region between WAIMEA INLET and D'URVILLE ISLAND: Mapping by Dana Clark (Cawthron) based on aerial photographs in 2013. Habitat definitions as consistent as possible with other Cawthron surveys, Davidson (1992), Stevens and Robertson (2008), and Robertson and Stevens (2012). Subtidal areas not well mapped. Vegetation difficult to assess from aerial photographs, so saltmarsh types not distinguished. Seagrass areas difficult to determine without ground-truthing and are likely to be underestimates. Note that the Nelson Bays ecosystems map extent does not include Whanganui estuary and other West Coast inlets and estuaries, but does extend beyond the eastern boundary of NCC (through to D'Urville Island).
Source reference	Clark (2014), supplied to NCC and TDC for the present project and use is restricted to this purpose only; see (Clark 2014) for references for individual data sources.

Group name	NELSON BAYS ECOSYSTEMS MAP
	Other relevant references include Davidson (1992), Robertson and Stevens (2012).
Relevance to Policy 11	See entries for individual habitat types
Matching KEA criteria	See entries for individual habitat types

Group name	NELSON BAYS ECOSYSTEMS MAP: SALTMARSH
Layer name	SALTMARSH_NelsonBaysEcosystemsMap
Data format and details	Polygon, feature class. Extracted from NelsonBaysEcosystemsMap, where Category = Saltmarsh.
Description	Saltmarsh extent and classification data, sourced from broadscale estuarine habitat maps (previous surveys, see note below) and based on various other sources outside of estuaries: aerial imagery (not ground-truthed, 'difficult to distinguish types of vegetation from aerial photographs in the absence of ground-truthing'); land cover data (LCDB3. Note that this has since replaced by LCDB5, which is based on 2018 imagery); Abel Tasman National Park (1991/92) or 'based on surrounding polygons'. Please note that the BROADSCALE ESTUARINE HABITATS dataset (collation of recent broadscale habitat map data, supplied by Salt Ecology) contains updated data based on resurveys of TDC and NCC estuaries, including saltmarsh (see TDC_NCC_SitesofMarineSignificance_Saltmarsh). For areas outside of the resurveyed estuaries, the Nelson Bays ecosystems map remains the only known source of information about saltmarsh. Saltmarsh habitat includes estuarine shrublands, tussockland, grassland, rushland, sedgeland, reedland, herbfield along tidal height and salinity gradients. Provides breeding, feeding and roosting habitat for banded rail, fernbird, bittern and several wader and waterbird species. At Risk plant (*Thyridia repens*, native musk).
Source reference	Clark (2014).
Relevance to Policy 11	11(a),(i),(iii),(v?). 11(b)(i),(ii),(iii),(iv),(v),(vi?)
Matching KEA criteria	1, 2, 3, 4, 5, 6, 7, 8?, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: SEAGRASS
Layer name	SEAGRASS_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class representing areas of seagrass, extracted from TasmanGoldenBays_NelsonBaysEcosystemsMap where Structural class = Seagrass. Areas where Refugia = Seagrass (i.e. where seagrass is not classed as a dominant habitat / structural class) are also shown using a definition query applied to REFUGIA_NelsonBaysEcosystemsMap.
Description	Seagrass extent and classification data, extracted from the Nelson Bays ecosystems map. Mapping data was sourced from: a. Broadscale estuarine habitat maps (Haven, 2009; Delaware, 2009; Waimea, 2006; Motupipi, 2007; Moutere, 2004; Ruataniwha, 2000 – in some cases polygons were modified by Clark for inclusion in the Ecosystem Services Habitat Map, see Comments attribute) b. Areas digitised from Abel Tasman National Park area habitat maps (Davidson 1992) c. Areas digitised from aerial imagery at Farewell Spit, with reference to Battley et al. (2005), who surveyed grain-size, macrofauna and seagrass distribution at 192 sites on the intertidal flats at Farewell Spit in 2003. Along with aerial photographs, the sites containing seagrass were used as a guide to map the distribution of seagrass along the intertidal flats of Farewell Spit. Note that seagrass extent may vary annually, so mapping information is only a snapshot in time. Please note that the collation of recent broadscale habitat map data, supplied by Salt Ecology, contains updated data based on resurvey of TDC and NCC estuaries, including seagrass extent and percent cover (TDC_NCC_SitesofMarineSignificance_Seagrass). Areas outside of the extent of the TDC_NCC_SitesofMarineSignificance_Seagrass layer remain the only known data source for seagrass (e.g. Farewell Spit, northwestern Golden Bay, Mārahau, sand bank area to southeast of Motueka estuary mouth). Seagrass beds are, among other things, important feeding and roosting area for seabirds and waterfowl, including Threatened and At Risk species.
Source reference	Clark (2014).
Relevance to Policy 11	11(a),(i). 11(b),(i),(ii),(iii), (iv),(v),(vi?)
Matching KEA criteria	1, 2? (at risk), 3, 4, 5, 6, 7, 8?, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: DUNELAND
Layer name	DUNELAND_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Structural class = Duneland
Description	Duneland polygons, extracted from NelsonBaysEcosystemsMap. Mapping based on 1) broadscale estuarine habitat maps; 2) areas digitised from Abel Tasman National Park area habitat maps (Davidson 1992); and 3) areas digitised from aerial imagery and surrounding mapping at Delaware, Kokorua, Tāhunanui and Farewell Spit. Clark (2014) noted that Duneland is not well mapped from aerial photographs because the extent of the dunes is difficult to determine, particularly where terrestrial vegetation encroaches. Please note that the collation of recent broadscale habitat map data, supplied by Salt Ecology, contains updated data based on resurvey of TDC and NCC estuaries, and should replace these duneland polygons if / where overlaps occur. Dunelands contain distinctive plant communities, and provide coastal protection, habitat for skinks and katipō spider (Threatened), and breeding habitat for Caspian terns, gulls and oystercatchers.
Source reference	Clark (2014).
Relevance to Policy 11	11(a)(i),(iii?),(v?). 11(b)(i),(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 2, 3, 4, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: REFUGIA
Layer name	REFUGIA_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Refugia attribute contains data
Description	Sub-set of the Nelson Bays ecosystems map, containing polygons (habitats) that were classified as 'Refugia', i.e. where the following habitats were dominant: SALTMARSH; SEAGRASS; SPONGE GARADEN; REEF; BRYOZOANS; SABELLID FIELDS; RHODOLITH BEDS; SHELL BANKS; OYSTER BEDS; MUSSEL BEDS. See individual layers, extracted from this data sub-set, for details – noting that the recent collation of estuarine habitat map data, supplied by Salt Ecology, contains updated information about the estuarine components of these habitats. Note that estuarine macroalgal beds were excluded as these comprise 'nuisance macroalgae layers that are commonly temporally variable and usually indicate areas of degradation rather than high ecological significance' (Leigh Stevens, pers. comm.).
Source reference	Clark (2014).
Relevance to Policy 11	See entries for individual habitat types
Matching KEA criteria	See entries for individual habitat types

Group name	NELSON BAYS ECOSYSTEMS MAP: SPONGE GARDEN
Layer name	SpongeGarden_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Refugia = Sponge garden.
Description	Polygons delineating the sponge garden areas described in Asher et al. (2008), provided by Cawthron for the Nelson Bays ecosystems map (Clark 2014). This remains the only source of information about sponges in these areas, since they occur subtidally and are therefore not monitored by ongoing / recent broadscale estuarine habitat mapping. Accuracy of sponge bed extent delimitation is uncertain but is likely coarse. The Traverse sponge garden covers approximately 1.2 ha, and the Saxton-Monaco channel approximately 4.8 ha. Asher et al. (2008) describe two regions containing biologically diverse sponge-associated communities in Waimea Inlet (sponge gardens), both dominated by *Mycale (Carmia) tasmani* and associated biota on a cobble / shingle substrate. See Asher et al (2008) for more details. Clark (2014) noted that there are probably other sponge gardens within the case study area. These were the only reported sponge gardens with reliable information.
Source reference	Asher et al. (2008).
Relevance to Policy 11	11(a)(iii?),(iv?),(v?). 11(b)(ii),(iii),(iv?),(v?)
Matching KEA criteria	1, 2?, 3, 4?, 5, 6, 7?, 8?, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: REEF
Layer name	REEF_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Refugia = Reef.
Description	Polygons extracted from Nelson Bays ecosystems map. Outline of reef based on DOC shapefile of reefs around Aotearoa New Zealand, mapped at a relatively coarse scale and missing smaller reefs. The original polygons were modified by Clark (2014) using other data sources: aerial imagery; habitat maps in Abel Tasman National Park (Davidson 1992); bathymetry data. Primarily used for deeper reefs that were not entirely visible in aerial photos. Comparisons with aerial photographs were made.
Source reference	Clark (2014). Reef shapefile was supplied by DOC for the ecosystem services map. Not publicly available.
Relevance to Policy 11	11(a),(i?),(iii?),(iv?),(v?). 11(b)(i),(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1?, 2?, 3, 4?, 5?, 6?, 7?, 8, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: BRYOZOANS
Layer name	BryozoanSilt_SeparationPt_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Refugia = Bryozoans.
Description	Polygons extracted from Nelson Bays ecosystems map (Clark 2014). Defined using data from Grange et al. (2003) based on side-scan sonar and ground-truthing with ROV video footage taken at Separation Point in 2002. Largest known area of bryozoan biogenic habitat in Nelson Bays. Potentially other areas of bryozoans within the case study region; however, these are most likely not of significance in comparison with those at Separation Point. Evidence of scattered, small bryozoan mounds within the Tonga Island Marine Reserve and another bed off D'Urville Island that may, or may not, still exist.
Source reference	Grange et al. (2003); Clark (2014); Jones et al. (2018).
Relevance to Policy 11	11(a)(ii?[10]),(iii),(iv?),(v?). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 2, 3, 4?, 5?, 6?, 7?, 8?, 9?

[10] According to Newcombe et al. (2015), the Separation Point bryozoan beds are internationally recognised (Wells et al. 1983).

Group name	NELSON BAYS ECOSYSTEMS MAP: TUBEWORMS
Layer name	SabellidField_NelsonBaysEcosystemsMap (tubeworms)
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Refugia = Sabellid field.
Description	Includes polygons coded 'Sabellid Field' in the Nelson Bays ecosystems map – sourced from previous broadscale estuarine habitat maps (Waimea 2006; Motueka 2001, 2004). Note that updated broadscale habitat maps include areas dominated by 'tubeworm reefs' in Moutere Inlet and Waimea Estuary. See: TDC_NCC_SitesofMarineSignificance_TubewormReef; TDC_NCC_SitesofMarineSignificance_TubewormReef_SubDom1. The coastal area off Motueka, where sabellid fields were reported in 2001, is beyond the extent of recent estuarine maps. No spatial data exist for observations of tubeworm reefs at Ruby Bay, but see descriptive observation provided by Rob Davidson: the Ruby Bay mounds are the largest in Tasman and Golden Bays (smaller areas occur in Waimea Inlet). Nationally they occur on the South and North Islands. Ruby Bay tubeworm mounds are located on the intertidal flats in northern Ruby Bay. The tubeworms are a sabellariid species (*Neosabellaria kaiparaensis*) that builds tubes of sand grains that clump together to form mounds over much of the intertidal gravel and cobble flats. Waimea Inlet tubeworm mounds observed on edge of channel south of Saxton Island in 1988.
Source reference	Map data (Clark 2014). Other relevant references for local area include Ekdale and Lewis (1993) and Rob Davidson (unpublished data), and for the national area, Morton and Miller (1968).
Relevance to Policy 11	11(a),(iii?),(iv?),(v?). 11(b)(ii),(iii),(iv?),(v?)
Matching KEA criteria	1, 2?, 3?, 4?, 5?,6, 7?, 8?, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: RHODOLITHS
Layer name	RhodolithBeds_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Refugia = Rhodolith bed.
Description	Rhodolith bed polygons extracted from the Nelson Bays ecosystems map. Abel Tasman National Park polygons based on beds described by Davidson and Freeman (2013). Mapped with a video sled, drop camera and diving. Areas of reef were excluded from Clark's (2014) shapefile. D'Urville polygons based on description in Davidson et al. (2011). Descriptions provided by Rob Davidson: the Abel Tasman National Park beds are the only rhodolith beds known from the coastal areas of Tasman and Golden Bays. The Onetahuti bed is the only one known to be located within a marine reserve in Aotearoa New Zealand. The Tōtaranui bed is probably the largest bed in the South Island. Part of the Tōtaranui bed is protected from commercial fishing within the Separation Point closed area but the whole bed is vulnerable to recreational fishing. Onetahuti (southwest of Tonga Island Marine Reserve): 20 ha, high-density rhodolith bed. Offshore of Tōtaranui (Abel Tasman National Park): 246 ha. Rhodolith beds around D'Urville Island (Coppermine and Ponganui Bays), estimated total area 22 ha. Found at depths of 6–26 m and covered up to 100% of the silt and dead shells on the seafloor. Habitat with restricted distribution in the bays, vulnerable to modification and that may support relatively high biodiversity and productivity.
Source reference	Map data: Clark (2014). Other relevant reports: Davidson et al. (2011), Davidson and Freeman (2013)
Relevance to Policy 11	11(a),(iii?),(iv?),(v?). 11(b)(i),(iii),(iv?),(v?)
Matching KEA criteria	1, 2, 3?, 4?, 5, 6, 7?, 8?, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: SHELL BANK
Layer name	ShellBank_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class, extracted from NelsonBaysEcosystemsMap, where Refugia = Shell bank.
Description	Estuarine areas dominated by SHELL BANK habitat (or, where shell bank was recorded as a subdominant habitat), sourced for Nelson Bays ecosystems map from previous broadscale estuarine habitat maps (Delaware, 2009; Haven, 2009; TDC region, 2012; Moutere, 2004; Waimea, 2006; Motupipi, 2007) and assigned 'Refugia' attribute. Shell banks are areas of dead / empty shells. Please note that the collation of recent broadscale habitat map data, supplied by Salt Ecology, contains updated data based on resurveys of these and other estuarine areas. See: TDC_NCC_SitesofMarineSignificance_ShellBank; TDC_NCC_SitesofMarineSignificance_ShellBank_SubDom1. Shellfish beds and associated substrates are, among other things, important feeding and roosting area for seabirds and waterfowl, including Threatened and At Risk species.
Source reference	Clark (2014).
Relevance to Policy 11	11(a),(iii?),(iv?),(v?). 11(b),(ii?),(iii),(iv?),(v)
Matching KEA criteria	1, 2?, 3, 4, 5, 6?, 7?, 8?, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: OYSTERS, MUSSELS
Layer name	OysterBeds_NelsonBaysEcosystemsMap; MusselBeds_NelsonBaysEcosystemsMap
Data format and details	Polygon feature classes, extracted from NelsonBaysEcosystemsMap where a) Refugia = Oyster bed, or b) Refugia = Mussel bed.
Description	Estuarine areas dominated by OYSTER or MUSSEL bed habitats (or where these was recorded as a subdominant habitat), sourced for Nelson Bays ecosystems map from previous broadscale estuarine habitat maps and assigned 'Refugia' attribute. Please note that the collation of recent broadscale habitat map data, supplied by Salt Ecology, contains updated data based on resurveys of these and other estuarine areas. See: TDC_NCC_SitesofMarineSignificance_MusselReef; TDC_NCC_SitesofMarineSignificance_MusselReef_SubDom1; TDC_NCC_SitesofMarineSignificance_OysterReef; TDC_NCC_SitesofMarineSignificance_OysterReef_SubDom1. Shellfish beds and associated substrates are, among other things, important feeding and roosting area for seabirds and waterfowl, including Threatened and At Risk species.
Source reference	Clark (2014).
Relevance to Policy 11	11(a),(iii?),(iv?),(v?). 11(b),(ii),(iii),(iv),(v?)
Matching KEA criteria	1, 2?, 3, 4, 5, 6?, 7?, 8?, 9?

Group name	NELSON BAYS ECOSYSTEMS MAP: SEDIMENTS
Layer name	Sediments_NelsonBaysEcosystemsMap
Data format and details	Polygon feature class; NelsonBaysEcosystemsMap sediment data – symbolised using Sed_Layer attribute
Description	Sediment data (SedLayer) from the Nelson Bays ecosystems map. Comprises unvegetated sediments, categorised as mud, sand / mud, sand, gravel, cobble and boulder (with subcategories of estuarine, < 30 m water depth, 30–200m water depth), estuarine beach, beach. See report for data sources.
Source reference	Clark (2014).
Relevance to Policy 11	11(b) (ii),(iii),(iv),(v),(iv?)
Matching KEA criteria	1, 2?, 3, 4, 5, 6?, 8?, 9?

Group name	MARINE RESERVE habitat maps & seabed survey
Layer name	HoroirangiMarineReserve_SeabedSurvey
Data format and details	Point feature class
Description	Soft sediment baseline ecological survey stations for Horoirangi Marine Reserve, 2006. Survey locations only, see Keeley et al. (2006). for data. Variables measured: apparent redox depth, sediment texture, total organic content, infaunal abundance and diversity, epibiota quantified from drop camera images.
Source reference	Keeley et al. (2006).
Relevance to Policy 11	Outside scope to assess
Matching KEA criteria	Outside scope to assess

Group name	MARINE RESERVE habitat maps & seabed survey
Layer name	HoroirangiHabitatMap
Data format and details	Polygon feature class, digitised from georeferenced report figure map.
Description	Benthic habitat map for Horoirangi Marine Reserve, generated by NIWA in 1995 based on side-scan sonar imagery and transect observations. Polygons are digital representations of a georeferenced image, generated by Cawthron for this project. They are an approximate representation only; please refer to NIWA report for more information: Grange and McLean (1995).
Source reference	Grange and McLean (1995).
Relevance to Policy 11	11(a)(i),(iii),(vi). 11(b),(i),(ii),(iii),(iv?),(v?),(vi?)
Matching KEA criteria	3?, 4?, 7?, 8?, 9?

Group name	MARINE RESERVE habitat maps & seabed survey
Layer name	WakapuakaTaiāpure_HabitatMap
Data format and details	Polygon feature class, digitised from georeferenced report figure map.
Description	Habitat map for Wakapuaka taiāpure, generated by NIWA in 2005. Polygons are digital representation of a georeferenced image, generated by Cawthron for this project. It is an approximate representation only; refer to Davey et al. (2005) for more information.
Source reference	Davey et al. (2005).
Relevance to Policy 11	11(b),(i),(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	3, 4?, 7?, 8?, 9?

Group name	OTHER SIGNIFICANT MARINE COMMUNITIES / AREAS
Layer name	LimestoneSubtidalCommunity_TaupoPoint
Data format and details	Polygon feature class, exported from shapefile supplied by Rob Davidson.
Description	The limestone substratum is restricted to Taupō Point, the Tata Islands and the Abel Tasman Monument. Limestone substrata at Taupō Point (Wainui Bay, Abel Tasman National Park) supports a distinct subtidal community type compared to adjacent granite coast. One of only a few subtidal limestone areas in the Nelson Bays. Cawthron note: these polygons were provided by Rob Davidson as indicative areas, based on intertidal and subtidal surveys, aerial photography and depth sounding. Accuracy of boundaries require improvement.
Source reference	Polygons supplied by Rob Davidson, based on: Davidson (1992); Davidson and Chadderton (1994).
Relevance to Policy 11	11(a),(iii?),(iv?),(v?). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1?, 2?, 3, 4?, 5?, 6, 7?, 8?, 9?

Group name	OTHER SIGNIFICANT MARINE COMMUNITIES / AREAS
Layer name	ShallowSubtidal_GoldenBay
Data format and details	Polygon feature class, exported from shapefile supplied by Rob Davidson.
Description	Inshore areas of Golden Bay are protected from dredging / trawling (exclusion zone, but note that Fisheries Restrictions dataset indicates that commercial fishers may use trawl nets only outside of period 1 November to 30 April). Unknown proportion of area supports biogenic habitats consisting of patches of horse mussels, ascidians, sponges, hydroids. Rare in offshore subtidal (predominantly uniform mud).
Source reference	Shapefile and description supplied by Rob Davidson, based on: Davidson (1998).
Relevance to Policy 11	11(a),(i?),(iii?),(iv?),(v?),(vi). 11(b),(i),(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 2?, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	OTHER SIGNIFICANT MARINE COMMUNITIES / AREAS
Layer name	Shellfish_Seagrass_MarahauBeach
Data format and details	Polygon feature class, exported from shapefile supplied by Rob Davidson.
Description	This sandflat, located along the Mārahau beach front, Abel Tasman National Park coast, supports seagrass and shellfish beds. Seagrass beds are becoming uncommon in Tasman and Golden Bays. Regularly used by a variety of wader species (5 threatened, 9 at risk).
Source reference	Shapefile and description supplied by Rob Davidson, based on: Molineux Project; Davidson and Richards (2004, 2005); Schuckard and Melville (2019).
Relevance to Policy 11	11(a)(i),(iii). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 2?, 3, 4, 5, 6, 8?, 9?

Group name	WETLANDS
Layer name	Current wetland extent (2013)
Data format and details	Feature Service Feature Class. Data added to map document via path (see 'Source reference') and therefore not filtered to coastal extent. Note that only wetlands within coastal extent were assessed for relevance to policies and threats.
Description	Description (from Our Environment Tool, see 'Source reference'): 'This wetlands dataset has its origins in the Wetlands of National Importance (WONI) project, which was part of the Sustainable Development Programme of Actions for Freshwaters which had the goal of identifying a list of water bodies that would protect a full range of freshwater biodiversity. Current wetlands were defined by combining existing databases including LCDB2 (Land Cover Database version 2), NZMS 260 Topomaps, existing surveys from Regional Councils, Queen Elizabeth II (QEII) covenant wetland polygons, DOC surveys (WERI database), and the 15m DEM, to define a single set of wetland polygons and centre points. All this data was checked against a standardised set of Landsat imagery using the Ecosat technology and where necessary new wetland boundaries delineated. Wetlands were classified into seven groups at the hydro-class level using fuzzy expert rules.'
Source reference	Layer sourced via DOC: https://seasketch.doc.govt.nz/arcgis/rest/services/National/Our_Estuaries/MapServer. Also available (to view / generate reports only) via: https://ourenvironment.scinfo.org.nz/maps-and-tools/app/Wetlands/wetlands_current
Relevance to Policy 11	11(a),(i?),(iii?),(v?). 11(b),(i),(ii?),(ii), (iii), (iv?),(iv?),(v),(vi?)
Matching KEA criteria	1, 2?, 3, 4, 5?, 6?, 8?, 9?

Group name	LAND COVER DATA
Layer name	LCDB5_TDC_NCC_CoastalEnvironment
Data format and details	Polygon feature class, sub-set to the TDC and NCC coastal environment and symbolised based on classifications generated from 2018 aerial imagery.
Description	Land cover data, extracted from Manaaki Whenua – Landcare Research's LCDBv5 using NCC and TDC coastal extent lines and symbolised based on CLASS_2018 & NAME_2018 (2018/19 aerial imagery). See metadata via link: https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand. This is a national-scale dataset, including data about indigenous vegetation, but there may be some accuracy limitations (e.g. for saltmarsh).
Source reference	https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand
Relevance to Policy 11	Not assessed because dataset includes a wide variety of land cover types, including some that are heavily modified by humans.
Matching KEA criteria	Not assessed because dataset includes a wide variety of land cover types, including some that are heavily modified by humans.

Group name	NATIONAL-SCALE HABITAT MAPS (MPI)
Layer name	a. Biogenic Habitats, b. Marine habitat map of New Zealand Bioregions, c. New Zealand Seafloor Community Classification of the Territorial Sea
Data format and details	a) and b) Feature Service Feature Classes, c) File Geodatabase Raster
Description	a. and b. Analysis of which coastal habitats in the New Zealand territorial sea were (at the time of layer development) represented in areas that meet the New Zealand Marine Protected Areas (MPA) Protection Standard (the Protection Standard). Approximate, predominantly physical surrogates of habitats derived from broad categories of environmental drivers such as depth, substratum, exposure and the actions of biogenic, habitat-forming organisms are mapped. Outstanding, rare, distinctive, internationally or nationally important habitats or ecosystems, or finer-scale species associations and ecosystem processes, are not assessed. Also, development of a fit-for-purpose, numerical classification of the marine environment, to support ongoing MPA planning and reporting at a national scale and complement work to develop Key Ecological Areas mapping for Aotearoa New Zealand. c. Layer metadata description: To support ongoing marine spatial planning in Aotearoa New Zealand, a numerical environmental classification using Gradient Forest (GF) models was developed using a broad suite of biotic and high-resolution environmental predictor variables. A total of 630,997 records of 1,716 taxa living on or near the seafloor and occurring at 39,766 unique locations was used to inform the transformation of 20 gridded environmental variables to represent spatial patterns of compositional turnover in 4 biotic groups (demersal fish, benthic invertebrates, macroalgae and reef fish) and the overall seafloor community. Compositional turnover of the overall community was classified using a hierarchical procedure to define groups at different levels of classification detail and at two resolutions: a 250 m resolution grid from the coastline to the edge of the territorial sea (12 nautical miles from shore), and a 1 km resolution grid from the edge of the territorial sea to the edge of the New Zealand exclusive economic zone. The 75-group-level classification was assessed as representing the highest number of groups that captured the majority of the variation across the Aotearoa New Zealand marine environment. This classification is referred to as the New Zealand Seafloor Community Classification (SCC). Associated spatially explicit measures of uncertainty for compositional turnover for the overall community (measured as the standard deviation of the mean (SD) compositional turnover averaged across each environmental variable) are also available, as is an added measure of uncertainty – coverage of the environmental space, which highlights geographic areas where predictions may be less certain due to low sampling. The full report and description of classes (at the 75 group level) are available at:

Group name	NATIONAL-SCALE HABITAT MAPS (MPI)
Description	https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-protected-areas/development-of-new-zealand-seafloor-community-classification.pdf https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-protected-areas/seafloor-community-classification-supplementary-information.pdf
Source reference	Spatial data sources: a and b) https://maps.mpi.govt.nz/wss/service/arcgis1/guest/MARINE/MARINE_Habitat/MapServer; c) https://hub.arcgis.com/documents/98d452b3b1ba4e1193a3b8b909bb9a64/about Reports: a and b) DOC and MFish (2011). c) Stephenson et al. (2021).
Relevance to Policy 11	11(a),(i?),(iii?),(v?). 11(b)(ii?),(ii), (iii), (iv),(v?),(vi?)
Matching KEA criteria	1, 2?, 3, 4?, 5, 6, 8?, 9?

Group name	BIODIVERSITY: DOC NZ Seagrass database
Layer name	a. National/Seagrass_Most_Recent_Public_201810 b. National/Seagrass_Second_Most_Recent_Public_201810 c. National/Seagrass_Third_Most_Recent_Public_201810 d. National/Seagrass_Fourth_Most_Recent_201806
Data format and details	Polygon Feature Classes
Description	NZ seagrass extent data. See Seasketch/About this project (https://www.seasketch.org/#projecthomepage/5357cfa467a68a303e1bb87a) for details about data layers. Cawthron notes that seagrass data captured in recent broadscale estuarine habitat maps for TDC and NCC have not yet been included, and that this resource is currently undergoing an update.
Source reference	Data layers imported via application programming interfaces, accessed from View Description (right click) for each layer in DOC Seasketch resource: https://www.seasketch.org/#projecthomepage/5357cfa467a68a303e1bb87a
Relevance to Policy 11	11(a),(i),(iii?). 11(b),(i),(ii),(iii),(iv),(v),(vi?)
Matching KEA criteria	1, 2?, 3, 4, 5, 6, 8, 9

Group name	BIODIVERSITY: Horse mussels / Atrina; Other bivalves
Layer name	Moorings2021_CableBay_BoulderBank_Delaware (symbolised in map based on 'HorseMussels', and also on 'Scallops')
Data format and details	Point feature class.
Description	Baseline biological data for three mooring sites used for the deployment of experimental structures, southeast Tasman Bay. Substrate type and seafloor communities were described using sonar imaging, drop camera and video. Survey data supplied by Rob Davidson in spreadsheet format, converted to spatial data by Cawthron. Cable Bay: Davidson and Richards (2021) estimated horse mussels ranged from zero to approximately 8 individuals per m^2, with an estimated mean density of 1–2 individuals per m^2. Horse mussels were often patchily distributed, with areas of bare sediment between clusters. It is likely this is the largest remaining bed in the area. Other surface-dwelling invertebrates included scallops (common), solitary ascidians (occasional), compound *Didemnum* spp. ascidian (sparse), pink urchin (uncommon), hermit crab (occasional), 11-arm seastar (occasional) and opalfish (occasional). Symbolised here based on horse mussel presence. Dataset also includes substrate type classification (all = silt / clay).
Source reference	Davidson and Richards (2021).
Relevance to Policy 11	11(a),(iii). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 3, 4?, 5, 6, 7?, 8?, 9?

Group name	BIODIVERSITY: Horse mussels / Atrina; Other bivalves
Layer name	a. Atrina_CableBay_NIWA b. Scallops_CableBay_NIWA
Data format and details	Polygon feature class.
Description	A survey in 2021 showed mixed species horse mussel and scallop bed (Sean Handley, NIWA, unpublished data).
Source reference	Supplied by Sean Handley (NIWA), unpublished data.
Relevance to Policy 11	11(a)(iii). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 3, 4?, 5, 6, 7?, 8?, 9?

Group name	BIODIVERSITY: Horse mussels / Atrina
Layer name	HorseMusselSites2022_PortNelsonLongTermMonitoring
Data format and details	Point feature class, coordinates supplied by Cawthron.
Description	Observations of moderate densities of intermediate-sized horse mussel individuals at the Port Nelson compass dolphin and adjacent to the Coastguard building (observations made during port surveys). At the latter site many individuals were dead and all were covered in sediment, and at both sites there was little development of epifaunal communities on shells. No spatial data for observations. Points are Port Nelson long-term monitoring sites at which horse mussels have been observed (Sneddon 2021).
Source reference	Nelson Haven: Emma Newcombe (Cawthron; pers. obs). Sites as per Sneddon (2021).
Relevance to Policy 11	11(a)(iii). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 3, 4?, 5, 6, 7?, 8?, 9?

Group name	BIODIVERSITY: Horse mussels / Atrina
Layer name	HorseMussels_AbelTasman
Data format and details	Polygon feature class.
Description	The following information was provided by Rob Davidson, along with the polygons in this dataset. Onetahuti: Two subsites in Onetahuti area of the Abel Tasman National Park coast. Horse mussels are present at sufficient densities to be classified as a bed. Recent diving by DOC suggests the horse mussel bed has grown and extends along Onetahuti Beach. Author recommends resurvey. Northern side of Separation Point, Abel Tasman National Park coast: a dense bed of horse mussels (estimate 10 per m^2) was recorded by divers in 1992 (Davidson 1992). The author stated that this was the highest abundance known for this species in Tasman and Golden Bays.
Source reference	Polygons supplied by Rob Davidson. Relevant reports: Onetahuti – Davidson and Freeman (2013); Davidson et al. (2013). Separation Point – Davidson (1992).
Relevance to Policy 11	11(a)(iii). 11(b)(ii),(iii),(iv)
Matching KEA criteria	1, 3, 4?, 5, 6, 7?, 8?, 9?

Group name	BIODIVERSITY: Horse mussels / Atrina
Layer name	HorseMussels_TasmanBay
Data format and details	Point feature class.
Description	This dataset represents transects along which horse mussel abundance was assessed from ROV video footage and multibeam data, collected as part of a project for TDC to investigate areas that are suitable for large vessels to anchor in Tasman Bay (Crossett 2023). Note that this is not a complete dataset because the observations and assessments were in progress during the time frame of our project. Please see the now published report (Crossett 2023) for updated information. Further sites have also been assessed by Scott-Simmonds et al. (2023). Due to the time frame of our project, the information in this report has not been included in the current report.
Source reference	Data supplied by Cawthron (Crossett 2023). See also Scott-Simmonds et al. (2023) for additional survey information.
Relevance to Policy 11	11(a)(iii). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 3, 4?, 5, 6, 7?, 8?, 9?

Group name	BIODIVERSITY: Horse mussels / Atrina; Other bivalves; Bryozoans
Layer name	a. BIVALVES_Atrina, b. BIVALVES_Compliation, c. BRYOZOANS_Compilation
Data format and details	Point feature classes.
Description	Data used in review of key biogenic habitats (Anderson et al. 2019). Compilation of data on habitat-forming species that support high diversity of associated species, including juveniles of commercially important fish. Highly vulnerable to disturbance, particularly bottom-contact fishing methods, which have eliminated this habitat in some parts of the region, and recovery likely to be on decadal scale. Georeferenced data from OBIS (http://www.iobis.org), Te Papa Natural History Collection, NIWA Invertebrate Collection, NIWA Vulnerable Marine Ecosystem dataset, bryozoan dataset for New Zealand compiled by Wood et al. (2013), bivalves from MPI trawl and scallop databases. Layers are sub-set for: a) *Atrina*, b) other bivalves and c) bryozoans. Note that many were submitted in the 1960s, but there are some more recent records.
Source reference	Spatial data supplied by NIWA. Relevant reports: Grange et al. (2003); Anderson et al. (2019).
Relevance to Policy 11	11(a)(i?),(iii). 11(b)(ii),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: MACROALGAE
Layer name	NIWA_Macroalgae
Data format and details	Point Feature class.
Description	Macroalgae data used in review of New Zealand's key biogenic habitats (Anderson et al. 2019), provided by NIWA and sub-set to the NCC and TDC regions. See report for details about data sources.
Source reference	Anderson et al. (2019).
Relevance to Policy 11	11(a),(i?),(iii?),(iv?). 11(b),(i),(ii),(iii),(iv),(v),(vi?)
Matching KEA criteria	1, 2?, 3, 4, 5, 6, 7?, 8, 9

Group name	BIODIVERSITY: MACROALGAE
Layer name	MBIS_coralline_algae_TasmanGoldenBays
Data format and details	Point feature class.
Description	Records for coralline algae within Tasman and Golden Bays, extracted from NIWA MBIS database: https://catalogue.data.govt.nz/dataset/mbis-nz. Observation / collection date ranges from 2013 to 2020. Occurrence details of Aotearoa New Zealand marine fauna and flora from around the coastline and offshore. Information is assimilated from a variety of sources, including unpublished datasets and digitised from journal articles. Where the source is from a published paper, the source paper citation is listed at the record level. Data were then assimilated from digital and non-digital sources (such as journal publications, reports, work sheets) into a central dataset. Marine species occurrence data collated from research events along the coast and in Aotearoa New Zealand waters. Biological data were sampled *in situ* using a variety of equipment such as trawls, pots, grabs, dredges and beach surveys. The scientific names have been mapped to the World Register of Marine Species (WoRMS), using the online taxon match tool. All sampling locations have been plotted on a map to perform a visual check. The most important check would be to see if all sampling locations are (1) in the marine and / or brackish environment, and (2) within the described sampling area. Citation: SWPRON (2014).
Source reference	https://catalogue.data.govt.nz/dataset/coralline-algae-of-northern-and-central-new-zealand1
Relevance to Policy 11	11(a),(iii?),(iv?).11(b),(ii),(iii),(iv?),(v?),(vi?)
Matching KEA criteria	1, 2?, 3?, 4?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: MACROALGAE
Layer name	RedAlgae_Onetahuti
Data format and details	Polygon feature class.
Description	The only known red algal bed in Tasman and Golden Bays is a subtidal area at the north end of Onetahuti Beach (southwest of Tonga Island Marine Reserve): area (5.3 ha) located northwest of Tonga Island near Reef Point in 10–13 m water depth. Dense bed of short, foliose and filamentous red algae (predominant species probably *Adamsiella* sp.), with some green algae, growing on shell hash. Mapped with video sled, drop camera and diving.
Source reference	Polygons supplied by Rob Davidson. Relevant report: Davidson and Freeman (2013).
Relevance to Policy 11	11(a)(iii),(iv?),(v?). 11(b)(ii),(iii),(iv?),(v?),(vi?)
Matching KEA criteria	1?, 2?, 3?, 4?, 5, 6, 7?, 8?, 9?

Group name	BIODIVERSITY: MACROALGAE
Layer name	PredictedGeographicalDistributionofZonariaTurneriana
Data format and details	Raster (.tif), added via ArcGIS Online and transferred to geodatabase.
Description	Predicted geographical distribution of macroalgae on subtidal rocky reefs in Aotearoa New Zealand using ensemble species distribution modelling (bootstrapped boosted regression tree and random forest models). *Zonaria turneriana* included as example; many others available (see Source reference). Detailed methods are available in Lundquist et al. (2020). Spatial predictions generated for all reef habitat (defined by DOC national rocky reef layer) less than 40 m depth.
Source reference	Lundquist et al. (2020). https://hub.arcgis.com/documents/51b18d8cc87844f1a004a55ce57231c8/about See usage limitations in metadata: https://www.arcgis.com/sharing/rest/content/items/51b18d8cc87844f1a004a55ce57231c8/info/metadata/metadata.xml?format=default&output=html
Relevance to Policy 11	11(a),(i?),(iii?), (iv?),(v?). 11(b)(ii), (iii), (iv),(v?),(vi?).
Matching KEA criteria	1?, 2?, 3?, 4?, 5, 6, 7?, 8, 9

Group name	BIODIVERSITY: MARINE MAMMALS (DOC)
Layer name	DOCMarineMammalDatabase_Sub-setNCCTDCarea_2022_11_28
Data format and details	Point features class. Dataset is displayed three ways in map document, using definition queries to sub-set: a. whales: DOCMarineMammalDatabase_Whales b. dolphins: DOCMarineMammalDatabase_Dolphins c. seals: DOCMarineMammalDatabase_Seals. See Source for use limitations.
Description	Marine mammal sightings database, information provided by DOC: DOC-reported sighting and stranding records for marine mammals (by species) in Golden and Tasman Bays. Compiled by DOC from various sources, and supplied 28 November 2022. This is a sub-set of the national database – restricted to sightings within the regional boundaries of NCC and TDC. Use is restricted to the specific project it was supplied for. Comments from DOC: the database combines records from three sources (Excel, MS Access and ArcGIS). The first column shows the source: 'MSAccess' for strandings, 'ArcGIS NATIS1' for Hector's / Māui sightings and incidents and seismic survey sightings, and 'Exce Sightings' for sightings. Excel handles dates poorly, so these appear in mixed formats, but to counter this there are separate columns for day, month and year. Observation type wording is different in each source. It is a work in progress to make this variable consistent across all three sources. Latitude and longitude use WGS84.
Source reference	Database supplied by DOC. The following caveats / restrictions were supplied by DOC: 'Please consider the following caveats when analysing the national marine mammal database: 1. The data is limited to records received by the Department 's National Office from a number of different sources and independent field offices and there are no guarantees that it is fully representative or accurate 2. The quality and quantity of data collection has improved over time, particularly with the advancement of technology. Note that the data is the property of DOC and therefore we ask that you observe the following conditions with regard to its use: 1. The data shall only be used in the manner outlined in your submitted proposal, unless prior permission is granted from DOC. 2. The Department is to be supplied with a copy of any reports, papers etc that result from your analysis of this data. 3. The Department is to be informed of the intention to publish any findings resulting from the analysis of this data prior to the draft being submitted to the chosen publication. 4. DOC is to be appropriately acknowledged in any reports, publications etc that result from your analysis of the data provided. 5. The data shall not be supplied to any third party without prior written permission from the Department. 6. The data supplied shall not be made available on the internet or any other publicly available medium without prior permission from the Department.'
Relevance to Policy 11	11(a)(i),(iv?). 11(b),(ii?),(v?),(vi?)
Matching KEA criteria	1, 2, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: MARINE MAMMALS (NIWA)
Layer name	Aerial&BoatSurvey_2010–2011 (marine mammals); sub-sets: MarMammalCounts_HectorsDolphin; MarMammalCounts_FurSeal; MarMammalCounts_DuskyDolphin; MarMammalCounts_CommonDolphin; MarMammalCounts_BottlenosedDolphin; MarMammalCounts_Dolphin_noID AerialObservation_HectorsDolphins; AerialSurvey_Seal; AllBirdData_DuskyDolphin; AerialSurvey_Dolphins
Data format and details	Point feature classes. Data supplied by NIWA in layer package format, sub-set and transferred to feature classes by Cawthron.
Description	Sightings data for marine mammals in Tasman and Golden Bays, compiled from different survey types (aerial and boat).
Source reference	Data supplied by NIWA in ArcGIS layer package format, sub-set and exported to geodatabase by Cawthron. Handley and Sagar (2011); Handley et al. (2011).
Relevance to Policy 11	11(a),(i),(iv?). 11(b), (ii?), (v?),(vi)
Matching KEA criteria	1, 2, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: MARINE MAMMALS (MPI)
Layer name	ProtectedSpeciesCaptures_TDC_NCC (marine mammal sub-set)
Data format and details	Point feature class, sub-set to include marine mammals using definition query: taxon = ‘Common dolphin’
Description	Protected species captures (by fisheries) dataset for time periods 2002–03 and 2019020, extracted from MPI / DragonFly online dataset: https://protectedspeciescaptures.nz/PSCv6/released and sub-set for the Nelson City and Tasman District Council regional boundaries. See: https://protectedspeciescaptures.nz for information about this dataset.
Source reference	https://protectedspeciescaptures.nz/PSCv6/released
Relevance to Policy 11	11(b) (ii?),(v?)
Matching KEA criteria	1?, 2?, 3?, 4?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: MARINE MAMMALS
Layer name	CoastalBirdSurvey2020_1kmSections_NZFurSeal (CoastalBirdSurvey_RawData)
Data format and details	Point feature class: CoastalBirdSurvey_RawData, sub-set to include marine mammals using definition query: NZ_Fur_Seal > 0
Description	Coastal bird survey for TDC region, but includes fur seal observations.
Source reference	McArthur et al. (2022). Observation / survey data supplied by TDC in spreadsheet format: 2020 TDC Coastal Bird Survey Rawdata, including 1kmSection; Breeding and band records datasets
Relevance to Policy 11	11(b), (ii?),(v?)
Matching KEA criteria	1?, 2?, 3?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: MARINE MAMMALS
Layer name	Cetaceans – modelled distribution
Data format and details	ArcGIS Map Service
Description	Modelled species distribution data (relative environmental suitability, average year-round probability of presence, density mean) for cetaceans (30 species) in Aotearoa New Zealand waters. See report (Source reference) for further description.
Source reference	https://onlinelibrary.wiley.com/doi/full/10.1111/ddi.13035; https://maps.mpi.govt.nz/wss/service/arcgis1/guest/MARINE/MARINE_Species_Cetacean/MapServer
Relevance to Policy 11	Potentially 11(a),(i). 11(b)(ii?),(iv),(v?)
Matching KEA criteria	1, 2, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: BIRDS
Layer name	SitesOfInternationalImportanceForShoreBirds
Data format and details	Point feature class, generated by Cawthron based on report figure.
Description	Sites of international importance to shorebirds, replicated from figure 1 map in Melville and Schuckard (2013). Tasman District has eight coastal areas that are of international importance for resident and / or migratory shorebirds meeting selection criteria under the Ramsar Convention on the Conservation of Wetlands, to which Aotearoa New Zealand is a party.
Source reference	Melville and Schuckard (2013).
Relevance to Policy 11	11(a),(i),(iv?). 11(b),(ii),(iii), (iv?),(v),(vi?)
Matching KEA criteria	1, 2, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: BIRDS
Layer name	AllBirdData, sub-set (by species) and saved to .gdb: AllBirdData_WhiteFrontedTern; AllBirdData_WhiteFacedStormPetrel; AllBirdData_WhiteCappedAlbatross; AllBirdData_SpottedShag; AllBirdData_SootyShearwater; AllBirdData_ReefHeron; AllBirdData_RedBilledGull; AllBirdData_PiedShag; AllBirdData_ParadiseShellDuck; AllBirdData_NZShoveler; AllBirdData_NorthernRoyalAlbatross; AllBirdData_MollyMawk; AllBirdData_LittleBluePenguin; AllBirdData_KingShag; AllBirdData_GreyBackedStormPetrel; AllBirdData_GiantPetrel; AllBirdData_Gannet; AllBirdData_FlutteringShearwater; AllBirdData_FleshfootedShearwater; AllBirdData_FairyPrion; AllBirdData_DivingPetrel; AllBirdData_CaspainTern; AllBirdData_BullersShearwater; AllBirdData_BullerMollyMawk; AllBirdData_BlackSwan; AllBirdData_BlackBackedGull; AllBirdData_BigShearwater; AllBirdData_BarTailedGodwit; AllBirdData_ArcticSkua; AllBirdData_UnidentifiedShag; AllBirdData_SmallShearwater; AllBirdData_SmallShag; AllBirdData_MiddleSizedShearwater; AllBirdData_MiddleSizedShag; AllBirdData_MiddleSizedMolly; AllBirdData_LargeShearwater
Data format and details	Point feature classes.
Description	Survey data (bird observations) from boat and aerial surveys.
Source reference	Data supplied by NIWA in ArcGIS layer package format, sub-set and exported to geodatabase by Cawthron. Handley and Sagar (2011); Handley et al. (2011).
Relevance to Policy 11	11a(i),(iv?). 11(b),(ii),(iii), (iv?),(v),(vi?)
Matching KEA criteria	1, 2, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: BIRDS
Layer name	ProtectedSpeciesCaptures_TDC_NCC
Data format and details	Point feature class, displayed using definition query: taxon <> 'Common dolphin' to include only birds.
Description	Protected species captures (by fisheries) dataset for time periods 2002–03 and 2019–20, extracted from MPI / DragonFly online dataset: https://protectedspeciescaptures.nz/PSCv6/released and sub-set for the NCC and TDC regional boundaries. Birds include: New Zealand white-capped albatross, fluttering shearwater, pied shag, prions, southern black-backed gull, spotted shag. See: https://protectedspeciescaptures.nz for information about this dataset.
Source reference	https://protectedspeciescaptures.nz/PSCv6/released
Relevance to Policy 11	11a(i),(iv?). 11(b),(ii),(iii),(iv?),(v),(vi?)
Matching KEA criteria	1, 2, 4?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: BIRDS
Layer name	a. CoastalBirdSurvey_RawData, b. CoastalBirdSurveyRawData_BreedingAndBandRecords
Data format and details	Point feature classes, generated from spreadsheets supplied by TDC. a. 1 km sections data from CoastaBirdSurvey_RawData, with definition queries to sub-set data, where each bird species > 0. This was done because many points contain observations of multiple species. Layers organised by conservation status (see Description): Migrant / Vagrant / At Risk / Threatened / Not Threatened. Note that Introduced species are excluded. b. CoastalBirdSurveyRawData_BreedingAndBandRecords, with definition queries to sub-set by BREEDING STATUS: Nests / Juveniles / Fledglings / Colony / Chicks. Displayed based on Species.
Description	Coastal bird survey data for TDC region (excluding West Coast). To improve the utility of the CoastalBirdSurvey_RawData dataset for the current project, Cawthron identified and assigned the conservation status of each bird species according to the New Zealand Threat Classification System (Robertson et al. 2016).
Source reference	McArthur et al. (2022). Other relevant report references: Melville and Schuckard (2013); Schuckard and Melville (2013, 2019); Melville (2015); McArthur et al. (2022). Resource used to assign conservation status to birds: Robertson et al. (2016).
Relevance to Policy 11	11(a)(i),(vi). 11(b),(ii?),(iii?),(iv?),(v),(vi)
Matching KEA criteria	1, 2, 3, 4?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: BACK BEACH BEETLE
Layer name	BackBeachBeetle_Map
Data format and details	Georeferenced hand-drawn report figure showing beetle habitat from 1998/99 and 2015/16, and survey transects.
Description	Survey to reassess presence and distribution of Back Beach beetle at Tāhunanui (see report and articles in 'Source reference').
Source reference	Map figure sourced from: Miller (2016) and georeferenced by Cawthron. Map shows mapped distribution recorded in January–February 2016 in green (and previous, 1998/99, distribution in pink) Other relevant references: https://en.wikipedia.org/wiki/Bembidion_tillyardi https://our.nelson.govt.nz/stories/the-back-beach-beetle-rides-again http://www.nelson.govt.nz/environment/nelson-nature/really-cool-nature-stuff/nelson-nature-videos/saving-the-back-beach-beetle
Relevance to Policy 11	11a(i),(iv?),(v?). 11(b),(ii),(iv?),(iii),(v?)
Matching KEA criteria	1?, 2, 3, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: FISH
Layer name	Fish_BoatAndAerialSurveys (Handley et al. 2011): a. Fish_BoatCounts (sub-set by species / type: Barracuda; BlueShark; FishAggregation; Shark); b. Fish_AerialCounts (sub-set by species / type: Shark; Kingfish; Kahawai; EagleRay; BlueShark; Barracuda; BaitFish)
Data format and details	Point feature classes, sub-set by species from master datasets supplied by NIWA.
Description	Survey data (fish observations) from boat and aerial surveys.
Source reference	Data supplied by NIWA in ArcGIS layer package format, sub-set and exported to geodatabase by Cawthron. Handley et al. (2011); Handley and Sagar (2011).
Relevance to Policy 11	Unlikely, but potentially 11a(i),(iv?). 11(b),(ii?),(iii),(iv),(v?),(vi?)
Matching KEA criteria	1?, 2?, 3?, 4?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: FISH
Layer name	New Zealand fish and squid distributions from research bottom trawls 1964–2008 (OBIS Provider)
Data format and details	Feature Service Feature Class, added via ArcGIS Online.
Description	New Zealand fish and squid distributions from research bottom trawls 1964–2008 (OBIS Provider). From 1997 to 2008, a research programme to determine if fish assemblages in the Aotearoa New Zealand region could be classified into clearly identifiable communities based on their associations with one another and with environmental features was undertaken. This dataset is taken from the resulting fish communities database. These data have been used to show geographical and depth distributions of species from all research tows within the New Zealand EEZ since 2008. https://data-niwa.opendata.arcgis.com/datasets/NIWA::new-zealand-fish-and-squid-distributions-from-research-bottom-trawls-1964-2008-obis-provider/about
Source reference	Dataset included as an ArcGIS Online layer (not downloaded) and is therefore not sub-set for the TDC and NCC region.
Relevance to Policy 11	Potentially 11a(i?),(iv?). 11(b),(ii?),(iv),(v?),(vi?)
Matching KEA criteria	1?, 2?, 3?, 4?, 5?, 6?, 8?, 9?

Group name	BIODIVERSITY: FISH
Layer name	Kingfish – Annual Distribution (example dataset)
Data format and details	Feature Service Feature Class
Description	Fish distribution areas (Hot spot; Normal range (90%); Full range (100%); Known not to exist; Unknown). Scientific interpretations based on the best available information from published and unpublished sources (MPI). Kingfish – Annual distribution included as an example, available for many more species; see 'Source reference' for link.
Source reference	https://www.arcgis.com/home/webmap/viewer.html?url=https://maps.mpi.govt.nz/wss/service/arcgis1/guest/MARINE/MARINE_Species_FSH/MapServer&source=sd
Relevance to Policy 11	11(b)(iv)
Matching KEA criteria	1?, 2?, 3?, 4?, 5?, 6?, 8?, 9?

Group name	BIODIVERSITY: FISH
Layer name	Inanga spawning sites
Data format and details	Feature Service Feature Class, added from DOC SeaSketch online resource.
Description	Īnanga spawning site observations (national dataset). Two records (observations from 1994) are within TDC coastal environment, at Motueka River mouth and upstream from Rākauroa / Torrent Bay (Abel Tasman National Park).
Source reference	https://seasketch.doc.govt.nz/arcgis/rest/services/National/Our_Estuaries/MapServer
Relevance to Policy 11	11(a),(i?),(iii?),(iv?). 11(b),(i),(ii),(iii),(iv),(v),(vi?)
Matching KEA criteria	1, 2?, 3, 4, 5, 6, 7?, 8, 9

Group name	BIODIVERSITY: FISH, CRAYFISH, PAUA
Layer name	HoroirangiMonitoringSites_Davidson2013
Data format and details	Point feature class, symbolised based on SiteType (crayfish, fish, pāua surveys).
Description	Biological monitoring sites within the Horoirangi Marine Reserve and at reference locations. Corresponding report (see 'Source reference') presents data for abundance / density and size of crayfish, fish and pāua observed in 2006 and 2013. Further data were collected in 2020 but no report has been supplied.
Source reference	Davidson (2006); Davidson et al. (2013).
Relevance to Policy 11	11(a)(vi). 11(b),(ii?),(iii),(iv?),(v?),(vi?)
Matching KEA criteria	1?, 3?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: Carex litorosa (sea sedge)
Layer name	CarexLitorosa_MaitaiRiverMouth
Data format and details	Polygon feature class, exported from shapefile supplied by Rob Davidson.
Description	Area of *Carex litorosa* (sea sedge), identified in the ecological report by Davidson et al. (2012) in relation to a proposed upgrade of the Maitai River walkway, Nelson.
Source reference	Davidson (2012).
Relevance to Policy 11	11(a),(i),(iii?). 11(b),(i?), (ii?),(iii?),(iv?),(v?),(vi?)
Matching KEA criteria	1, 2, 3?, 4, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: tubeworms, Ruby Bay
Layer name	Tubeworms_RubyBay
Data format and details	Polygon feature class.
Description	Refer to ‘Source reference’.
Source reference	Polygon supplied by Rob Davidson. Ekdale and Lewis (1993) described tubeworm reef at Ruby Bay. Polygon shapefile supplied by Rob Davidson. Method of polygon generation is uncertain and accuracy likely low.
Relevance to Policy 11	11(a),(iii?),(iv?). 11(b),(ii?),(iii?),(iv?),(v?),(vi?)
Matching KEA criteria	1?, 2?, 3?, 4?, 5?, 6?, 7?, 8?, 9?

Group name	BIODIVERSITY: multiple species
Layer name	MBIS_SpeciesRecords_NIWA
Data format and details	Point feature class.
Description	Marine biological observation data from coastal and offshore surveys around Aotearoa New Zealand (MBIS NZ), sub-set for Tasman and Golden Bays. Contains records for marine worms, macroalgae, echinoderms, molluscs, cnidarians, arthropods and chordates. Record dates range from 1904 to 2020.
Source reference	https://data-niwa.opendata.arcgis.com/datasets/ca1c91e1106d4ee497cf9bb222a94f67_0/explore?location=-40.925458%2C174.242457%2C7.60
Relevance to Policy 11	Potentially 11a(i) depending on the species recorded,(iii?),(iv?).
Matching KEA criteria	1?, 2?, 3?, 4?, 5?, 6?, 7?, 8?, 9?

Appendix 5. Identified threats to habitats and indigenous biodiversity

We evaluated threats to habitats and indigenous biodiversity at a general, broadscale level for each individual (or group) data layer in the spatial inventory where appropriate. Refer to Section 1.3.3 for further details on how these assessments were carried out, including their limitations.

Note that climate change is an overarching threat for all habitats and indigenous biodiversity. Impacts of this (e.g. marine heatwave, ocean acidification, more frequent and intense storms, increasing air temperature) are not necessarily specifically mentioned in Table A5.1.

Table A5.1. (Provided as an electronic appendix) A summary of identified threats to habitats and indigenous biodiversity for relevant data layers in the spatial data inventory (Appendix 1).

Appendix 6. Summary values from estuary broadscale monitoring

Table A6.1. (Provided as an electronic appendix) A summary of values from estuary broadscale monitoring results is provided as a standalone Excel file accompanying this report.

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6. REFERENCES

Anderson T, Morrison M, MacDiarmid A, Clark M, D'Archino R, Tracey D, Gordon D, Read G, Kettles H, Morrisey D. 2019. Review of New Zealand's key biogenic habitats. Wellington: National Institute of Water and Atmospheric Research. NIWA Client Report 2018139WN. Prepared for the Ministry for the Environment.

Asher R, Clark K, Gillespie P. 2008. Waimea Inlet Sponge Gardens. Nelson: Cawthron Institute. Cawthron Report 1467. Prepared for Tasman District Council.

Batson PB, Probert PK. 2000. Bryozoan thickets off Otago Peninsula. Wellington: Ministry of Fisheries. New Zealand Fisheries Assessment Report 2000/46.

Battley PF, Melville DS, Schuckard R, Ballance PF. 2005. Quantitative survey of the intertidal benthos of Farewell Spit, Golden Bay. Wellington: Ministry of Fisheries. Marine Biodiversity Biosecurity Report No. 7.

Berthelsen A, Floerl L, Morrisey D. 2023a. Tasman coastal marine environments: publicly available sites of significance to iwi. Nelson: Cawthron Institute. Cawthron Report 3894. Prepared for Tasman District Council and Nelson City Council.

Berthelsen A, Stevens LM, Floerl L, Morrisey D. 2023b. Tasman and Nelson coastal marine environments: bathymetry and hydrosystems. Nelson: Cawthron Institute. Cawthron Report 3908. Prepared for Tasman District Council and Nelson City Council.

Bradstock M, Gordon DP. 1983. Coral-like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. New Zealand Journal of Marine and Freshwater Research. 17:159–163.

Boffa Miskell Limited. 2011. Golden Bay Outstanding Natural Landscapes and features. Wellington: Boffa Miskell Ltd. Prepared for Tasman District Council.

Boffa Miskell Limited. 2015a. Nelson coastal study: pressures and threats to Nelson's highly valued parts of the coastal environment. Wellington: Boffa Miskell Ltd. Prepared for Nelson City Council.

Boffa Miskell Limited. 2015b. Nelson coastal study: natural character of the Nelson coastal environment. Wellington: Boffa Miskell Ltd. Prepared for Nelson City Council.

Boffa Miskell Limited. 2022. Te Tai o Aorere / Tasman District coastal environment study. Coastal natural character assessment. Wellington: Boffa Miskell Ltd. Prepared for Tasman District Council.

Bridget Gilbert Landscape Architecture. 2022. Tasman District landscape study 2022. Outstanding natural features and landscapes. Auckland: Bridget Gilbert Landscape Architecture. Prepared for Tasman District Council.

Clark D. 2014. Nelson Bays ecosystems map. Nelson: Cawthron Institute. Cawthron Report 2498. Prepared for the Ministry of Business, Innovation and Employment.

Clemente KJ E, Thomsen MS, Zimmerman RC. 2023. The vulnerability and resilience of seagrass ecosystems to marine heatwaves in New Zealand: a remote sensing analysis of seascape metrics using PlanetScope imagery. Remote Sensing in Ecology and Conservation. https://doi.org/10.1002/rse2.343

Cole R, Grange K, Morrisey D. 2003. Marine habitats, fish and benthic species within a proposed marine reserve, North Nelson. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report NEL2003-005.

Cranfield HJ, Rowden AA, Smith DJ, Gordon DP, Michael KP. 2004. Macrofaunal assemblages of benthic habitat of different complexity and the proposition of a model of biogenic reef habitat regeneration in Foveaux Strait, New Zealand. Journal of Sea Research. 52:109–125.

Crosset D. 2023. Tasman Bay / Te Tai-o-Aorere anchor area surveys. Nelson: Cawthron Institute. Cawthron Report 3906. Prepared for Tasman District Council.

Davey N, Bradley A, Grange K. 2005. Habitat mapping of Wakapuaka Taiapure. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report NEL2005-023. Prepared for Department of Conservation, Nelson.

Davidson RJ. 1990. A report on the ecology of Whanganui Inlet, North-west Nelson. Nelson and Blenheim: Department of Conservation, Nelson / Marlborough Conservancy. Occasional Publication 2.

Davidson RJ. 1992. A report on the intertidal and shallow subtidal ecology of the Abel Tasman National Park, Nelson. Nelson and Blenheim: Department of Conservation, Nelson / Marlborough Conservancy. Occasional Publication 4.

Davidson RJ. 1998. Biological report on a proposed spat-catching area near Onekaka, Golden Bay. Nelson: Davidson Environmental Ltd. Report SMR173.

Davidson RJ. 2006. Horoirangi Marine Reserve, North Nelson, rocky shore baseline biological report. Nelson: Davidson Environmental Limited. Survey and Monitoring Report 513. Prepared for Department of Conservation, Nelson.

Davidson RJ. 2012. Ecological report in relation to a proposed upgrade of the Maitai River walkway, Nelson. Nelson: Davidson Environmental Limited. Survey and Monitoring Report 739. Prepared for Staig and Smith.

Davidson RJ, Chadderton WL. 1994. Marine reserve site selection along the Abel Tasman National Park coast, New Zealand: consideration of subtidal rocky communities. Aquatic Conservation: Freshwater and Marine Ecosystems. 4:153–167.

Davidson RJ, Duffy CAJ, Gaze P, Baxter A, DuFresne S, Courtney S, Hamill P. 2011. Ecologically significant marine sites in Marlborough, New Zealand. Blenheim: Marlborough District Council. Coordinated by Davidson Environmental Limited for Marlborough District Council and Department of Conservation.

Davidson RJ, Freeman D. 2013. Trial indicators for an ecological integrity assessment (EIA), Abel Tasman coast. Nelson: Davidson Environmental Limited. Survey and Monitoring Report 772. Prepared for Department of Conservation, Wellington.

Davidson RJ, Richards A. 2004. Biological baseline report in relation to sand extraction and deposition at Marahau. Nelson: Davidson Environmental Ltd. Survey and Monitoring Report 452. Prepared for Molineux Project Development Ltd.

Davidson RJ, Richards LA. 2005. Biological report in relation to sand extraction and deposition at Marahau sandflats prior to the second extraction event. Nelson: Davidson Environmental Ltd. Survey and Monitoring Report 491. Prepared for Molineux Project Development Ltd.

Davidson RJ, Richards LA. 2021. Baseline biological data for three mooring sites used for the deployment of experimental structures, south-east Tasman Bay. Nelson: Davidson Environmental Limited. Survey and Monitoring Report 1088. Prepared for Plant and Food Research.

Davidson R, Richards L, Bayly S, Devries D, Bodin G. 2013. Horoirangi Marine Reserve, North Nelson, report on rocky shore biological monitoring: 2006–2013. Nelson: Davidson Environmental Limited. Prepared for Department of Conservation.

Davidson RJ, Richards LA, Beyer-Mair J. 2023. Biological monitoring report for marine farm 8628 located near Whangatoetoe Bay, Port Underwood: 8th resampling event (Summer 2023). Nelson: Davidson Environmental Ltd. Survey and Monitoring Report 1168. Prepared for F Scott Madsen and Penny Fredricks (for Scott Madsen Family Trust).

Davidson RJ, Stark KE, Preece JR, Lawless PF, Clarke IE. 1993. Internationally and nationally important coastal areas from Kahurangi Point to Waimea Inlet, Nelson, New Zealand: recommendations for protection. Nelson and Blenheim: Department of Conservation, Nelson/Marlborough Conservancy. Occasional Publication 14.

[DOC] Department of Conservation. 2010. New Zealand Coastal Policy Statement 2010. Wellington: Department of Conservation. https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/coastal-management/nz-coastal-policy-statement-2010.pdf

[DOC] Department of Conservation. 2019. NZCPS 2010 guidance note. Policy 11: indigenous biological diversity (biodiversity). Wellington: Department of Conservation.

[DOC and MFish] Department of Conservation and Ministry of Fisheries. 2011. Coastal marine habitats and marine protected areas in the New Zealand territorial sea: a broad scale gap analysis. Wellington: Department of Conservation and Ministry of Fisheries.

Ekdale AA, Lewis DW. 1993. Sabellariid reefs in Ruby Bay, New Zealand: a modern analogue of *Skolithos* 'piperock' that is not produced by burrowing activity. Palacios. 8:614–620.

Forrest BM, Stevens LM, Rabel H. 2022. Fine scale intertidal monitoring of Waimea Waimeha Inlet. Nelson: Salt Ecology. Salt Ecology Report 082. Prepared for Tasman District Council and Nelson City Council.

Froude VA. 2013. Tasman District coastal environment inland boundary and natural character mapping: methodology and summary results. Porirua: Pacific Eco-Logic Ltd. Prepared for Tasman District Council.

Froude VA, Smith R. 2004. Area-based restrictions in the New Zealand marine environment. Wellington: Department of Conservation. Department of Conservation MCU Report.

Grange K, Cole R. 1996. A further survey of potential marine reserve sites off the Boulder Bank. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report 1996/NEL60412/1. Prepared for Royal Forest & Bird Society Nelson.

Grange KR, Tovey A, Hill AF. 2003. The spatial extent and nature of the bryozoan communities at Separation Point, Tasman Bay. Wellington: Ministry of Fisheries. New Zealand Marine Biodiversity Biosecurity Report 4.

Handley S, Berthelsen A, Davidson R, Floerl L, Morrisey D. 2023a. Tasman coastal and marine environments: historical data. Nelson: Cawthron Institute. Cawthron Report 3965. Prepared for Tasman District Council and Nelson City Council.

Handley S, Berthelsen A, Floerl L, Morrisey D, Stevens L, Davidson R. 2023b. Tasman coastal marine environments: effects of activities. Nelson: Cawthron Institute. Cawthron Report 3896. Prepared for Tasman District Council.

Handley S, Sagar P. 2011. Seabird, marine mammal and surface fish surveys of Golden and Tasman Bays. Part A: aerial surveys. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report NEL2011-020. Prepared for Friends of Nelson Haven and Tasman Bay Incorporated and AWE New Zealand Pty Ltd.

Handley S, Sagar P, Cairney D, Carter M. 2011. Seabird, marine mammal and surface fish surveys of Golden and Tasman Bays. Hamilton: National Institute of Water and Atmospheric Research. Part C: boat surveys. NIWA Client Report

NEL2011-020. Prepared for Friends of Nelson Haven and Tasman Bay Incorporated and AWE New Zealand Pty Ltd.

Hayward BW. 2020. Identification and assessment of geoheritage values in Tasman District. Report BWH 201/20. Prepared for Tasman District Council.

Jones EG, Morrison MA, Davey N Hartill BW Sutton C. 2016. Biogenic habitats on New Zealand's continental shelf. Part I: local ecological knowledge. Wellington: Ministry for Primary Industries. New Zealand Aquatic Environment and Biodiversity Report 174.

Jones EG, Morrison MA, Davey N, Mills S, Pallentin A, George S, Kelly M, Tuck I. 2018. Biogenic habitats on New Zealand's continental shelf. Part II: national field survey and analysis. Wellington: Fisheries New Zealand. New Zealand Aquatic Environment and Biodiversity Report 202.

Keeley N, Gillespie P, Bennett C. 2006. Horoirangi Marine Reserve soft sediment baseline ecological survey, 2006. Nelson: Cawthron Institute. Cawthron Report 1186. Prepared for Department of Conservation.

Lundquist C, Stephenson F, McCartain L, Watson S, Brough T, Nelson W, Neill K, Anderson T, Anderson O, Bulmer R, et al. 2020. Evaluating Key Ecological Areas datasets for the New Zealand Marine Environment. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report 2020109HN. Prepared for Department of Conservation.

McArthur N, Melville DS, Schuckard R, Thomas D, Toy R, Toy S. 2022. A baseline survey of the indigenous bird values of the Tasman District coastline. Prepared for Tasman District Council.

McLean M, Grange K. 1995. A marine habitat survey of marine reserve options, north-east of Nelson. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report 1995/NEL60402/1. Prepared for Royal and Bird Society Nelson.

Melville DS. 2015. Assessment of shorebird use of proposed boat mooring sites at Otuwhero / Marahau and Motueka. Prepared for Tasman District Council.

Melville DS, Schuckard R. 2013. Effects of selected activities on shorebirds in Tasman District: management issues and options for sites of international importance. Prepared for Tasman District Council.

Miller I. 2016. A re-survey for the endemic 'Back Beach beetle' *Bembidion tillyardi* (Brookes, 1927) at the Tahunanui Beach high shore inlet, January–February, 2016. Prepared for Nelson City Council.

Morrison ML, Jones EG, Consalvey M, Berkenbusch K. 2014. Linking marine fisheries species to biogenic habitats in New Zealand: a review and synthesis of knowledge. Wellington: Ministry of Fisheries. New Zealand Aquatic Environment and Biodiversity Report 130.

Morton J, Miller M. 1968. The New Zealand sea shore. Auckland: Collins.

Neill K, D'Archino R, Farr T, Nelson WA. 2012. Macroalgal diversity associated with soft sediment habitats in New Zealand. Wellington: Ministry of Fisheries. New Zealand Aquatic Environment Biodiversity Report 87.

Nelson WA, Adams NM, Fox JM. 1992. Marine algae of the northern South Island. Wellington: National Museum of New Zealand. Miscellaneous Publications of the National Museum of New Zealand 26.

Nelson WA, D'Archino R, Neill KF, Farr TJ. 2014. Macroalgal diversity associated with rhodolith beds in northern New Zealand. Cryptogamie, Algologie. 35:27–47.

Nelson WA, Neill K, Farr T, Barr N, D'Archino R, Miller S, Stewart R. 2012. Rhodolith beds in northern New Zealand: characterisation of associated biodiversity and vulnerability to environmental stressors. Wellington: Ministry for Primary Industries. New Zealand Aquatic Environment and Biodiversity Report 99.

Newcombe E, Clark D, Gillespie P, Morrisey D, MacKenzie L. 2015. Assessing the state of the marine environment in Tasman Bay and Golden Bay. Nelson: Cawthron Institute. Cawthron Report 2716. Prepared for Nelson City Council and Tasman District Council.

Petersen G, Stephenson F, Brough T, Rowden A. 2020. Seafloor community classification: group descriptions. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report 2020230HN. Prepared for Department of Conservation.

Pinkerton M, Gall M, O'Callaghan, Thoral F, Swales A. 2022. Monitoring coastal suspended sediment in Aotearoa New Zealand: utility of satellite remote sensing. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report 2022106WN. Prepared for the Department of Conservation.

Robertson BM, Stevens LM. 2008. Motupipi Estuary vulnerability assessment and monitoring recommendations March 2008. Nelson: Wriggle Coastal Management. Envirolink Report 423. Prepared for Tasman District Council.

Robertson BM, Stevens LM. 2012. Tasman Coast – Waimea Inlet to Kahurangi Point. Habitat mapping, ecological risk assessment, and monitoring recommendations. Nelson: Wriggle Coastal Management. Prepared for Tasman District Council.

Robertson HA, Baird K, Dowding JE, Elliott GP, Hitchmough RA, Miskelly CM, McArthur N, O'Donnell CFJ, Sagar PM, Scofield RP, et al. 2016. Conservation status of New Zealand birds, 2016. Wellington: Department of Conservation. New Zealand Threat Classification Series 19.

Saxton F. 1980. Coral loss could deplete fish stock [of tarakihi and snapper in Tasman Bay, New Zealand, *Chrysophtys auratus*, *Cheilodactylus macropterus*]. Catch '80 (New Zealand).

Scott-Simmonds T, Stevens LM, Roberts KL, Forrest BM 2022. Broad scale intertidal habitat mapping of Kokorua Inlet. Nelson: Salt Ecology. Salt Ecology Report 095. Prepared for Nelson City Council.

Scott-Simmonds T, Davidson RJ, Richards L 2023. Benthic assessment of high-tonnage ship anchorages within the Nelson region. Nelson: TC Environmental Ltd. Prepared for Nelson City Council.

Schuckard R, Melville DS. 2013. Shorebirds of Farewell Spit, Golden Bay and Tasman Bay. Prepared for Nelson City Council and Tasman District Council.

Schuckard R, Melville DS. 2019. Coastal birds of the Tasman / Nelson Region: a review of current information. Prepared for Tasman District Council and Nelson City Council.

Seaward K, Acosta H, Inglis GI, Wood B, Riding TAC, Wilkens S, Gould B. 2015. The Marine Biosecurity Porthole – a web-based information system on non-indigenous marine species in New Zealand. Management of Biological Invasions. 6:177–184. http://dx.doi.org/10.3391/mbi.2015.6.2.08

Shanahan B, Crawshaw J, Squires K, McElroy T, Griffiths R, Wade O. 2023. Guidance on council seagrass monitoring. Hamilton: Waikato Regional Council. 2322-HBRC268-Guidance-on-council-seagrass-monitoring.pdf (waikatoregion.govt.nz)

Smith ANH. 2008. Predicting the distribution and relative abundance of fishes on shallow subtidal reefs around New Zealand. Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report WLG2008-9.

Smith ANH, Duffy CAJ, Leathwick JR. 2013. Predicting the distribution and relative abundance of fishes on shallow subtidal reefs around New Zealand. Wellington: Department of Conservation. Science for Conservation Series 323.

Sneddon R. 2021. Port Nelson long-term monitoring programme: 2021 survey. Nelson: Cawthron Institute. Cawthron Report 3646. Prepared for Port Nelson Ltd.

Stephenson F, Goetz K, Mouton T, Beets F, Hailes S, Roberts J, Pinkerton M, MacDiarmid A. 2020b. Spatial distribution modelling of New Zealand cetacean species. Wellington: Fisheries New Zealand. New Zealand Aquatic Environment and Biodiversity Report 240.

Stephenson F, Goetz K, Sharp BR, Mouton TL, Beets FL, Roberts J, MacDiarmid AB, Constantine R, Lundquist CJ. 2020c. Modelling the spatial distribution of cetaceans in New Zealand waters. Diversity and Distributions. 26:495–516.

Stephenson F, Leathwick JR, Francis MP, Lundquist CJ. 2020a. A New Zealand demersal fish classification using Gradient Forest models. New Zealand Journal of Marine and Freshwater Research. 54:60–85.

Stephenson F, Rowden A, Anderson T, Hewitt J, Costello M, Pinkerton M, Morrison M, Clark M, Wadhwa S, Mouton T, Lundquist C. 2018. Mapping key ecological areas in the New Zealand marine environment: data collation. Hamilton:

National Institute of Water and Atmospheric Research. NIWA Client Report 2018332HN. Prepared for Department of Conservation.

Stephenson F, Rowden A, Brough T, Leathwick J, Bulmer R, Clark D, Lundquist C, Greenfield B, Bowden D, Tuck I, et al. 2021. Development of a New Zealand Seafloor Community Classification (SCC). Hamilton: National Institute of Water and Atmospheric Research. NIWA Client Report 2020243WN. Prepared for Department of Conservation.

Stevens LM, Forrest BM. 2019a. Broad scale intertidal habitat mapping of Delaware Inlet 2018. Nelson: Salt Ecology. Salt Ecology Report 011. Prepared for Nelson City Council.

Stevens LM, Forrest BM. 2019b. Broad scale intertidal habitat mapping of Nelson Haven. Nelson: Salt Ecology. Salt Ecology Report 022. Prepared for Nelson City Council.

Stevens LM, Robertson BM. 2008. Motupipi Estuary 2008 broad scale habitat mapping. Nelson: Salt Ecology. Prepared for Tasman District Council.

Stevens LM, Robertson BM. 2010. Waimea Inlet 2010 vulnerability assessment and monitoring recommendations. Nelson: Salt Ecology. Prepared for Tasman District Council.

Stevens LM, Robertson BM. 2011. Waimea Inlet historical sediment coring 2011. Nelson: Wriggle Coastal Management. Prepared for Tasman District Council.

Stevens LM, Robertson BM. 2015a. Kokorua Inlet broad scale habitat mapping 2014/2015. Nelson: Salt Ecology. Prepared for Nelson City Council.

Stevens LM, Robertson BM. 2015b. Motupipi Estuary 2015 broad scale habitat mapping. Nelson: Salt Ecology. Prepared for Tasman District Council.

Stevens LM, Robertson BM. 2015c. Ruataniwha Inlet 2015. Broad scale habitat mapping. Nelson: Salt Ecology. Prepared for Tasman District Council.

Stevens LM, Robertson BM. 2017a. Whanganui Inlet: 2016 broad scale habitat mapping. Nelson: Salt Ecology. Prepared for Tasman District Council.

Stevens LM, Robertson BP. 2017b. Nelson Region estuaries: vulnerability assessment and monitoring recommendations. Nelson: Salt Ecology. Prepared for Nelson City Council.

Stevens L, Scott-Simmonds T, Forrest BM. 2020a. Broad scale intertidal habitat mapping of estuaries of the Motueka delta 2019. Nelson: Salt Ecology. Salt Ecology Report 035. Prepared for Tasman District Council.

Stevens L, Scott-Simmonds T, Forrest BM. 2020b. Broad scale intertidal habitat mapping of Moutere Inlet 2019. Nelson: Salt Ecology. Salt Ecology Report 034. Prepared for Tasman District Council.

Stevens L, Scott-Simmonds T, Forrest BM. 2020c. Broad scale intertidal habitat mapping of Waimea Inlet. Nelson: Salt Ecology. Salt Ecology Report 052. Prepared for Tasman District Council and Nelson City Council.

SWPRON. 2014– . Marine biological observation data from coastal and offshore surveys around New Zealand. Wellington: Southwestern Pacific OBIS, National Institute of Water and Atmospheric Research. https://nzobisipt.niwa.co.nz/resource?r=mbis_nz

Wells SM, Pyle RM, Collins NM, IUCN Conservation Monitoring Centre, compilers. 1983. The IUCN invertebrate Red Data book. Gland: International Union for Conservation of Nature and Natural Resources.

Wood ACL, Probert PK. 2013. Bryozoan-dominated benthos of Otago shelf, New Zealand: its associated fauna, environmental setting and anthropogenic threats. Journal of the Royal Society of New Zealand. 43:231–249.

Wood ACL, Rowden AA, Compton TJ, Gordon DP, Probert PK. 2013. Habitat-forming bryozoans in New Zealand: their known and predicted distribution in relation to broad-scale environmental variables and fishing effort. PLoS ONE. 8:e75160.