

Outstanding Natural Features Identifying and Mapping additional sites in Northland

Methodology Report

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1.0 Introduction

This report outlines the way that outstanding natural features (ONFs) in Northland, additional to those already scheduled and mapped in the proposed Northland Regional Policy Statement (Jan 2014), have been identified and their extent mapped. It also categorises ONFs on the basis of size and robustness to assist in protecting their differing values. Background information on each proposed additional ONF's significance, description, locality and references is provided and also updated for existing ONFs. This report is for information purposes only and does not form part of the Regional Policy Statement.

2.0 Background

Outstanding natural features are a matter of national importance in Section 6(b) of the Resource Management Act 1991 and are to be protected from inappropriate subdivision, use and development. This is reinforced in Policy 15 of the New Zealand Coastal Policy Statement.

In order to retain the scientific, educational and amenity values of outstanding natural features, those at risk were – where practicable - identified on the proposed Northland Regional Policy Statement maps (Jan 2014). The major source of information was the “Inventory and maps of Important Geological Sites and Landforms in the Northland Region”, Geological Society of New Zealand Miscellaneous Publication No. 83, 51 pp, compiled by Kenny and Hayward (1996). This inventory identifies the best examples of Northland's geology and landforms. It was compiled using the combined knowledge and advice of a large sector of the specialist geological, geomorphological, speleological and soil science communities of New Zealand. The NZ Geopreservation Inventory database has been considerably refined and updated since 1996.

The Regional Policy Statement maps only included those features (larger sites only) that had been mapped in the published inventory (1996). The new Northland Regional Policy Statement (Jan 2014) included a method to address the lack of accurate maps of smaller sites by providing lists of potential additional features, mostly taken from the inventory, and recommended that they be assessed and mapped at a later date.

3.0 Methodology for this assessment and mapping exercise

3.1 Background

In the proposed new Northland Regional Policy Statement (Jan 2014), 56 ONFs were scheduled and shown on the published maps. Appendix 4 of the NRPS identified “those natural features that are likely to warrant being identified as outstanding natural features but further work is required to map their spatial extent.” This appendix provided two tables: Table 1 listed 70 features that are “natural” and are ranked in the Geopreservation Inventory as being of international or national significance, or regional significance and considered vulnerable in the inventory (categories 1 and 2; see section 3.2). Table 2 listed 26 features of regional significance with a vulnerability ranking of 3 (unlikely to be damaged by humans) in the inventory. Appendix 4 states that features in Table 1 “are likely to qualify as ONFs and are to be subject to further assessment and mapping as stated in Method 4.5.4(3)”, and that features in Table 2 “potentially warrant mapping as ONFs pending further assessment.”

3.2 Significance and vulnerability rankings of the NZ Geopreservation Inventory

The scientific, educational and aesthetic significance ranking provides has three levels:

- A International
- B National
- C Regional

A vulnerability classification (1 - 4) has been assigned to each feature, depending on its perceived susceptibility to human activities:

- 1 highly vulnerable to complete destruction or major modification by humans;
- 2 moderately vulnerable to modification by humans;
- 3 unlikely to be damaged by humans; and

4 could be improved by human activity.

Both these classifications are periodically reviewed and modified for individual sites as new information becomes available about their scientific importance, their popularity as tourist attractions or of proposed future developments.

3.3 Which sites were assessed for inclusion?

Since the NRPS Appendix 4 lists were compiled there has been further work on the NZ Geopreservation Inventory, including a national review and comparative assessment of coastal landform sites and a desk top review of gaps in the representative coverage of all feature types in Northland and Auckland. As a result some sites in the inventory have been modified, consolidated or deleted and a number of additional sites added.

The present exercise has considered all sites listed in Tables 1 and 2 in Appendix 4 of the new (2014) NRPS as well as all sites currently in the Northland region in the NZ Geopreservation Inventory database (website <http://services.main.net.nz/geopreservation/>). All geoscience ONFs not in the NRPS schedule or Appendix 4 lists were included. The NZ Geopreservation Inventory includes some historic man-made features and buildings associated with geology and these have been excluded from the assessment as they more properly should be protected under the historic heritage sections of the RMA.

3.4 Assessment methodology

To be eligible for assessment in this exercise, a site first needed to have been accepted into the NZ Geopreservation Inventory of the Geoscience Society of NZ, which aims to document all geological and landform sites of international, national or regional scientific and educational significance throughout the country. These inventories have been compiled, initially by subdiscipline categories, over the past 30 years from the collective nominations of the NZ geoscience community. The criteria used to assess whether a site or feature qualifies for inclusion in the Inventory and its importance ranking are listed below in section 3.5.

The sites outlined in section 3.3 (all from the Inventory) were further assessed for their suitability for scheduling and mapping as ONFs in the NRPS on a site by site basis. In these assessments the value of protecting sites for their scientific, educational or aesthetic importance was weighed up against such criteria as their fragility and vulnerability to damage by non-natural agents, and the possible monetary or nuisance costs of scheduling features on private land. Reasons for declining the inclusion of 24 suggested sites from Tables 1 and 2 include:

- a. The scientific importance of a site was for the presence of microscopic minerals or fossils that could not be readily appreciated in the field and that were unlikely to be subject to over-collecting by commercial or recreational collectors. Some of the rock exposure that contained the significant specimens was always likely to be available for scientific collection and study without the need for ONF status and management.
- b. The scientific and educational value of a natural geological feature is in the face(s) of an active or potentially active quarry and the economic cost of protecting part of the quarry face was deemed too great compared with the value of the feature. Wherever possible an alternative, maybe somewhat inferior, replacement exposure was sought to replace the one excluded.
- c. Several of the sites in the tables lay within the mapped boundaries of existing ONFs on the NRPS maps or lay adjacent to existing ONFs, the boundaries of which could readily be extended to encompass the additional feature within the existing ONF.
- d. The scientifically important landforms were too large and owned by too many individual private landowners and likely to be subject to further major subdivisions and development in the future such that scheduling it or a small representative part of the feature was not practical nor economically justifiable.

Appendix 1 of this report lists 24 features from the NRPS Appendix 4, Tables 1 and 2, that in this assessment have been deemed not to warrant inclusion in the Northland Regional Policy Statement and District Schemes as ONFs. Appendix 2 of this report lists 148 features (51 from Table 1; 24 from Table 2; from 53 from the upgraded NZ Geopreservation Inventory; 20 scheduled in district schemes but not Outstanding Natural Features – Identifying and mapping additional sites Report May 2016)

mentioned in RPS) that have been here assessed as being worthy of being classified and mapped as ONFs in the Northland Regional Policy statement and District Schemes with notes about how their boundaries have been mapped (3.5 below).

3.5 Outstanding Natural Features Assessment criteria

The following criteria were used to identify Northland's Outstanding Natural Features (ONFs) as shown on the newly supplied GIS aerial photos. These are the criteria used to identify features for the NZ Geopreservation Inventory.

- a. The extent to which the landform or geological feature contributes to the understanding of the geology or evolution of the biota in Northland, New Zealand or the earth.
- b. The rarity or unusual nature of the feature.
- c. The extent to which it is an outstanding representative example of the diversity of Northland's natural landforms and geological features.
- d. The extent to which the landform or geological feature is a component of a recognisable group of geologically associated features (e.g. Whangarei or Kaikohe volcanic fields).
- e. The extent to which the landform or geological feature contributes to the aesthetic value or visual legibility of the wider natural landscape.
- f. The community association with, or public appreciation of, the values of the feature.
- g. The potential value of the feature for public education.
- h. The potential value of the feature to provide additional understanding of the geological or biotic history.
- i. The state of preservation of the feature.
- j. The extent to which a feature is associated with a historically important natural event, geologically related industry, or individual involved in earth science research.

3.6 Mapping methodology

GIS mapping was done at a scale of 1:5000 using the same air photo base map as the new NRPC (2014) planning maps. The preliminary GIS maps (using Topo50 base maps) from the NZ Geopreservation Inventory recently produced in a desktop exercise by the Geoscience Society of NZ using a NZ Lottery Environment and Heritage grant (now available on the website <http://services.main.net.nz/geopreservation/>) were used as a starting point for most sites accepted for recommending to be scheduled as ONFs.

These feature map boundaries were modified using the following criteria:

- a. Where the whole or part of a recommended ONF was on public land (e.g. intertidal, esplanade reserves, road reserves, parks and reserves) the boundaries were, wherever possible, accepted or slightly modified: to better fit the air photo base map; to align with the reserve boundary; or lie within it.
- b. Where the whole or part of a recommended ONF more or less coincided with an existing Outstanding Natural Landscape (ONL) in the new NRPS, the boundary of the ONF was generally reduced to align with that of the ONL or fit inside it.
- c. Where the whole or part of a recommended ONF occurs within private land, the mapped boundaries were more carefully drawn to enclose the minimum land area for realistic protection and wherever possible to exclude areas of habitation and farming activities.
- d. Where a recommended ONF more or less coincided with the boundaries of a QE2 covenanted area, the ONF boundaries were modified to stay entirely within the covenanted area.
- e. Where the whole or part of a recommended ONF occurs within private land, but the boundaries could not be accurately determined from air photo sources or the roads, permission was sought from the owners for access on to their properties to refine the mapping to the smallest and most precise area based on the values of the features. Where requests for access permission were denied or no reply received the boundaries mapped from the literature and air photos have not been able to be refined.

The opportunity was also taken to review the accuracy of maps of existing ONFs in the new NRPS and in a few instances (Appendix 4) the boundaries have been suggested to be slightly modified or reduced. In

several instances boundaries have been suggested to be extended to incorporate additional features listed in the new NRPS Appendix 4, but in no instances are there any suggested extensions onto private land, except at Onemama where the ONF is extended into an area of QE2 covenant and at Puketutu (Puketona) where a whole small unmodified volcanic cone had been left out.

4.0 Categories of Outstanding Natural Features

4.1 Feature types

To assist management and decision-making, outstanding natural features have also been categorised by type to provide an indication of the kind of values that make them significant and how better to manage potential risks to these values. The categories described below are the same as in the Auckland Unitary Plan and differ slightly in their numbering from the new NRPS (shown in brackets).

A. Large landforms (= A in NRPS)

Landforms that are sufficiently large and robust to withstand moderate to small-scale earthworks or constructions without significant impact. The values of such features typically relate to the underlying geology which tells of the history of their formation and the resulting outstanding large-scale landforms, rather than or in addition to their visual amenity or landscape type factors. Major multi-storey developments, intense urban and industrial subdivisions or large scale earthworks (e.g., a commercial quarry or major motorway cuttings) can significantly detract from the integrity of these landforms and their geological features.

Examples include Whangape Harbour entrance gorge and Pouto dune-dammed lakes.

B. Smaller more fragile landforms (= D in NRPS)

Small landforms or other features that could be damaged or destroyed by relatively small-scale earthworks or constructions. The values of these often spectacular, localised landforms relate to their visual and aesthetic appeal and/or scientific interest. Most earthworks, buildings, constructions or plantings would adversely impact on the visual and aesthetic appeal or scientific value of these fragile features.

Examples include Whangarei Falls and Koutu giant concretions.

C. Dynamic landforms and features (= C in NRPS)

Landforms or features that rely on the continuation of natural physical processes beyond the feature for their continued existence.. Because of this, these dynamic landforms or features are not only susceptible to direct damage, but to more distant actions that may impact the continuation of the natural processes (e.g. sand supply; dune stabilisation; groundwater levels; soil erosion in cave catchments). Permanent earthworks, building construction, vegetation plantings, extraction of nearby groundwater or other actions could adversely affect the functioning and appearance of these features.

Examples include Runaruna mud volcano, Ngamotu shell tombolo, and Te Werahi sand dunes.

D. Exposures of geological material (= part of E in NRPS)

Natural or man-made exposures that are sufficiently large and robust that small-scale earthworks or rock sampling will have no significant impact. Their values relate to the natural geological features that can be seen within the rocks and the information they contain about the history of their formation, the geological origins of the region or the fossil history of the biota of New Zealand. Large-scale earthworks, construction of buildings, vegetation plantings or constructions of walls or erosion barriers could adversely impact the visual, educational or scientific values of these exposures.

Examples include Maunganui Bluff Miocene basalt and Whatuwhiwhi Cretaceous sedimentary rocks, Cape Karikari.

E. Fragile exposures of geological material (= part of E in NRPS)

Small, natural or man-made exposures or high value portions of exposures that could be damaged or destroyed by small-scale earthworks or construction. Their values relate to the information they contain about the history of their geological formation or the fossil biota of New Zealand. Most earthworks, building constructions, vegetation plantings or constructions of walls or erosion barriers could adversely impact the visual, educational or scientific values of these exposures. Periodic vegetation clearance may improve their values.

Examples of these include Avoca trace fossils and Parua Bay red chert.

F. Caves (new to NRPS)

Caves, such as lava and sea caves and their entrances, may, depending upon their depth underground, be susceptible to damage from significant earthworks constructions above them, or from changes in their catchments that may fill them with eroded soil.

Examples are Jellicoe sea cave, Whangaroa and Waipu caves and karst.

V. Volcanic cones (= B in NRPS)

Scoria cones, tuff cones and volcanic domes that are sufficiently robust to withstand small-scale, localised earthworks or constructions without significant impact. They derive their values from their distinctive conical form and prominence in the wider landscape setting. Structures in prominent positions, significant permanent earthworks such as farm roads across steep slopes, and rectangular exotic forest plantings can detract from or compromise these natural features, particularly where they protrude significantly into the skyline, alter the cone form or disguise the underlying landform.

Examples include Hikurangi dacite dome and Onoke scoria cone, Kamo.

4.2 Example of activity table that relates to categories of ONF

This activity table comes from the Auckland Unitary Plan and the operative Hauraki Gulf Islands District Plan. The table relates to resource consent requirements for land use and development on ONFs.

Table 1: Activity table – Outstanding natural features overlay - Land use and development

Activity	A	B	C	D	E	F	V
Construction							
Buildings and structures	D	NC	NC	NC	NC	D	D
Earthworks							
Removal, fill, modification of more than 2 cu m	D	Pr	D	D	Pr	NC	D
Removal, fill, modification of less than 2 cu m	P	RD	RD	D	NC	RD	RD
Rural							
Grazing of sheep and goats	P	RD	RD	P	RD	P	P
Grazing of other stock	RD	RD	RD	P	RD	P	D
Farm or forestry quarries	Pr	Pr	Pr	RD	Pr	Pr	Pr
Forestry	RD	D	D	D	NC	D	D
Conservation	P	RD	D	D	NC	NC	RD

planting							
Fences - post and wire	P	RD	RD	RD	D	NC	P
Fences - except post and wire	RD	D	D	D	D	NC	D
Utilities							
Minor infrastructure upgrading	P	RD	RD	RD	NC	NC	D

P = permitted

RD = restricted discretionary

D = discretionary

NC = non-compliant

Pr = prohibited

Assessment criteria

The council will consider the relevant assessment criteria below for the restricted discretionary activities listed above:

1. Whether the nature, form and extent of the proposed works or activity adversely affects the ONF for which the item was scheduled:
 - a. whether the activity will result in increased erosion of the ONF
 - b. for grazing applications, whether the proposed stocking intensity will result in increased compaction or erosion of the ONF, or will result in changes to the vegetation on site in ways that will affect the values for which the ONF is scheduled e.g. grazing effects on dune vegetation resulting in changes to the nature and form of the dunes
 - c. for fencing applications, whether the proposed fence requires ground disturbance or earthworks that will affect the values for which the ONF is scheduled
 - d. whether the activity will interfere with natural processes e.g. forestry or vegetation planting effects the natural dynamic supply of sand to wind-blown dunes.
2. Whether the proposed works or activity cause adverse visual effects or adversely affect visual appreciation of the ONF.
3. The degree to which the ONF has already been modified so that further modification will not cause significant additional loss of geological value.
4. The extent to which the modification is necessary.
5. The purpose of the proposed works or activity and whether it has specific connections or relevance to the scheduled ONF.
6. What alternative methods and locations are available to the applicant for carrying out the work or activities that do not affect a scheduled ONF.
7. The extent to which the proposed works will protect the ONF from further damage, such as erosion protection, or remediate it from previous damage. This excludes potential damage from the activity for which consent is sought.
8. In the case of the subdivisions, the extent to which the resultant sites can be developed without affecting the values for which the ONF is scheduled.

Appendix 1

List of features in proposed NRPS (2014) Appendix 4, Tables 1 and 2 that have been assessed as not being suitable for recognition and mapping as ONF's in Northland regional policy statements or district schemes.

Feature name	NRPS Appendix 4	Reason for non-inclusion
Avoca karst	Table 1 Regionally Significant	Private land in a little seen area and not of exceptional value.
Bushy Point clinoptilolite	Table 1 Regionally Significant	Visually insignificant and therefore under no threat and hard to justify inclusion.
Crows Nest Quarry melange	Table 1 Regionally Significant	Quarry has recently reopened and inclusion would unreasonably interfere with operations.
Kamo Hot Springs	Table 1 - Regionally Significant; scheduled in Whangarei District Scheme	All natural springs are not flowing and their sites are highly modified.
Mangaru Range pillow lava - hyaloclastite sequence	Table 1 Nationally significant	A scattered widespread feature all on private land not deemed to be under any threat in near future.
One Tree Point relict dunes and beach ridges, Bream Bay	Table 1 Nationally significant	A huge landform feature mostly in hundreds of private properties - not practical to protect all or any significant part as new city projected to be developed over it.
Otaika Valley basalt proto-karst, Whāngārei	Table 1, regionally significant	Area of protokarst small and in private garden. Recognition of larger areas of similar quality protokarst above Helena Bay and at Puhipuhi make this site less outstanding and not worth pursuing.
Puhipuhi cinnabar	Table 1 Nationally significant	Visually insignificant in area of potential mineral exploitation on private land.
Puhipuhi stibnite (Mt Mitchell)	Table 1 Regionally Significant	Visually insignificant in area of potential mineral exploitation on private land.
Puketōtara erionite	Table 1 Internationally significant	Included in existing Puketotara ONF
Rangiahua basalt proto-karst, Ōkaihau	Table 1, Regionally significant	Scattered karst boulders visible from road but deemed insufficiently well-developed compared with the outstanding values of Waierere Boulders and Lake Manuwai.
Rehia hornfels with mineral larnite	Table 1 Nationally significant	Visually insignificant in farm lime quarry on private land.
Reserve Point Eocene shelf sediments (The Nook, Whāngārei Harbour)	Table 2 Regionally Significant	Combined with existing Reserve Pt nephelinite flows and garnet andesite, Whangarei Harbour ONF.
Simpkin's Quarry herschelite	Table 1 Nationally significant	Visually insignificant in farm lime quarry on private land.
Taipa garnet andesite plug / dike	Table 1 Regionally Significant	Quarry is periodically active and privately owned and examples of the garnet are likely always able to be found in rubble nearby.
Te Pene weathered rhyolite dome	Table 1 Regionally Significant	Landform and rock cover a large area of private land and are not sufficiently outstanding to justify inclusion.
Tokerau Beach dune field	Table 1 Regionally Significant	Huge landform feature mostly in hundreds of private properties - not practical to protect all or any significant part.
Tom Bowling Bay dune field	Table 1 Nationally significant	Already included in Waikuku tombolo dunes and dune-dammed swamp ONF
Waikuku Beach dune field	Table 1 Regionally Significant	Already included in Waikuku tombolo dunes and dune-dammed swamp ONF.
Waimamaku, Pinehill Stream Miocene fossil molluscs	Table 1, nationally significant Scheduled in Far North District Scheme	Site no longer exposed.
Lodore Rd obsidian source	Scheduled in Far North District Scheme	Reportedly a small area with obsidian cobbles now hidden beneath pine tree plantation; not

		as important as other recently discovered obsidian sources to the north.
Motukokako (Piercy) Island skarn and sea arch	Scheduled in Far North District Scheme	Added to Motukokako skarn ONF of NRPS.
Perforated Point overturned fold	Scheduled in Far North District Scheme	Combined with Mt Camel Cretaceous volcanoclastic sedimentary rocks ONF of Far North District Scheme.
Taupo Bay flow	Scheduled in Far North District Scheme	Combined with Whangaroa Nth Head ring plain ONF of NRPS.
Taupo Bay ring plain deposits	Scheduled in Far North District Scheme	Combined with Whangaroa Nth Head ring plain ONF of NRPS.
Port Whangarei fossil beds	Scheduled in Whangarei District Scheme	Does not qualify for inclusion in NZ Geopreservation Inventory as not a natural site – dredge spoil.

Appendix 2

Recommended additional Outstanding Natural Features for Northland Region for inclusion in the NRPS from NRPS Appendix 4 and the NZ Geopreservation Inventory, with notes on how their boundaries have been mapped.

Feature name	NRPS Appendix 4 or NZ Geopreservation Inventory or Scheduled in District Schemes	Mapping notes
Arrow Rocks Permian-Triassic boundary	Table 1, now internationally significant	All intertidal rocks.
Camp Bay mylonite and schistose Tangihua rocks	Table 1, internationally significant; scheduled in Far North District Scheme	All in public land
Lake Manuwai basalt proto-karst, Kerikeri	Table 1, now ranked internationally significant	Visited by lake with Kerikeri Irrigation representative. Two properties on Northwest side visited. No permission to visit farm at north end. ONF restricted to most outstanding boulders and lake shore.
Wairere basalt proto-karst boulders, Hokianga	Table 1, internationally significant	Site restricted to stream bed and sides and one area of boulders across stream, following inspection with one set of owners and permission of other.
Avoca trace fossils	Table 1, nationally significant	Two areas: one small boulder on private land; other is a roadcut that is now well mapped.
Kauri Mountain hornfels and metallic mineralisation	Table 1, nationally significant	Restricted to esplanade reserve and intertidal.
Kamō limestone pinnacles	Table 1, nationally significant; scheduled in Whangarei District Scheme	Private land. Restricted to area within fenced private reserve. Need to check any legal status.
Maunganui Bluff Miocene basalt	Table 1, nationally significant	All within ONL; except little bit at S end in public reserve.
Ngāwhā Springs hydrothermal field	Table 1, nationally significant; Scheduled in Far North District Scheme	Extent on private land determined during inspection with main private landowner (Top Energy). Two hydrothermal crater lakes are in Crown prison land; two are in DoC Scientific Reserve.
Ohia black shale, Doubtless Bay	Table 1, nationally significant	Owned by Mangonui County Council; disused overgrown quarry. Confined to eastern face on boundary.
Pandora pillow lava and sediment, Spirits Bay	Table 1, nationally significant	All within reserve land or intertidal.
Poor Knights sea arches and caves	Table 1, nationally significant	Whole islands as too many to individually map. All Nature Reserve.
Pouerua scoria and lava fields (northern side)	Table 1, nationally significant	Privately owned. All mapped area within Pouerua Heritage precinct.
Runaruna mud volcano	Table 1, nationally significant; scheduled in Far North District Scheme	Small area within privately owned farm.
Tauranganui Stream mouth melange, Doubtless Bay	Table 1, nationally significant; scheduled in Far North District Scheme	Confined to intertidal and esplanade reserve.
Te Reinga Bay thrust contact, Doubtless Bay	Table 1, nationally significant	Confined to intertidal and esplanade reserve.
Te Rewa Pt Pleistocene fossils, Hokianga Harbour	Table 1, nationally significant	Confined to intertidal and esplanade reserve.
Te Werahi sand dunes and fossil fauna, Cape Reinga	Table 1, nationally significant	All in reserve - not grazed
Waikari Inlet "old hat", Bay of Islands	Table 1, nationally significant Scheduled in Far North District Scheme	Confined to islet and intertidal
Waikuku Beach (north) Miocene limestone, North Cape	Table 1, nationally significant Scheduled in Far North District Scheme	All in reserve and ONL.

Waikuku Beach (south) Miocene limestone, North Cape	Table 1, nationally significant Scheduled in Far North District Scheme	All in reserve and ONL.
Taita Stream Miocene fossils, Waimamaku	Table 1, nationally significant Scheduled in Far North District Scheme	Site confined to banks on short section of stream. Discuss with land owner.
Waimamaku River Miocene sedimentary sequence	Table 1, nationally significant Scheduled in Far North District Scheme	Site confined to esplanade reserve along river. Significance downgraded to regional.
Waipapa River outlier of Waitemata sediments, Puketi	Table 1, nationally significant; Scheduled in Far North District Scheme	Small area of river bank on private farmland.
Waitangi flow gabbroic inclusions	Table 1, nationally significant; Scheduled in Far North District Scheme	Confined to intertidal zone outside property boundaries
Whāngāpē Harbour entrance gorge	Table 1, nationally significant	Restricted within ONL
Whangape Pleistocene fossils	Table 1, nationally significant	Restricted to intertidal and low banks at high tide.
Abbey Caves and karst, Whāngārei	Table 1, regionally significant; scheduled in Whangarei District Scheme	Visited and ONF restricted to karst areas.
Ahipara Pliocene lignite	Table 1, regionally significant	Entirely in reserve land.
Hewlett Point karst, Whāngārei Harbour	Table 1, regionally significant	Boundary mapped from air photos and helicopter oblique photos. May include some lower quality karst boulders but no on-site inspection permitted. Only small part of karst is on private land according to legal boundary overlay of aerial photographs.
Hokianga Miocene "orbitolite" bed	Table 1, regionally significant; scheduled in Far North District Scheme	All reserve or intertidal
Kaiikanui basalt proto-karst, Helena Bay	Table 1, regionally significant	All private land previously identified was visited with permission of land owners or viewed from over fences. Areas of outstanding basalt protokarst were limited to just one private property (Webb Bros) and the extent of a number of patches on either side of Kaiikanui Rd was mapped onto aerial photos leaving all areas without significantly karst boulders outside of the proposed ONF. One area included has had some damage by recent earth moving machinery selectively harvesting the best boulders for sale.
Kaikohe scoria cone	Table 1 Regionally Significant; scheduled in Far North District Scheme	Visited and flew over with helicopter resulting in more precise extent mapped. Restricted to less developed private and reserve land. Only shown as spot on District Scheme map.
Kawiti scoria cone	Table 1, regionally significant	Land ownership not clear - partly railways purposes reserve. Viewed from road and map refined.
Matarau Rd basalt prtoto-karst, Kamo	Table 1, regionally significant	Private land. Easily seen and mapped from road. Area reduced to one extremely rocky area beside road.
Maungaraho intrusive volcanic breccia, Tokatoka	Table 1, regionally significant	Visited and precise location mapped, on road reserve.
Mititai breccia-filled volcanic neck, Tokatoka	Table 1, regionally significant	On private land. Small overgrown hilly area and old quarry.
Ngahere Drive karst, Whāngārei	Table 1, regionally significant	All in small reserves.
Paradise Quarry karst, Portland, Whāngārei	Table 1, regionally significant	All private land but QE2 covenants. Have used small QE2 covenant on natural limestone area - does not capture the stratigraphy and have

		therefore added two QE2 covenanted areas on end of Onameama Pt to Onemama ONF.
Stoney Knowe basalt proto-karst, Helena Bay	Table 1, regionally significant	Restricted to small area that owners want protected.
Takahiwai algal limestone, Whangarei Harbour	Table 1, nationally significant	Private farm land. Very small area, well mapped.
Te Ruatahi dune sequence, Mimiwhangata	Table 1, regionally significant	Entirely in reserve and intertidal
Todds Quarry nephelinite, Tokatoka	Table 1, regionally significant	On private land. Needs visit to discuss with owner and refine map to smallest area.
Waikiekie karst	Table 1, regionally significant	Mapped from road. One part deleted.
Waiōmio Caves (Kawiti Caves) and limestone pillars	Table 1, regionally significant	Mapped as best possible from road. No permission given to visit and refine on private land.
Waipū Caves and karst	Table 1, regionally significant	Some reserve and some private. Refined mapping on private land undertaken on foot with owners' permission.
Waipu Cove Oligocene-Miocene sequence and karst	Table 1, regionally significant	Restricted almost entirely to reserve and intertidal
Wairua Falls	Table 1, regionally significant	All within reserve.
Bream Head eroded stratovolcano	Table 2, regionally significant	All intertidal and reserve, all ONL.
Houto spilite and conical hill	Table 2, regionally significant	Hill on private land, mapped from topo map and air photos. Road cut well mapped in road reserve.
South Bream Tail Arch Dome and columnar-jointed dacite	Table 2, regionally significant	Intertidal, esplanade reserve and strip of private cliffs, all in ONL
Two Tone Cave, Waipū	Table 2, regionally significant	Boundary drawn from caves map with outlet and three entrances aligned to positions in streams where they occur. Underlies a large hilly area mostly in forest. Permission to visit land not provided.
Haruru Falls, Waitangi	Table 2, regionally significant; scheduled in Far North District Scheme	Confined to esplanade reserve and strip of Waitangi Trust land
Hikurangi dacite dome	Table 2, regionally significant; scheduled in Whangarei District Scheme	Confined to ONL without southern extension
Jellicoe sea cave, Whangaroa	Table 2, regionally significant; scheduled in Far North District Scheme	Intertidal and Esplanade reserve.
Koutu giant concretions, Hokianga	Table 2, regionally significant	Confined to intertidal and esplanade reserve.
Matapia Island sea arch, Ninety Mile Beach	Table 2, regionally significant	Confined to intertidal and islet.
McLeod Bay Miocene unconformity, Whāngārei Heads	Table 2, regionally significant	Confined to intertidal
Opononi Limestone, Hokianga	Table 2, regionally significant; scheduled in Far North District Scheme	Confined to intertidal
Otangaroa Cave, Mangamuka	Table 2, regionally significant; scheduled in Far North District Scheme	Location from literature. Permission to visit not provided by owner.
Pahi Peninsula greensand-limestone sequences, Kaipara Harbour	Table 2, regionally significant	All intertidal and esplanade reserve. Visited and mapped - no private land nor oyster farm areas.
Parakiore dome, Whāngārei	Table 2, regionally significant	Restricted to existing ONL.
Paranui Falls, Whāngārei	Table 2, regionally significant	Restricted to within reserve.
Pukekaroro dacite dome, Kaiwaka	Table 2, regionally significant	Tweaked to be all inside reserve & ONL
Rainbow Falls, Kerikeri	Table 2, regionally significant; scheduled in Far North District Scheme	Confined to reserve area around falls
Rawene Paleocene limestone	Table 2, regionally significant; scheduled in Far North District Scheme	Confined to intertidal - needs check for southern extent (too far)

Skull Creek-Mangawhati Pt autochthonous sedimentary sequence, Whāngārei Harbour	Table 2, regionally significant	Confined to intertidal. Visited and precisely mapped. Includes small area of limestone karst on point that is in private land.
St Pauls exfoliation dome, Whangaroa	Table 2, regionally significant; scheduled in Far North District Scheme	Confined to rock and buffer zone around it - all within ONL.
Taratara butte, Whangaroa	Table 2, regionally significant; scheduled in Far North District Scheme	All within ONL.
Whāngārei Falls	Table 2, regionally significant	All in reserve.
Whangaroa exfoliation domes	Table 2, regionally significant; Scheduled in Far North District Scheme	All in ONL.
Whatuwhiwi Cretaceous sediments, Cape Karikari	Table 2, regionally significant; Scheduled in Far North District Scheme	Confined to ONL and intertidal rocks.
Waihou Valley limestone bluffs and mid tertiary sequence	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Name changed from Cave Stream to more appropriate Waihou Valley. All on private farmland. Site visit with farmer's permission refined extent to bed of Cave Stream and three raeas of near vertical bluffs.
Hihi Beach, Manganui Lignite beds	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Only reserve and intertidal rocks and cliffs.
Karai Point Miocene dacite dome	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Restricted to non-private land in cliffs and foreshore.
Mt Camel Cretaceous volcanoclastic rocks	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	All in ONL, combined with Perforated Pt
Ngahuha scoria cone, Kawakawa	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	On three private farms. Site visit with main land owner determined extent and excluded southern crater and scoria ring that is less distinct and is being quarried.
Rangiahua autochthonous sedimentary sequence, Okaihau	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	On two private farms. Site visit on one farm with owners' permission. Restricted area to small, deep sinkhole, small forested bluffs, waterfall and area of rocks.
Tauranga Bay channelised flow, Whangaroa	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Restricted to cliffs in reserve land.
Tauranga Bay coastal features	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Restricted to cliffs and intertidal.
Te Huka Beach and Kurahaupo Rocks Miocene sedimentary sequence, Far North	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	All ONL or intertidal.
Te Reinga Bay thrust contact, Doubtless Bay	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Restricted to cliffs and intertidal.
Twilight Beach pillow lavas, Far North	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	All reserve and intertidal
Wairakau estuary, Whangaroa Harbour	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	All in ONL.
Waitapu Bay Cretaceous unconformity, Whangaroa Harbour	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	All intertidal outside private land
Whangape pillow basalt	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Restricted to ONL and intertidal
Whangaroa Harbour lacustrine sequence	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Restricted to ONL and intertidal.

Whangatupere Bay plutons	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Coastal cliffs and intertidal rocks all in ONL and on Crown Land.
Lake Omapere lava-flow-dammed lake	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Restricted to lake and narrow lake fringe.
Waihou Valley limestone bluffs and mid tertiary sequence	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Site visit undertaken with farmer's permission. ONF restricted to Cave Stream bed and three areas of bluffs.
Wekaweka natural gas seep, Hokianga	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	Refined to small area within patch of bush in paddock.
Whakaterekia allochthon block, Whangaroa	Scheduled in Far North District Scheme; classified regionally significant in NZ Geopreservation Inventory	No permission from owner obtained and so retained mapped area from literature.
Bald Rock, Kaiwaka	classified regionally significant in NZ Geopreservation Inventory	Well mapped from helicopter. On private owned bushy land.
Black Rocks columnar basalt, Bay of Islands	Classified regionally significant in NZ Geopreservation Inventory	Rocks with no ownership title surrounded by sea.
Brynderwyn dacite domes	Classified regionally significant in NZ Geopreservation Inventory	Entirely within ONL, half reserve and half private bush. Area outside ONL not mapped.
Cone Rock, Whangaroa	Classified regionally significant in NZ Geopreservation Inventory	Coastal rock with no ownership title surrounded by sea
Hen Island pinnacles	Classified regionally significant in NZ Geopreservation Inventory	Nature Reserve.
Hoopers Point basal Waitemata sequence	Classified regionally significant in NZ Geopreservation Inventory	Maori Land all in ONL, all slip face and cliff
Hororako Creek shellspit, Kaipara Harbour	Classified regionally significant in NZ Geopreservation Inventory	All intertidal, no private land
Houhora pillow lava	Classified regionally significant in NZ Geopreservation Inventory	Intertidal and small bluffed private area all within ONL
Kaiaraara old hat islet, Russell	Classified internationally significant in NZ Geopreservation Inventory	Islet and intertidal
Kamo Brickworks Eocene coal measures	Classified regionally significant in NZ Geopreservation Inventory	Private land, confined to former quarry face beside carpark.
Karakanui deep-water limestone, Hukatere	Classified regionally significant in NZ Geopreservation Inventory	Restricted to narrow strip of private low cliffs and intertidal zone, no grazing land included.
Kawerua lava-flow reefs, Waipoua coast	Classified regionally significant in NZ Geopreservation Inventory	Restricted to intertidal and reserve
Lake Ora lava-flow-dammed lake	Classified regionally significant in NZ Geopreservation Inventory	Restricted to lake bed plus 20 m fringe in ONL and forested steep margin ~5 m wide around rest.
Mangawhai Heads halloysite	Classified regionally significant in NZ Geopreservation Inventory	All reserve land
Mangawhai Spit	Classified nationally significant in NZ Geopreservation Inventory	Restricted to reserve and narrow intertidal strip
Maungapiko conglomerate dome, Spirits Bay	Classified regionally significant in NZ Geopreservation Inventory	Maori land in ONL
Mokau Stream soda spring and travertine, Helena Bay	Classified regionally significant in NZ Geopreservation Inventory	On recently harvested crown forestry land.
Motuarohia Island tombolos and tide pools, Bay of Islands	Classified regionally significant in NZ Geopreservation Inventory	All in intertidal or reserve except small piece of tombolo which is part of ONL.
Motukawanui pillow lava, Cavalli Islands	Classified regionally significant in NZ Geopreservation Inventory	Intertidal and reserve
Ngamotu shell tombolo, Kaipara Harbour	Classified regionally significant in NZ Geopreservation Inventory	All intertidal.
Ngunguru River mouth pillow basalts and peperites	Classified regionally significant in NZ Geopreservation Inventory	Restricted to intertidal and esplanade reserve
Ninepin sea pinnacle, Bay of Islands	Classified regionally significant in NZ Geopreservation Inventory	Rock in sea
Ocean Beach autochthon-allochthon contact, Whangarei Heads	Classified regionally significant in NZ Geopreservation Inventory	Restricted to intertidal and esplanade reserve
Old Woman Rock, Hen Island	Classified regionally significant in NZ	All intertidal.

	Geopreservation Inventory	
Oneriri Road hyaloclastic tuff, Kaiwaka	classified regionally significant in NZ Geopreservation Inventory	On private land, restricted to one face of small disused farm quarry. Site visit needed and discuss with land owner.
Onoke scoria cone, Kamo	Classified regionally significant in NZ Geopreservation Inventory	Restricted to reserve and publicly owned land
Opuawhanga dacite dome	Classified regionally significant in NZ Geopreservation Inventory	Distinctive landform easily mapped from air photos on private land.
Parahaka dacite dome, Whangarei	Classified regionally significant in NZ Geopreservation Inventory	Restricted to within existing ONL.
Parua Bay red chert, Whangarei Harbour	Classified regionally significant in NZ Geopreservation Inventory	Entirely in intertidal rocks
Patipatiarero rock, Omapere	classified regionally significant in NZ Geopreservation Inventory	Almost entirely in crown-owned land.
Piroa Falls, Waipu Gorge	Classified regionally significant in NZ Geopreservation Inventory	Entirely within reserve
Poka Rd Early Miocene fossils, Waimamaku	classified regionally significant in NZ Geopreservation Inventory	Restricted to road cutting and cuttings on one side of farm track in private land.
Poroporo Island drowned ridge crest, Bay of Islands	Classified regionally significant in NZ Geopreservation Inventory	Entirely reserve and ONL
Pouto dune-dammed lakes	Classified regionally significant in NZ Geopreservation Inventory	Entirely within ONL and almost all reserve
Pungaere limestone shafts and cave	classified regionally significant in NZ Geopreservation Inventory	Confined area of bush on private land, well mapped from air photos.
Pungaere natural bridge	classified nationally significant in NZ Geopreservation Inventory	Entirely on crown land.
Pungaere Rd rhyolitic sediments and obsidian	classified regionally significant in NZ Geopreservation Inventory	Entirely in road reserve.
Rahui drowned lava flow, Kerikeri	Classified nationally significant in NZ Geopreservation Inventory	Map confined to marine area
Rangi Point giant concretions, Hokianga	Classified regionally significant in NZ Geopreservation Inventory	Restricted to intertidal
Rangiora Bay honeycomb weathering, North Cape	Classified regionally significant in NZ Geopreservation Inventory	Restricted to high cliffs in publicly-owned land.
Sail Rock stack	Classified regionally significant in NZ Geopreservation Inventory	Whole rock
Spirits Bay Miocene giant barnacle fossils	Classified regionally significant in NZ Geopreservation Inventory	Maori Land in ONL/intertidal
St Peters conglomerate dome, Whangaroa	Classified regionally significant in NZ Geopreservation Inventory	Rock and buffer zone all within ONL
Sweetwater dune-dammed lakes, Awanui	Classified regionally significant in NZ Geopreservation Inventory	Restricted to reserve land
Tapotupotu estuary, Cape Reinga	Classified regionally significant in NZ Geopreservation Inventory	All reserve, not camp ground or recreation areas
Taronui gravel barrier and lagoon, Kerikeri	Classified regionally significant in NZ Geopreservation Inventory	All intertidal or fringe of reserve
Te Kauri Pt ignimbrite, Tinopai	Classified regionally significant in NZ Geopreservation Inventory	No private land included
Te Wairoa soda spring and travertine deposit, Matapouri Bay	Classified regionally significant in NZ Geopreservation Inventory	Visited and replotted in correct location, in public reserve.
Twilight Beach badlands, Far North	Classified regionally significant in NZ Geopreservation Inventory	All reserve land not grazed
Urquharts Bay concretions, Whangarei Heads	Classified regionally significant in NZ Geopreservation Inventory	Confined to intertidal
Waipoua dune lakes	Classified regionally significant in NZ Geopreservation Inventory	Restricted to reserve land
Waitahora Lagoon, Spirits Bay	Classified regionally significant in NZ Geopreservation Inventory	All intertidal and reserve
Whakapirau Creek cusplate foreland, Kaipara Harbour	classified regionally significant in NZ Geopreservation Inventory	Air photo & cadastral a long way apart; grazing land excluded - mostly public foreshore.
Whangamumu Harbour and peninsulas, Cape Brett Peninsula	Classified regionally significant in NZ Geopreservation Inventory	All within ONL, majority in reserve & intertidal
Wharepoke Falls, Kerikeri	Classified regionally significant in NZ Geopreservation Inventory	Restricted to area around falls and plunge pool in reserve

Appendix 3

Documentation for features recommended for scheduling as Outstanding Natural Features for Northland Region. See accompanying GIS layer for maps. * = sites that have not had permission to visit on private land and therefore their mapped extent is preliminary.

Name	Dist	Cat	Significance statement	Brief description	Location	I	V	Refs
Abbey Caves and karst, Whangarei	Whg	B, F	One of the best preserved and most easily accessible areas of karst landforms and small caves in Northland.	About 4 hectares of vegetated karst with entrances to several caves on one partly underground stream, containing speleothems. Hundreds of limestone boulders with fluting and some castellated. Several 5 m limestone pinnacles in middle of bushed reserve. Several sink holes.	300 m east of Abbey Caves Road, half way between Whareora Road and Old Parua Bay Road; 2 km east of Parahaka and 3 km east of Whangarei.	C	2	
Ahipara Pliocene lignite	Far Nth	E	Oldest dated sand dunes and lignitic swamp deposits in Northland.	Exposure of sequence through lignite bed near base of Pliocene-Holocene dune sequence.	Exposed in inland bluffs high above Shipwreck Bay, Ahipara.	C	2	B22
Arrow Rocks Permian-Triassic boundary	Far Nth	E	One of the few exposures of the Permian-Triassic boundary in the Southern Hemisphere. This boundary records one of the largest extinction events on Earth.	Structurally complex sequence of greywackes with Permian-Triassic boundary identified using microfossil radiolaria and conodonts.	In shore platform of Arrow Rocks, 1 km NNE offshore from Marble Bay, Whangaroa.	A	2	T1
Avoca trace fossils	Kaip	E	Two of the best exposures of well-preserved three-dimensional trace fossils in New Zealand.	Two localities: a. Three dimensional trace fossils on underside of large limestone boulder in farm paddock. B. Numerous Scolicia trace fossils in road cutting section in glauconitic calcareous sandstone.	On base of limestone boulder in farm paddock, 100 m from quarry just south of Tangowahine Valley Rd intersection with Avoca Rd; and in Tangowahine Valley Rd road-cutting c.600 m south of the same intersection.	B	1	G2
Bald Rock dacite dome	Kaip	B	Prominent rounded rock peak (exfoliation dome) visible from highway one and some of freshest dacite in Northland.	238 m high exfoliation dome of dacite of early Miocene age. Prominent rock feature seen from Hwy 1.	1 km northeast of junction of highway 1 and Baldrock Rd	C	2	
Black Rocks columnar basalt, Bay of Islands	Far Nth	B	One of the best examples of small columnar-jointed basalt islets in New Zealand.	Columnar-jointed basalt flow remnants from a cluster of black rocky islets just above high water level with subtidal reefs that are mostly steep-sided, and extend to between about 4 m and 30 m depth. Subtidal caves, tunnels, shafts, pinnacles and very large boulders are common. Eroded distal remnants of a long lava flow.	500 m off the east coast of Moturoa Island, at the entrance to Kerikeri Inlet, Bay of Islands.	B	2	
Bream Head eroded stratovolcano	Whg	A	Best exposed section through the cone facies and underlying subvolcanic intrusions in the Taurikura volcanic centre around Whangarei Heads. Includes the rocky pinnacles of Bream Head ridge.	Virtually continuous exposure. Cone facies rubbly breccia and andesite flows in the east and subvolcanic andesite, dacite and rhyolite intrusions into the underlying Northland Allochthon in the west, just beneath the volcanics outcrop which forms the rocky peaks of Bream Head.	Coastal section and foreshore rocks, 5 km length of coastline from Busby Point east to Bream Head and also the slopes up to the Bream Head ridge and rocky pinnacles.	C	3	I4
Brynderwyn dacite domes	Kaip	V	Prominent Miocene volcanic domes that sit high above surrounding eroded allochthonous sedimentary rocks.	Dated as early Miocene these dacite domes are inferred to have intruded through softer allochthonous sedimentary rocks and erupted steep sided domes on the surface. Erosion has removed much of the softer surrounding rock and left the domes upstanding.	Half way between Maungaturoto and Kaiwaka	C	3	H14

Camp Bay mylonite and schistose Tangihua rocks	Far Nth	D	The only well-exposed area of schistose Tangihua Volcanics anywhere. These are inferred to be mylonites formed in an oceanic transform fault within the ancient Pacific Plate.	Coastal section of schistose sheeted dike complex and other igneous rocks with a complex suite of dikes overlying less deformed pillow lavas; inferred to be formed in a mylonitised oceanic transform fault zone.	Coastal section at Camp Bay, north of Taupo Bay.	A	3	B19, H1
Cone Rock, Whangaroa	Far Nth	B	Spectacular conical coastal pinnacle. Well known landmark for boaties.	Large conical pinnacle of flow-banded dacite. Part of a volcanic dome that was intruded and erupted about 20 million years ago.	400 m north of headland between Motukahakaha Bay and Whangaroa Bay.	C	3	B19
Haruru Falls, Waitangi	Far Nth	B	An outstanding 12 m high waterfall plunging over the eroding face of a columnar-jointed basalt flow. Easily accessible and viewed by thousands every year.	A scenic waterfall, eroding part of a 5 km long columnar jointed basalt flow that was confined by the Waitangi River valley.	3 km up Waitangi River from the coast, W of Paihia, just off Haruru Falls Road, Bay of Islands.	C	3	A1, K3
Hen Island pinnacles	Whg	B	Spectacular rock pinnacles on the main ridge of Hen Island seen for many km in all directions.	Pinnacles of volcanic breccia eroded from a 20 million year old stratovolcano. Includes one large rock balancing on a narrow pedestal.	West end of crest of Hen Island, including Balancing Rock.	C	3	H17
Hewlett Point karst, Whangarei Harbour	Whg	B	Small area of well-exposed coastal karst developed in autochthonous Whangarei limestone.	c. 200 x 50 m block of Whangarei Limestone with fluting, flagginess and small solution cracks.	Northwest tip of Hewlett Point.	C	2	I4
Hihi Beach, Manganui Lignite Formation	Far Nth	E	Best exposure of Manganui Lignite Formation. Well-exposed valley fill alluvial sequence of mid Miocene age.	Non-marine conglomerate and thin carbonaceous sandstone fill a valley eroded into underlying Tangihua Volcanics rocks.	In cliffs and foreshore at the west end of Hihi Beach.	C	3	B19
Hikurangi dacite dome	Whg	V	Large, prominent volcanic dome that dominates the landscape adjacent to highway 1 north of Whangarei.	200 m high, slightly eroded volcanic dacite dome, recently dated as < 2 million years old.	1.5 km west of Hikurangi township.	C	2	H14
Hokianga Miocene "Orbitolite" bed	Far Nth	E	One of only two examples in New Zealand of sedimentary rocks made of large foraminifera. Largest fossil foraminifera in New Zealand.	A small (5x 5 m) exposure first reported by Hochstetter in 1864. The larger foraminifera are of international biostratigraphic value.	At east end of small beach 500 m inside Hokianga South Head and accessed by a public track from near the end of Signal Station Rd.	B	1	B12
Hoopers Point basal Waitemata sequence	Far Nth	E	Only good exposure of the basal Waitemata sequence deposited on top of Northland Allochthon rocks. Provides constraints on timing and environment of emplacement of Northland Allochthon in northern Northland.	20 m thick sequence from basal limestone up into mudstones of earliest Miocene (Lw) sediments deposited on top of allochthonous Tangihua Volcanics. Oldest known Waitemata Group sedimentary rocks.	On north side of saddle that joins Hoopers Point (east end Spirits Bay) to mainland. Section exposed in upper half of steep cliff/partly grassed slopes.	C	2	T1
Hororako Creek shell spit, Kaipara Harbour	Kaip	C	Longest and most serpentine shell spit in the Kaipara Harbour.	400 m long snaking shell spit on west side of Hororako Creek arm of Kaipara Harbour. The spit hugs the shoreline at its southern end but then swings east and extends more than half way across the arm.	Kaipara Harbour, west side of Hororako Creek arm, 1 km from the mouth and 1.5 km from the head.	C	2	
Houhora pillow lavas	Far Nth	E	Excellent example of elongate-lobed pillow lava.	A small seacliff exposure of a Tangihua Volcanics lense of pillow lava with beautifully displayed elongate lobes.	In low cliffs close to the south point of Mt Camel (Perpendicular Pt) at the entrance to Houhora Harbour.	C	2	
Houto spilite and conical hill	Whg	B, E	Oldest known occurrence of allochthonous ophiolites (Tangihuas) in Northland. Forms iconic eroded conical hill.	Spilitic lava and pillows with intercalated red-brown marble and mudstone with earliest Cretaceous fossils (in road cut).	Forming Houto Hill and surrounding area, rock exposures are in roadcuttings.	C	2	

Jellicoe Sea Cave, Whangaroa	Far Nth	F	Unusual narrow, navigable sea cave, linked historically to Lord Jellicoe who holidayed there.	50 m long, 1-2 m wide, 3-8 m high "keyhole" cave that passes right through small point and is navigable by small dinghy. Eroded along joint through Wairakau Volcanics breccias. Joined by second passage midway along with underwater link to surging ocean.	Through small point on seaward side of Whangaroa North Head.	C	3	
Kaiaraara old hat islet, Russell	Far Nth	B	First "old hat" islet in the world to be described (Dana 1849) and used as the classic example by Prof Bartrum to describe the "old hat" phenomenon in New Zealand and world-wide.	Kaiaraara Island (Mill Island) was first brought into scientific prominence by Professor J. D. Dana, who visited the Bay of Islands district in 1840 as a member of the United States Exploring Expedition of 1838–42. He first commented on their occurrence in northern New Zealand, sketching Kaiaraara Island in his 1849 report, and initiating a debate on their origin that has continued to the present time, including important papers (with Kaiaraara Island pix) by Auckland's Professor J.A. Bartrum (1916, 1924, 1925).	Off the southern tip of Tahapuke Bay, c. 500 m south of southern Kororareka Bay, Russell.	A	2	D1, B3, B4, B5, K4
Kaiikanui basalt proto-karst, Helena Bay	Whg	B	One of the two best and most easily seen examples in the Helena Bay area of fluted surfaces (proto-karst) formed on basalt.	Cap of Horeke Basalt on greywacke ridge crest. Several mapped areas of large basalt boulders, many with extremely well-developed, internationally-rare solution-weathered surfaces (protokarst).	In paddocks on both sides of Kaiikanui Road, east of Bridal Track Rd junction. Often at top of steep slopes on edge of eroding basalt flows.	B	2	S4
Kaikohe Hill scoria cone	Far Nth	V	Prominent volcanic cone at west end of Kaikohe	A 30 m high scoria cone with a 5 m deep crater, breached to the E, sitting in the NW corner of the Kaikohe volcanic field.	Due W of Kaikohe (Centre).	C	1	
Kamo Brickworks Eocene coal measures	Whg	E	Best remaining permanent exposure of Kamo Coal Measures. Easily viewed.	Jarositic carbonaceous mudstone, sandstone, conglomerate and coal sequence typical of the lithologies of the late Eocene Kamo Coal Measures.	In cutting alongside former Kamo Brickworks building, now a garden centre. On south side of main railway line just east of where it ran underneath the old North Rd.	C	1	K2
Kamo limestone pinnacles	Whg	B	Most spectacular and best preserved limestone karst pinnacles in Northland. Some of deepest and sharpest fluting on a limestone in NZ.	Three or four vertical sided, 10 m high, 3-5 m across pinnacles of Whangarei Limestone, on small low knoll in bush. Several fallen over. Many surrounding smaller limestone blocks - many with well-developed fluting, often deep and sharp. Several fallen over. Many surrounding smaller limestone blocks - many with well-developed fluting, often deep and sharp. The top of one fallen pinnacle is the best fluting in Northland, if not the country.	Approx 1 km east of SH 1 on Kamo Springs flat, Whangarei. 100 m southeast of old house, now bed and breakfast called The Rocks. In small area close to Whangarei city, protected in private reserve with bush remnants and QE2 covenant.	B	1	K5
Karakanui deep-water limestone, Hukatere	Kaip	D	Best example of deep-water Oligocene limestone sequence in northern New Zealand.	Thick sequence of Oligocene Mahurangi Limestone within unshaped block of Northland Allochthon. Continuous exposure in high tide platform and low cliffs for 1 km +. Excellent examples of thin-bedding, deep-water carbonate turbidites and trace fossils.	In low cliffs and high tide platform along south west side of Karakanui Peninsula, Kaipara Harbour	C	2	K1
Karai Point Miocene dacite dome	Far Nth	E	Excellent coastal exposure of small eroded flow-banded dacite dome of early Miocene age.	200 m diameter intrusional neck of dome with circular flow-banding parallel to margins.	In coastal exposures around Karai Point, 1.5 km southeast of Cone Rock.	C	3	B19

Kauri Mountain hornfels and metallic mineralisation	Whg	E	Well-exposed example of hornfels (rocks metamorphosed by heat of intruding magma). Best example in Northland of veins of metallic mineralisation including galena, sphalerite and pyrite.	Hornfels up to 2 m wide at contact with quartz-diorite are exposed in cliffs and shore platform.	In coastal cliff and foreshore at Flax Bay, east coast of Kauri Mt.	B	3	B10
Kawerua lava-flow reefs, Waipoua coast	Far Nth	B	Most significant basalt reefs (Waipoua Basalt) between Maunganui Bluff and Kaikai Beach. Shape of reefs and tidal rock lagoons determined by west-dipping sequence of flows.	Prominent point on exposed west coast, formed by west-dipping sequence of basalt lava flows, producing the seaward tilt of some large reefs.	Shore platforms extending up to 1.5 km south of Kawerua, 13.5 km south of Hokianga Harbour entrance.	C	2	H5
Kawiti scoria cone	Far Nth	V	Prominent peaks of the partly quarried, southeasternmost scoria cone in the Kaikohe Volcanic Field.	The Kawiti cone has been considerably modified by railways quarrying, but the two peaks on the western side are still largely intact and form a prominent feature when viewed from the west.	Tui Pa Hill, 120 m high Tui Pa Hill, 120 m high, on north side of Ngapipito Rd, 5 km WSW of Moerewa.	C	1	A1, B23
Koutu giant concretions, Hokianga	Far Nth	B	Some of largest and most accessible spherical concretions that have been eroded out of their host rocks in New Zealand. Major tourist attraction.	Numerous spherical concretions line the foreshore and intertidal zone for c. 1 km. Largest are in excess of 4 m across. Erode out of Late Cretaceous Punakitere Sandstone which is exposed in the foreshore and low cliffs.	Between 300 m east of end of Cabbage Tree Bay Rd and just south of Mahina Rd point. Foreshore and intertidal area in strip.	B	1	H13
Lake Manuwai basalt proto-karst, Kerikeri	Far Nth	B	One of two best developed and most extensive examples of fluted basalt proto-karst in New Zealand and possibly in the world. Produced by solution of the basalt rock. Majority of karst is on basalt that is still in-situ where the lava solidified.	A large area of fluted basalt lava flow rock. Best developed around the northwestern end of the flooded valley - best seen when lake level is 1-2 m below full. Seen by using water craft in amongst them. Flutes extend the full height (5-10 m) of most cliffs and boulders along the foreshore and are up to 60-80 cm deep and sometimes 50 cm wide. Some have basins etched out of their upper surfaces. An enclosed flooded basin on the northwestern side is almost completely surrounded by fluted cliffs and boulders. An area above the lake on the NW side has numerous well fluted bouldres sticking out above ground level.	In two areas - the best is along northwestern shores of Lake Manuwai, but also one area along shoreline on eastern side of lake.	A	1	K5, H16
Lake Omapere lava-flow-dammed lake	Far Nth	A	Largest lake in New Zealand formed by a lava flow damming a valley.	4 x 4.5 km roughly circular shallow lake dammed by a lava flow across its northwestern side and now overflowing to the west.	5 km north of Kaikohe.	B	3	E1
Lake Ora lava-flow-dammed lake	Whg	A	Excellent example of a small lake formed when a valley was dammed by a lava flow from Hurupaki volcano.	Small 2 ha lake backed by a forested watershed growing on eroded greywacke basement.	At end of Lake Ora Rd, 2 km southwest of Kamo.	C	3	W3
Mangawhai Heads halloysite	Kaip	E	Most easily accessible example in New Zealand of white halloysite clay derived from weathering of dacite volcaic rock.	Small 10 x 10 m knoll of white halloysite clay sticks out above the surrounding sand dune.	On seaward side of carpark at Mangawhai Heads beach	C	1	

Mangawhai Spit	Kaip	C	One of the best examples of a sand dune barrier spit in northern New Zealand. Only known sand dune system to preserve a distinctive volcanic ash horizon (Kaharoa Tephra) within its stratigraphy that allows its recent dynamic history since human arrival to be documented.	4 km-long spit, 400-1000 m wide composed of older Pleistocene sand (south end) overlain by Holocene sand dunes. Buried soil and forest remains provide evidence of forest clearance by fire (charcoal) shortly before the 1314 AD eruption of Kaharoa Tephra. This is followed by evidence in huge middens of pre-European Maori occupation in dune hollows followed by erosion of the foredune and westward movement of sand to form the presentday 50 m high inland dune.	Barrier enclosing Mangawhai Harbour. Across the harbour from Mangawhai Heads township.	B	2	E3, M2
Mangawhati Point limestone karst and greensand, Whangarei Harbour	Whg	E	Well exposed autochthonous middle Tertiary sequence beneath Northland Allochthon. Includes excellent example of coastal karst, intensively burrowed (Scolicia) calcareous greensand, the best crab fossil locality in Northland.	Conglomerate, glauconitic calcareous sandstone and bioclastic limestone overlain by basal allochthon. Includes Eocene sandstone beds with moderately rich fossil bivalves and crabs. Coastal karst extends around Mangawhati Pt. Allochthon lithologies include rare black chert.	Around Mangawhati Point extending 500 m south on the east side along the foreshore.	C	2	
Matapia Island sea arch, Ninety Mile Beach	Far Nth	B	Iconic sea arch visible from Ninety Mile Beach.	Sea arch eroded into steeply dipping conglomerate and sandstone of Matapia Formation.	Matapia Island, located 1.5 km offshore of Ninety Mile Beach and about 10 km south of Te Paki Stream mouth.	C	3	B20
Matarau Rd basalt proto-karst, Kamo	Whg	B	One of most easily seen examples of basalt proto-karst near Whangarei. Large fluted boulders near road with solution basins on top.	Boulders of basalt (derived from Whangarei Volcanic Field) with solution fluting and basins on their surface. Hillside covered with basalt boulders some fluted. Best boulders within 10 m of road.	On east side of Matarau Rd, 0.6-0.8 km south of junction with Rushbrook Rd, 8 km NW of Kamo.	C	1	H16
Maunganui Bluff Miocene basalt	Kaip	D	Best exposure of the sequence of basalt flows cut by basalt dikes (Waipoua Basalt) that formed New Zealand's largest shield volcano (now considerably eroded).	Numerous basalt flows and interbedded airfall pyroclastics, intruded by swarm of basalt dikes that indicate proximity to eruptive centre to the SW.	Sea cliffs on western side of Maunganui Bluff, Waipoua. Most easily accessed and seen at low tide on the southern end.	B	3	H7
Maungapiko conglomerate dome, Spirits Bay	Far Nth	B	Most prominent example of an exfoliation dome of bedded conglomerate in northern Northland.	165 m high dome of bedded Kaurahaupo Conglomerate (early Miocene) surrounded on all its upper sides by bluffs with a rounded profile on top.	500 m north of the Spirits Bay carpark.	C	2	B15
Maungaraho intrusive volcanic breccia, Tokatoka	Kaip	E	Well exposed example of volcanic breccia filling a volcanic conduit intruding Mahurangi Limestone.	Part of the plumbing system beneath the early Miocene Tokatoka stratovolcano that has now been eroded away.	In road cut on Mititai Rd, 300 m north of Maungaraho Rock Rd junction.	C	2	B8
McLeod Bay Miocene unconformity, Whangarei Heads	Whg	E	Easily accessible and excellent exposure of deep water early Miocene thin-bedded sandstone and siltstone unconformably overlying Oligocene limestone and itself overlain by Northland Allochthon.	Sequence is near vertical and may be a block within Northland Allochthon. Provides a window into the history of the rocks deposited in this region prior to the incoming of the Northland Allochthon about 23 million years ago.	In foreshore 100-200 m northeast of wharf at west end of McLeod Bay.	C	2	B1
Mititai breccia-filled volcanic neck, Tokatoka	Kaip	B, E	Best exposed example of several breccia-filled volcanic necks in the Tokatoka area.	200 m diameter neck intruding Northland Allochthon and filled with blocks of country rock and volcanic breccia.	Forming small hill 100 m south of Mititai-Tauraroa Road, 1 km east of Inch Road Junction, with exposures seen in disused small farm quarry.	C	2	B8
Mokau Stream soda spring and travertine, Helena Bay	Whg	C	One of the two best examples of travertine deposits from active soda springs in northern New Zealand.	Eastern spring has built up a 10 m wide and 2 m high travertine apron flowing down into raupo swamp (photo p. 8 in ref).	4.2 km SSW of Oakura beside forestry road at end of Pukapuka Rd. Springs just above raupo swamp, 30 m east of Orchard Rd.	C	1	P1

Motuarohia Island tombolos and tide pools, Bay of Islands	Far Nth	C	Best example in Northland of a tombolo linking together two islands and a rock stack forming deep tidal pools, widely used for recreation.	Two greywacke islands (either end of Motuarohia) and a rock stack in between have been linked together by a sand tombolo across the south side, creating two large tidal pools with mouths opening north. An unusual coastal landform.	Eastern end of Motuarohia Island (Roberton Island), 5 km ENE of Tapeka Point, eastern Bay of Islands.	C	2	M6
Motukawanui pillow lava, Cavalli Islands	Far Nth	E	Best preserved pillow lava sequence in Waipapa greywacke basement in Northland.	50 m thick sequence of pillow lavas conformably within a sequence of multicoloured argillite and chert.	South end of 'Pillow Bay', on east side of Motukawanui.	C	3	M7, R1, S7
Mt Camel Cretaceous volcanoclastic rocks	Far Nth	D	Excellent coastal exposure of Mt Camel Volcanics rocks and associated flysch.	Well-exposed thin bedded flysch interbedded with pyroclastic beds of Mt Camel Volcanics, demonstrating that they were deposited together.	South end of Kowhai Beach, north east side of Mt Camel.	C	3	H3, I4
Ngahere Drive karst, Whangarei	Whg	B	Small but spectacular, easily accessible outcrops of lapiez-weathered limestone close to Whangarei.	Fluted and castellated crystalline Whangarei Limestone outcrops in two small reserves and in steep bushed reserve along and on south side of Ngahere Drive and end of Hospital Road. High bluffs in southern reserve and Top Rocks are used for rock climbing.	Half way along Ngahere Drive where the road splits to go either side of it. Also 200 m further east, on northern side of road, is a rock climbing reserve (Top Rocks and Main Crag). Steep hillside reserve with limestone bluffs on Sth side of ends of Ngahere Drive and Hospital Rd.	C	1	W3
Ngahuha scoria cone, Kawakawa	Far Nth	V	A distinctive small scoria cone in the Kaikohe Volcanic Field. Source of extensive lava flows.	A small scoria cone, 62 m above the surrounding basalt plateau. Earthworks of Ngahuha Pa on top. Source of lava flows. Visible from state highway 1, 4 km north of Moerewa. Four identifiable craters - one in NE near trig has been breached to SE with rafted scoria mounds towards Marshall Rd; two central craters coalesce and form large depression breached to the W and source of lava flows. This double crater has had some quarrying of crater floor; shallow southern crater with low arcuate southern scoria rampart with scoria ramparts on SW side quarried away by present quarrying.	2.5 km SE of Pakaraka.	C	2	A1, B23
Ngamotu shell tombolo, Kaipara Harbour	Kaip	C	Best example of a shell spit tombolo in Northland.	150 m long, 20 m wide shell spit tombolo linking Ngamotu Island to Puketotara Peninsula, Includes the shell beaches right around the island and on the adjacent mainland that are part of this dynamic system.	Kaipara Harbour, west side of Whakaki Arm on Puketotara Peninsula, 3km SW of Pakaurangi Pt.	C	2	
Ngawha Springs geothermal field	Far Nth	C	Largest and hottest geothermal field in northern New Zealand. Surface features include hot and cold springs, gas vents, sinter and altered rocks and hydrothermal explosion craters now forming small ponds. Formerly mined for cinnabar (mercury mineral).	The field consists of a number of hot and cold springs, with the cold springs, sinter deposits, fumaroles and stagnant acidic pools. Mercury deposits (cinnabar) occur in lake sediments and is also being currently deposited. Two hot pools complexes are included in the field. There are three NE-oriented lines of small hydrothermal explosion craters now filled with water as ponds. The following ponds are included in this feature: Waitetera, Waipawa, Tuwhakino, Waiparaheka and Ngamokaikai.	6 km east of Kaikohe at Ngawha Springs tourist attraction.	B	2	B25, F2, P1
Ngunguru River mouth pillow basalt and peperite	Whg	E	The most accessible example of pillow basalt and peperite within basement greywacke (Waipapa Group) in northern New Zealand.	Coastal outcrops of Permian-Triassic Waipapa terrane pillow basalt with interbedded peperites (lava that has been brecciated by eruption into cold sea water).	Western end of Whangaumu (Wellingtons) Bay, 7 km by road east of Ngunguru township, 30 km NE of Whangarei.	C	3	

Ninepin sea pinnacle, Bay of Islands	Far Nth	B	Well known iconic rock pinnacle sticking out of the sea at the northern entrance to the Bay of Islands. An unusual landform, particularly in greywacke rocks.	About 20 m high conical pinnacle of greywacke sticks out of the water, which is over 50 m deep at this location.	2 km east of Cape Wiwiki, Purerua Peninsula northern entrance to the Bay of Islands.	C	3	
Ocean Beach autochthon-allochthon contact, Whangarei Heads	Whg	E	One of very the few exposures where the basal contact of Northland Allochthon can be seen and provides clues into how and when it was emplaced.	Waipapa greywacke unconformably overlain by Waitemata Group sandstone and pebble breccia, in turn overlain by Northland Allochthon melange.	In intertidal rocks and low cliffs at the north end of Ocean Beach, at end of Kauri Mt Rd.	C	2	S6, S5
Ohia black shale, Doubtless Bay	Far North	E	Best exposure of black shale in Northland; one of the best exposures of this important rock type in New Zealand.	Quarry faces with massive black shale and associated dark grey chert. Potential source of hydrocarbons for petroleum exploration when deeply buried.	In old county quarry on south side of main highway 10, 2 km east of junction with Whatuwhiwhi turnoff. Just protect the southern quarry face adjacent to the old quarry entrance.	B	2	H19
Old Woman Rock, Hen Island	Whg	B	Unusual intertidal rock stack eroded into shape of woman, name-bearer for adjacent Wahine Bay.	Rock stack sits on intertidal platform and is eroded out of volcanic breccia.	Western entrance of Wahine Bay, Hen Island.	C	2	
Oneriri Road hyaloclastic tuff, Kaiwaka	Kaip	E	Type of volcanic eruptive centre not known elsewhere in Northland.	Hyaloclastic tuff infilling eruptive vent. Intrudes through muddy limestone country rock with some skarn metamorphism.	Old farm quarry on Oneriri Road, Kaiwaka.	C	2	
Onoke scoria cone, Kamo	Whg	V	Visually prominent, bush-clad peak of scoria cone is valuable part of Kamo's landscape and one of the volcanoes of the Whangarei basalt field. Overgrown remains of railway ballast quarry and its associated earthworks is best example of this kind of industrial site in a scoria cone in New Zealand.	200 m high peak of remaining scoria cone rises 80 m above Kamo. Disused quarry had access from railway line in northeast and is overgrown with scrub and forest. Remains of a steam boiler still within the workings.	1 km west of Kamo centre with access into the reserve off Dip Rd.	C	2	B25
Opononi limestone, Hokianga	Far North	E	The best exposure in the Hokianga area of a small sequence through deep water Oligocene limestone with redeposited sandstone beds.	Thick argillaceous limestone containing mass flow units of bioclastic sandy limestone from shallow water.	Exposed intertidally on the south shore of Hokianga Harbour, 100-200 m east of Opononi wharf.	C	2	
Opuawhanga dacite dome, Hikurangi	Whg	V	Smallest of the three young dacite domes close to Whangarei. Forms prominent hill.	Prominent flat-topped hill in back-road rural setting. 259 m high, approx 400 m across at base. Slightly eroded.	1.5 km due west of Opuawhanga. 10 km north of Hikurangi.	C	2	
*Otangaroa Cave, Mangamuka	Far Nth	F	This small stream cave contains subfossil bones, including moa, native frog and the site of an extinct large skink.	Small stream cave about 100 m in length in Oligocene limestone. Type locality of extinct skink <i>Oligosoma northlandi</i> . The site at which the fossil bones were found is a rock debris pile about 50 m upstream from the cave entrance and immediately before a very low section of cave passage. The bones were found on the rock pile, but only above the level of flood-deposited silts, and their position along the strand line suggests that they were carried in as carcasses by floodwaters, entering via an entrance in the unexplored, upstream reaches of the cave.	Up hillside, approximately 100 m south of Otangaroa Road, halfway between lime quarry and road turnoff to top of Mangataniwha trig.	C	1	W5, W6

Pahi greensand-limestone sequences, Kaipara Harbour	Kaip	E	Well exposed section showing close juxtaposition of two different late Eocene-Oligocene sequences in different blocks within Northland Allochthon. Superb mid Eocene greensand flysch and trace fossils.	Sequences include turbidite greensand, shelly shelf greensand and bathyal argillaceous limestone. Greensand contains rich Eocene fossils. A key section for understanding the Eocene geology of northern New Zealand.	Intertidal and lower cliff exposures from the tip of Pahi Peninsula for 1.5 km along its west side.	C	3	F3, S10
Pandora pillow lava and sediment, Spirits Bay	Far Nth	E	One of the best preserved and well exposed examples of multicoloured mudstone and limestone within the Tangihua Volcanics Complex.	Tangihua pillow lava flows stratigraphically and tectonically intercalated with multi-coloured siliceous, non-calcareous mudstone and fossiliferous pink micritic limestone.	In intertidal rocks and low cliffs immediately west of Whangakea Stream mouth, Pandora, western end of Spirits Bay.	C	2	B15
Paradise Quarry karst, Portland, Whangarei	Whg	B	A small area of limestone (Paradise Stone) karst in its naturally exposed and weathered form, protected by a QE2 covenant.	Adjacent to a small building stone quarry which produces "Paradise Stone" - a popular limestone, used for decorative flagstones. An unusual rock type in Northland and source of a fossil lanternfish.	Paradise Quarry, Old Stone Road, near Portland.	C	2	W3
Parahaka dacite dome, Whangarei	Whg	V	High eroded dome which dominates the eastern side of Whangarei city.	Early Miocene intrusive dome of dacite that has had the softer surrounding rocks eroded away leaving it's as a high and prominent dome-shaped hill above the east side of Whangarei City.	East side of Whangarei city.	C	3	W3
Parakiore dacite dome, Whangarei	Whg	V	Prominant volcanic landform, one of two young volcanic domes in Whangarei area.	200 m high, slightly eroded dacite dome with two peaks, recently dated as less than 2 million years old.	1 km W of SH1, 4 km NW of Kamo.	C	3	H24
Paranui Falls, Whangarei	Whg	B	One of the five most scenic waterfalls over basalt lava flows in Northland.	Paranui Stream flows over edge of eroding basalt lava flow with a vertical drop an incised gorge-like basin.	On Paranui Stream, adjacent to Whareora Rd beside junction with Clapham Rd, 4 km north of centre of Whangarei.	C	3	W3
Parua Bay red chert, Whangarei Harbour	Whg	E	Excellent and most easily accessible exposure of red chert within greywacke basement sequence in Northland.	Intertidal outcrop over 80 x 50 m of foreshore adjacent to road.	Between Parua Bay boat ramp carpark and hotel.	C	2	
Patipatiarero rock, Omapere	Far North	B	Spectacular knife-edge knob of bedded conglomerate.	Narrow ridge crest knob with bluffs of Omapere Conglomerate of early Miocene age.	Above Signal Station Rd, 800 m west of main highway saddle above Omapere.	C	2	
Piroa Falls, Waipu Gorge	Kaip	B	Highest substantial falls over greywacke in Northland. Easily accessible, tourist attraction.	20 m high falls with one big drop and small upper fall. Flows over Caples Terrane greywacke sandstone.	On Piroa Stream, in Waipu Gorge.	C	3	
Poka Rd Early Miocene fossils, Waimamaku	Far North	E	Excellent and easily accessible exposure of unique assemblage of transported shallow and in-situ deep water early Miocene fossils shed off the front of the Northland Allochthon.	Only known exposure of Harnetts Formation rocks. Numerous well preserved fossil sharks teeth, solitary corals and deep-water foraminifera of Waitakian age within a small block of allochthon derived pebble conglomerates. The sequence is inferred to have accumulated in a deepwater channel on top or in front of the moving Allochthon and subsequently to have been incorporated into the top of it.	In small bluff on south side of Poka Rd and in farm road (locally known as Harnetts Track) cutting up east side of steep spur 0-100 m south of Poka Rd and 250 m east of junction with Tuoro Rd.	C	2	E6, H19

Poor Knights sea arches and caves	Whg	F	Best developed sea arches, tunnels and caves in New Zealand. Includes completely submerged tunnels, air bubble caves - many of which have been named.	Numerous arches, tunnels and caves ranging up to 200 m long and 50 m wide, eroded by the sea along joints in silicified rhyolite breccia. Located at present sea level, depths up to 30-40 m below present and uplifted to heights up to 80 m above present. On and through Tawhiti Rahi, Aorangi, Aorangaia and Archway islands. Tawhiti Rahi itself contains uplifted seacave c.60 m asl (dimensions 12 m deep, 8 m wide, 5 m high).	Around the coast of the Poor Knights Islands eg. Rikoriko Cave; Mao Mao Arch; Cathedral Arch.	B	3	H9
Poroporo Island drowned ridge crest, Bay of Islands	Far Nth	A	An unusual serpentine-shaped narrow island illustrating its drowned crest origins.	NW-SE oriented, 800 m long x 150 m wide greywacke island being the former crest of a ridge prior to its drowning by sea level rise in the Holocene.	500 m southwest of Urupukapuka Island, Te Rawhiti Inlet, eastern Bay of Islands.	C	2	
Pouto dune-dammed lakes	Kaip	A	One of the best examples of a cluster of small sand-dune dammed lakes on the west coast of Northland.	7 km belt of 7 small lakes between two phases of dune accretion.	West and northwest of Pouto	C	2	
Pukekaroro dacite dome, Kaiwaka	Kaip	V	One of best preserved and most easily recognised examples of an early Miocene volcanic dome landform in New Zealand.	1.5 km diameter, forest-covered dome-shaped hill rising to 301 m ASL. Volcanic dome of dacite dated at 17 million years old.	On east side of state highway 1, 3 km north of Kaiwaka.	C	3	H14
Pungaere limestone shafts and cave	Far North	F	Rare example of vertical solution shafts in Northland. At least one has opening into subhorizontal limestone cave.	Small area of limestone high sticking out from surrounding younger volcanic rocks. Limestone has at least seven distinct shafts each about 30-50 m across. One has 30 m-long cave.	600-800 m northeast of junction of Pungaere Rd and Glendale Heights Rd, about 6 km west of Hwy 10.	C	1	
Pungaere natural bridge	Far North	B	One of two natural bridges in basalt lava flows in New Zealand. Spectacular chasm and dry waterfall.	Dry waterfall at head of 40 m long, 8-10 m deep, vertical walled, 8 m wide chasm. Chasm has displaced basalt block forming natural bridge over part of chasm.	On Pungaere Stm, 50 m downstream from where it passes beneath Onekura Rd.	B	2	H21
Pungaere Rd rhyolitic sediments and obsidian	Far North	E	Most accessible exposure of reworked rhyolitic sediment in Northland.	20 m long, 2 m high road cutting containing bedded rhyolitic silt and reworked rhyolitic pebble conglomerate. Some channels evident.	In road cutting on south side of Pungaere Rd and road scraping on north side opposite. 2 km west of junction with Onekura Rd.	C	1	
Rahui drowned lava flow, Kerikeri	Far Nth	B	One of the two best examples in New Zealand of a young basalt lava flow that has been partially drowned by rising sea level.	2 km long line of elongate intertidal and supratidal reefs and islets extending into Kerikeri Inlet from the south side. This is the end of a young basalt lava flow from Te Puke volcano.	Extends into Kerikeri Inlet from south side, 7-9 km east of Kerikeri.	B	2	E1
Rainbow Falls, Kerikeri	Far Nth	B	One of the five best examples of a waterfall cascading over the edge of an eroding basalt lava flow in northern New Zealand.	27 m high waterfall over basalt flow with undercut eroded out of softer underlying sediment.	On Kerikeri River, 3 km upstream from Old Stone Store	C	2	
Rangi Point giant concretions, Hokianga	Far Nth	B	One of the two best and most easily accessible places to see giant concretions in northern New Zealand.	Numerous spherical concretions line the foreshore and intertidal zone for 1 km. Eroding out of Late Cretaceous Punakitere Sandstone.	At the southern end of Rangi Point Road, off West Coast Road south of Panguru, mid western Hokianga Harbour coast. Foreshore and intertidal strip.	C	1	
Rangiahua autochthonous sedimentary sequence, sink hole and cave, Okaihau	Far Nth	E	Most complete and best exposed autochthonous middle Tertiary sequence beneath the allochthon in Northland. Deep sink hole and small cave.	Sequence of Ruatangata Sandstone, deep water "Whangarei Limestone" and Waitemata Group sitting on Waipapa Group greywacke and overlain by Northland Allochthon.	In valley of true left tributary of Hautau Stream from where stream emerges from cave extending up hillside to the southeast through limestone outcrop to Waitematas. Sink hole in catchment of Hutoia Stream.	C	2	E4, E5, E7

Rangiora Bay honeycomb weathering, North Cape	Far Nth	D	One of best examples of honeycomb weathering (tafoni) in sea cliffs in Northland.	Honeycomb weathering in cliff faces of early Miocene Kaurahaupo Conglomerate.	Small bay 5 km north of Parengarenga Harbour entrance, Great Exhibition Bay, North Cape.	C	2	
Rawene Paleocene limestones	Far Nth	E	Best exposures of deep water Paleocene limestone facies in Northland.	Many blocks comprise thin turbidites of calcareous sandstone/sandy limestone within background non-calcareous pink, green and grey mudstone. Nannofossil studies show that all six nannofossil zones of the Paleocene are present.	Intertidal foreshore extending from 50 m north of end of Gundry St to 100 m south of end of McDonnell St on the west side of Rawene peninsula.	C	2	K1
Runaruna mud volcano, Herekino	Far Nth	C	Best example of an active mud volcano in New Zealand and only active one in Northland.	3 m high mud volcano mound with multiple vents discharging mix of carbon dioxide, methane, allochthon derived mud and some water.	In farm paddock near Panguru/Pawarenga/Broadwood road intersection.	B	1	P1, H15
Sail Rock	Whg	B	An excellent example of a marine eroded sea-stack.	140 m high rock stack of Miocene andesitic volcanic breccia - formerly part of the south side of the Hen Island stratovolcano.	4 km south of Hen Island, 11 km NE of Bream Tail.	C	3	H17
South Bream Tail Arch Dome and columnar-jointed dacite	Kaip	E	Best exposed section through a dacite dome in Northland. Best and most extensive example of coastal columnar jointing in dacite in New Zealand.	1 km exposure of flow-banded columnar-jointed dacite dome. Columnar jointing best developed near southern intrusional contact. Orientation of columnar jointing swings from S-dipping through horizontal to N-dipping moving through the outcrop from south to north, giving classic pattern of cooling joints as the intrusion flares outwards on the underside of an extrusional dome structure.	1 km stretch of coastal cliffs and intertidal rocks from 1 km north of staircase at beginning of Mangawhai Walkway (c. 2.5 km north of Mangawhai Heads) to the arch (c. 500 m south of Bream Tail).	C	2	E1
Spirits Bay Miocene giant barnacle fossils	Far Nth	E	Only example of fossil, deep-water giant barnacles in Northland. Easily accessible and easily seen at low tide.	10 x 5 m lens of fossil early Miocene giant barnacles (<i>Bathylasma aucklandica</i>) preserved near the base of the cliffs sitting on Tangihua Volcanics.	In low coastal cliffs at the northernmost end of Spirits Bay.	C	2	H11
St Pauls exfoliation dome, Whangaroa	Far Nth	B	A prominent dome-shaped rocky hilltop visible from many parts of the Whangaroa area.	Composed of volcanic laharic breccias of t early Miocene Wairakau Volcanics. Dome produced by exfoliation of relatively unjointed rock outcrop.	High hill above Whangaroa township.	C	2	H9
St Peters conglomerate dome, Whangaroa	Far Nth	B	Prominent and well-known example of a rocky dome-shaped hill.	A prominent 167 m high rounded dome of Wairakau Volcanics laharic breccia/conglomerate on the north side of Whangaroa Hbr. Formed by exfoliation of a relatively massive rock.	1 km east of end of road at Totara North.	C	2	H9
Stoney Knowe basalt proto-karst, Helena Bay	Whg	B	Excellent small example of well-developed basalt proto-karst boulders.	Cap of Horeke Basalt on greywacke. Numerous large scattered basalt boulders, some developing solution-weathered surfaces.	In small fenced triangle of land between small cattle yards and access road to Huruiki Trig on north side of Russell Rd.	B	1	H16, H12
Sweetwater dune-dammed lakes, Awanui	Far Nth	B	Well-developed and easily accessible elongate lakes and swamps in swales between sand dunes.	Numerous dune-dammed swamps and lakes up to 1.5 km long, entrapped by an echelon series of northeast-trending longitudinal dunes, now protected from prevailing southwesterlies by coastal pine plantations.	1.5-4 km inland from southern end of Ninety Mile Beach, about 20 km north of Kaitaia.	C	2	
Taita Stream Miocene fossils, Waimamaku	Far North	E	Diverse, early Miocene fossils, including the largest foraminifera (3-4 cm diameter) in New Zealand.	Fauna coming out of massive displaced bed includes numerous larger foraminifera, algal rhodoliths and encrusting bryozoa, serpulid worms and corals.	Approximately 2.5 km up Taita Rd from Waimamaku, 50 m downhill on west side of road, in stream banks and small slips.	B	2	W1

Takahiwai algal limestone, Whangarei Harbour	Whg	E	One of the best examples of algal (rhodolith) limestones in New Zealand. Smallest of two known exposures in the vicinity.	Probably in-situ blocks of c. 5 m thick late Eocene algal limestone. Concentrically banded algal rhodolith spheres 1-6 cm diameter throughout, within distinctively bedded unit. Several blocks have been split open along bedding planes to expose plan views	Blocks cover area of c. 30 x 20 m, beside farm track near junction of three forks of a small stream, c. 200 m up flat section of valley from the coast. Stream valley mouth is largest and about midway between Mangawhati Pt and where Takahiwai Rd leaves coast.	B	1	M3
Tapotupotu estuary, Cape Reinga	Far Nth	C	Northernmost estuary in New Zealand. Excellent, easily accessible and viewable example of a sand-filled valley creating a mangrove and salt marsh estuary.	Extending 1.5 km inland from tidal mouth over east end of Tapotupotu Beach and dunes.	From eastern end of Tapotupotu beach, inland for c. 1.5 km.	C	2	
Taratara butte, Whangaroa	Far Nth	B	One of the best examples of a butte in the North Island.	A spectacular flat topped, steep sided hill, the flat top controlled by very gently dipping strata. An unusual feature in Northland.	2 km inland from southern shores of Whangaroa Harbour.	B	3	
Taronui gravel barrier and lagoon, Kerikeri	Far Nth	C	Possibly the best example in New Zealand of a coastal lagoon enclosed by a gravel barrier and margined by a white silica sand beach.	400 x 200 m coastal tidal lagoon with no breach in the gravel barrier across the northeast side.	In Taronui Bay on west side of mouth of Tapuaetahi Creek, 11 km northeast of Kerikeri.	B	2	
Tauranga Bay channelised flow, Whangaroa	Far Nth	E	Most easily accessible example of a flow confined within a Miocene ring plain paleogully.	200 m+ wide andesite flow filling 10m deep paleogully in laharc breccia sequence.	In cliffs at back of Tauranga Bay camp ground.	C	2	H9
Tauranga Bay coastal features, Whangaroa	Far Nth	B	Well developed examples of wide shore platforms, sea stacks and a sea arch.	Eroded in greywacke that forms Te Anina Pt and rock stacks offshore.	Te Anina Pt and stacks, east end of Tauranga Bay, Whangaroa Bay.	C	2	
Tauranganui Stream mouth melange, Doubtless Bay	Far Nth	E	An excellent example of a structural melange between nappes within the Northland Allochthon.	Melange zone between overlying Tangihua Volcanics and Mangakahia Complex. Melange contains blocks of Late Cretaceous cherts, sandstones and conglomerates.	In foreshore rocks at Tauranganui Stream mouth, north of Waitetoki.	B	2	B19
Te Huka Beach and Kurahaupo Rocks Miocene sedimentary sequence, Far Nth	Far Nth	D	Best exposed sequence through most of early Miocene lower Parengarenga Group.	Deep water fine-grained sediments overlain by volcanoclastic conglomerates (Kurahaupo Conglomerate).	In sea cliffs and intertidal rocks from west end of Te Huka Beach to east end of Kurahaupo Rocks point.	C	2	B15
Te Kauri Pt ignimbrite, Tinopai	Kaip	E	Most accessible and one of the best exposures of Miocene ignimbrite and incorporated fossilised logs and log moulds in northern New Zealand.	Thick ignimbrite forms cliff with carbonised, silicified fossil logs and log moulds within this 18 million year old pyroclastic flow deposit.	Forming cliffs on north side of Te Kauri Pt and south end of Sandy beach, Hukatere Peninsula, Kaipara Harbour.	C	2	
Te Pua Volcanic Crater, Kaikohe	Far Nth	A	An unusual large tuff ring with a large crater in the Kaikohe Volcanic Field	A 2.5 km diameter, sub-circular centre with a large central crater, 750 m in diameter and 30-40 m deep. Flows travelled less than 0.75 km from the vent. Te Pua is cut by a minor fault.	Immediately E of the Putahi rhyolite dome in the Kaikohe area. Remuera Settlement Rd runs through the middle.	C	2	
Te Reinga Bay thrust contact, Doubtless Bay	Far Nth	E	One of the best examples of contacts between nappes within the Northland Allochthon.	Sharp thrust contact between overlying Tangihua Volcanics and Late Cretaceous Mangakahia Complex flysch.	In foreshore rocks at Te Reinga Bay, Northeast of Waitoki.	B	3	B19
Te Rewa Pt Pleistocene fossils, Hokianga Harbour	Far Nth	D	One of the two richest Pleistocene shallow marine fossil localities in Northland. Onlap contact on Tangihua Volcanics exposed.	Fossiliferous shallow marine and estuarine mudstone, sandstone and conglomerate exposed in low coastal cliffs and adjacent shore platform. Includes a pebbly breccia contact on Tangihua Volcanics breccia overlain by a woody carbonaceous estuarine mudstone at Te Mata Pt.	Coastal exposures around Te Rewa and Te Mata Points.	B	1	

Te Ruatahi dune sequence, Mimiwhangata	Whg	E	Occurrence of rich Holocene terrestrial fossil faunas in eroding dune sand.	Dune field containing late Holocene fossil land snail assemblages	South end of Te Ruatahi Beach, Mimiwhangata.	C	1	B18
Te Wairoa soda spring and travertine, Matapouri Bay	Whg	C	One of the two best examples of travertine deposited by an active soda spring in northern New Zealand.	6 m diameter, 4 m high travertine deposit extends from small spring down towards swamp. Mound is hard as concrete and orange stained on top.	3 km SW of junction of Matapouri and Clements Rd. 600 m up a true left tributary of Te Wairoa Stm from end of road where it crosses main stream. On true left bank of tributary adjacent tgo small area of toitoi swamp.	C	1	P1
Te Werahi sand dunes and fossil fauna, Cape Reinga	Far Nth	C	One of best remaining examples of coastal sand dunes draped over rocky ridges. Contain rich subfossil bird and bat bones, and landsnails.	Dune field containing Late Pleistocene and Holocene fossil vertebrate (birds, bats) and land snail assemblages.	Between Cape Maria van Dieman and Te Werahi Beach.	B	1	M4, B17
*Todds Quarry nephelinite, Tokatoka	Kaip	E	Best known of several middle Miocene nephelinite intrusions in Northland.	20 m thick dike-like intrusion with skarn contacts in limestone. Contains mantle-derived xenoliths.	In old overgrown quarry (Todds) near top of hill, east of the side road.	C	2	B11
Twilight Beach badlands, Far Nth	Far Nth	C	Best example of badlands erosion in northern North Island.	A 300 x 100 m area of bare ground with purple and red soils eroded into deep runnels.	500 m inland on ridge crest from southern end of Twilight Beach.	C	2	
Twilight Beach pillow lavas, Far Nth	Far Nth	E	One of the best preserved, accessible examples of Cretaceous pillow lavas in Northland.	Basal sequence of Cretaceous pillow lavas (Tangihua Volcanics) overlying and interfingering with terrigenous sandstone and multicoloured mudstones. Excellent 3D exposure of tubular pillows with wrinkled glassy selvages.	Rocks at south end of Twilight Beach.	C	3	B15
Two Tone Cave, Waipu	Whg	F	Second longest cave in Northland with numerous branches.	Horizontal stream cave about 3 km long. In places the cave floor is on greywacke-limestone contact. Cave has at least four entrances where small streams flow underground and join up underground before all exiting together. Numerous speleothems.	North side of Caves Road, Waipu.	C	3	N2, N3
Urquharts Bay concretions, Whangarei Heads	Whg	B	Most easily accessible large spherical concretions in the Whangarei area, Northland.	A number of spherical concretions up to 1.5 m diameter on the beach and eroding out of the Cretaceous parent rocks at the south end of Urquharts Bay.	On beach and in low eroding banks at south west end of Urquharts Bay, Whangarei Heads.	C	2	H13
Waihou Valley limestone bluffs and mid tertiary sequence	Far Nth	B	Three prominent limestone bluffs and several limestone caves – rare in Northland. The best, most complete and well exposed sequence up through mid Tertiary sedimentary rocks that are intermediate in character between those typically found in the Northland Allochthon and in the autochthon.	Occurs within a large allochthonous block.	In lower 1 km of Cave Stream, from its junction with Waikaraka Stream up through limestone bluffs. Prominent bluffs under forest north of Cave Stream and two narrow limestone bluffs south of Cave Stream. Includes cave entrances.	C	3	E7
Waikari Inlet "old hat", Bay of Islands	Far Nth	B	One of the best examples of an "old hat" island in New Zealand.	A small island surrounded by broad intertidal rock platforms, giving it the classic "old hat" shape. Eroded in greywacke rock.	Motutokape Island, 700 m due east of Opua wharf, near entrance to Waikari Inlet.	B	3	C2
Waikiekie karst	Kaip	B	Most accessible example of rare solution runnels developed in allochthonous Oligocene limestone of the Northland Allochthon..	A small area of karstic limestone protruding through grass and forming a small stream gorge. Karst is extremely rare in the Northland Allochthon as allochthonous limestone is usually too muddy to develop karst features.	From little gorge between Neville Road and Auckland-Dargaville railway line southwards between Tapuha Road and railway line for 300 m.	C	2	

Waikuku Beach (north) Miocene limestone, North Cape	Far Nth	E	One of only two small knobs (both at Waikuku) comprising the only marine middle or late Miocene sedimentary rock and fossils known north of East Cape or Kawhia.	Bioclastic warm water limestone. Contains interesting warm water molluscs and larger foraminifera.	North end of Waikuku Beach, North Cape. Small rock outcrop at back of beach, projecting through Quaternary sands.	B	2	L2
Waikuku Beach (south) Miocene limestone, North Cape	Far Nth	E	One of only two small knobs (both at Waikuku) comprising the only marine middle or late Miocene sedimentary rock and fossils known north of East Cape or Kawhia.	Bioclastic warm water limestone. Contains interesting warm water molluscs and larger foraminifera.	South end of Waikuku Beach, North Cape. Small rock outcrop at back of beach, projecting through Quaternary sands.	B	2	L2
Waimamaku River Miocene sedimentary sequence	Far North	E	Excellent exposure of moderately deep-water early Miocene sedimentary sequence.	Thick, well-bedded sequence of Waititi Formation with diverse fauna of small mollusca in some beds.	In slipping cliff face on north side of Waimamaku River, 100-300 m downstream of junction with Waititi Stream, approx 1 km east of Waimamaku township.	C	3	W1
Waiomio Caves (Kawiti Caves) and limestone pillars	Far Nth	B	Outstanding glow worm-caves and unusual karst limestone pinnacles. Well known tourist attraction.	Glow-worm caves with stalactites and stalagmites, ornate cave decorations and magnificent Cathedral cavern, in Oligocene limestone. A small stream flows through the cave from a blind valley to the north. Karstified limestone pillars are a striking feature of the landscape.	5 km south of Kawakawa, off Waiomio Rd. Limestone bluffs, pinnacles and cave.	C	2	D2, N1
Waipapa River outlier of Waitemata sediments, Puketū	Far Nth	E	Only known exposure of early Miocene marine sedimentary rocks between Opāpere and Parengārenga. Sequence records the first phase of allochthon movement into Northland.	20 m sequence sitting unconformably on Whangarei Limestone consisting of basal conglomerate, bioclastic sandstone, flysch, and finally mass flow deposits of allochthon clasts.	On south side on outside of abrupt bend in Waipapa River, around 500 m downstream from Puketū Forest picnic area.	B	2	E4
Waipoua dune lakes	Far Nth	B	Only significant examples of lakes dammed by moving Quaternary sand dunes between Maunganui Bluff and Hokianga Harbour.	Two small lakes, the northernmost (north of Waipoua River mouth) is surrounded by high dunes and presumably is pre Holocene. The second dune lake (south of Waipoua R mouth) is separated from the beach by a low Holocene sand dune and is therefore of Holocene age.	Lakes 0.6-0.8 km from the beach and 0.5 and 1.5 km north and south of Waipoua River mouth respectively. Northern lake is c. 200 x 80 m in size and the southern lake is c. 400 x 150 m in size.	C	2	
Waipu Caves and karst	Whg	B, F	Best and largest area of limestone karst geomorphology in Northland, south of Whangarei. Includes largest cave passage in Northland. Waipu Cave system is now longest in Northland. Fossil bone deposits in Paryphanta Passage. Karst includes some spectacular 5 m+ high pinnacles, numerous spectacular dissolved features.	Fluted boulders and sinkholes in Oligocene limestone at Waipu Caves reserve, Waipu Caves Walkway, along roadside and in one spectacular area next to a small quarry south of Waipu Caves Rd. About 3 km horizontal stream cave. Includes both Waipu Cave and Elver Canyon Cave and Main Cave which are now all connected. Main resurgence is at head of deep gorge on south side of Waipu Caves Rd.	Waipu Cave system is north of Waipu Caves Road, Waipu. Surface karst is in four separately mapped areas, mostly north of the road but one area to the south.	C	2	W6
Waipu Cove Oligocene-Miocene sequence and coastal karst	Whg	B, F	Only significant coastal karst and karstic sea cave in Northland. Exposes clear stratigraphic sedimentary relationship between Waitemata flysch, Te Kuiti Group limestone and basement.	Oligocene shallow water, flaggy, bioclastic, sandy limestone unconformably sits on Waipapa greywacke and passes abruptly and conformably up into deep water early Miocene Waitemata flysch. Outcrops and large fallen boulders developing solution runnels. One solution cave with speleothems around point from western end of Langs Beach (Q08 / 484 723).	Coastal section from 500 m SE of Waipu Cove to point at western end of Langs Beach.	C	2	

Wairakau estuary, Whangaroa Harbour	Far Nth	B	Best example of a deeply incised small gorge flooded by the sea in Northland.	Gorge was invaded by the sea during post-glacial sea level rise. Now the embayment is partly infilled by modern sediments forming a tidal estuary with steep rocky walls.	Mouth of Wairakau Stream, head of Pekapeka Bay, Whangaroa Harbour.	C	3	
Wairere Boulders basalt proto-karst, Hokianga	Far Nth	B	Best known example in New Zealand of a valley filled with gigantic basalt boulders that are relics from a former lava flow that extended over the valley. One of two best examples in New Zealand and probably the world of deep fluting and basins produced by solution of basalt (proto-karst).	Valley part filled with large boulders of fluted basalt derived from the Horeke Basalt flow on top of ridge that used to extend across valley. A private tourist attraction with track through them. Boulders in stream bed are tilted at many different angles relative to the fluting whereas most of the fluted boulders above the stream have vertical fluting and solutions basins and sometimes flats on top.	Hokianga, Wairere Valley, extending inland from head of Wairere estuary at end of McDonnell Rd.	A	2	B6, S2
Wairua Falls	Whg	B	One of the five largest waterfalls over basalt lava flows in Northland.	River falls over the edge of a lava flow from Whatitiri shield volcano and erodes into softer country rock alongside. A dam upstream diverts some of the water for hydro purposes.	At end of Wairua Falls Road, 2 km from turnoff from HWY 14.	C	2	E1,
Waitahora Lagoon, Spirits Bay	Far Nth	C	Only coast-parallel, barrier-enclosed lagoon in northern Northland and northernmost lagoon in New Zealand.	Brackish Waitahora Lagoon drains Paranoa Swamp and is almost permanently closed off by long-shore drift-induced sand barrier accumulation, 2 km long and 100 m wide, at the western end of Te Horo Beach, Spirits Bay.	2 km east of Pandora, western Spirits Bay, Far Nth.	C	2	
Waitangi columnar-jointed lava flow and gabbroic inclusions	Far Nth	E	Best locality for gabbroic inclusions of lava of Quaternary age in Northland.	A columnar jointed basalt flow extends into the sea forming a 20 m by 50 m portion of the shore platform with 8 m outcrop on N end of boulder covered beach. Inclusions may be found in 2-3 m band near top of the outcrop, and in boulders on the shore platform.	On North edge of the Waitangi Treaty House Grounds and south east corner of Waitangi golf course where it abuts the coast.	B	2	A1, S4
Waitapu Bay Cretaceous unconformity, Whangaroa Harbour	Far Nth	E	Best exposure of late Cretaceous conglomerate and micaceous sandstone unconformably overlying early Cretaceous Tupou Formation.	Occurs within a large nappe in Northland Allochthon. Best exposure of several around Whangaroa, where late Cretaceous conglomerate and micaceous sandstone unconformably overlies with sedimentary contact an irregular surface of early Cretaceous Tupou Formation.	On point, 200 m north of Ota Point, Waitapu Bay, south Whangaroa Harbour.	C	2	B19
Wekaweka natural gas seep, Hokianga	Far North	C	Best, perhaps only, true hydrocarbon seep in Northland.	A 5-m-diameter watery mud pool with moderate to vigorous discharge of methane.	Approx. 5 km up the Wekaweka Valley road and 800 m up farm track on north side. In patch of manuka 30 m south of farm track.	C	1	P1
Whakapirau Creek cusped foreland, Kaipara Harbour	Kaip	B	Best example of a shell spit-created cusped foreland in Northland.	Arrow-shaped piece of low-lying land extends 150 m northward out into Whakapirau Ck with bounding shell spits on both edges of the arrow.	Kaipara Harbour, south side of Whakapirau Arm, and 500 m east of entrance.	C	2	
Whakaterekie allochthon block, Whangaroa	Far Nth	D	Well exposed stream section through basal nappe of the allochthon containing overturned unshattered argillaceous limestone.	Thinly bedded Oligocene argillaceous limestone (not sheared) grading up into calcareous siltstone.	Whakaterekie U-bend gorge, North Omahuta, 500 m downstream from New Zealand Forest Service headquarters at Mangapa.	C	2	B21

Whangamumu Harbour and peninsulas, Cape Brett Peninsula	Far Nth	A	Unusual narrow, sinuous deep-water harbour with two elongate peninsulas jutting out into sea on either side. Shape reflects origins by drowning of deeply incised small valley.	3 km long, 500-800 m wide deep-water harbour, being the drowned deeply incised head of a small valley eroded into greywacke rocks that form the two finger-like peninsulas, one on each side.	Whangamumu Harbour and enclosing peninsulas along northern and southern coasts, eastern side of Cape Brett Peninsula, east of Bay of Islands.	C	3	
Whangape Harbour entrance gorge	Far Nth	A	Spectacular, deeply-incised river gorge flooded by post-glacial sea-level rise to form a narrow, elongate harbour entrance. Landform unique in New Zealand.	Narrow, sinuous harbour entrance (3km long by 100-300 m across at sea level), with steep slopes on both sides rising to 300 m ASL. Water averages 4-5 m deep.	Forms entrance to Whangape Harbour, west Northland.	B	3	
Whangape pillow basalt	Far Nth	E	One of the best preserved and easily accessible examples of pillow lava and fresh hyaloclastite in the Tangihua Volcanic Group of Northland.	Well-preserved late Cretaceous pillow lavas and hyaloclastite, exposed in three dimensions showing lobe-like form.	In shore platform and low cliffs on south side and west end of Whangape Harbour.	C	2	
*Whangape Pleistocene fossils	Far Nth	E	One of the two richest shallow-marine fossil faunas in Northland.	Fossiliferous shallow marine mudstone and sandstone exposed in low coastal cliffs and shore platform. Late Pleistocene MIS 7 age.	Coastal exposures at the end of Proctor Rd, Whangape Harbour.	B	1	
Whangarei Falls	Whg	B	One of the five best examples of a waterfall cascading over the edge of an eroding basalt lava flow in northern New Zealand.	A scenic 26 m high waterfall where the Hatea River plunges over the eroding edge of a columnar-jointed basalt flow originating from Vinegar Hill. 30 m total thickness, with the base of the basalt corresponding with the base of the falls. Shows change from platy jointing near top of flow to columnar jointing near base.	50 m downstream from Tutukaka Road bridge over the Hatea River, approximately 1 km E of Tikipunga, within the outer suburbs of Whangarei city.	C	3	A1, M1, S3
Whangaroa exfoliation domes	Far Nth	B	A spectacular area of rocky exfoliation domes, rock pinnacles, rocky ridges and overhanging rocks (Dukes Nose).	Eroded out of andesite laharc breccias that were deposited on the ring plain of the early Miocene Wairakau Volcano. Spectacular rock formations surround much of Pekapeka Bay, Whangaroa Harbour.	Ridge along south side of Pekapeka Bay, Whangaroa Harbour - includes The Dukes Nose.	C	2	
Whangaroa Harbour lacustrine sequence	Far Nth	E	Best exposure of lacustrine sediments in Wairakau Volcanics sequence. One of the best exposures of penecontemporaneous slump folding in lake sediments in New Zealand.	Three units up to 0.5 m thick, of penecontemporaneous slump folding and spectacular liquefaction within a 10 m thick sequence of fine grained early Miocene volcanigenic lake sediments.	Northwest side Whangaroa Harbour coastline, 2 km northeast of Totara North.	C	3	W2, H9
Whangatupere Bay plutons	Far Nth	D	Best exposed section through the two intrusive plutons of Karikari Plutonics. Only major intrusive plutons in Northland.	Exposures of predominantly quartz microdiorite with coarse lithologies present. Dike intrusions are common.	Coastal intertidal rock and cliff section around Whangatupere Bay, Karikari Peninsula.	C	3	I3, R2, R3
Wharepoke Falls, Kerikeri	Far Nth	B	An unusual example of a wide, low waterfall over a basalt flow.	5 m high falls over eroded Pliocene basalt lava flow with large plunge pool beneath. Tourist attraction.	On Kerikeri River about 1 km upstream from Stone Store and 2 km downstream from Rainbow Falls.	C	2	
Whatuwhiwi Cretaceous sedimentary rocks and pillow lavas, Cape Karikari	Far Nth	E	Most complete and least deformed late Cretaceous sedimentary rock sequence in Northland. Type locality of Tokerau Formation mid Cretaceous sedimentary rocks and pillow lava.	Little deformed (in situ?) conglomerate, flysch and mudstone resting unconformably on Cretaceous Houhora Volcanics. Includes type section of bedded Tokerau Formation argillite and greywacke with intercalated pillow lava flow intruded by early Miocene dike.	2 km section from point east of Patia Pt to Waiparaheke Stm, Whatuwhiwi, Cape Karikari. Also short intertidal rock section west end of Parakeraka Bay.	C	2	I2

Appendix 4

Suggested map boundary modifications for sites currently scheduled and mapped as Outstanding Natural Features for Northland Region (see supplied GIS layer)

Feature name	Suggested map modification and reasons
Ahipara basal Tangihua melange	Mapped area modified to include more of the intertidal rocks - all in public land.
Aurere Beach allochthon, pillow lavas and tombolo, Taipa	Three sites combined to make one larger site with extended map - all in reserve land or intertidal.
Baylys Beach dune sand and lignite	Area completely remapped based on helicopter photography to include the three best exposed sections of lignite and sand dune deposits from Baylys Beach south. Largest section is crown land.
Mangonui Miocene coconut beds, Coopers Beach	Map modified following recent sand movements that exposed fossil forest and siderite roses
Marble Bay Permian fusulines, corals, spilite and melange	Mapped area corrected by shifting seaward to cover intertidal rocks and less land.
Motukokako (Piercy) Island skarn and sea arch	Map extended to include arch - all within ONL
Ngararatunua scoria cone	Map too much area to East and too little to south - replacement map contains less farmland and more steep bush
Ngunguru Sandspit	Maintained same map area on land but extended to include intertidal sand as this is essential part of spit system.
North Cape ultramafic/gabbro complex and North Cape Island tombolo	Map boundaries changed to delete stream valleys with no outcrop and to include old serpentinite quarry area now in reserve. All still in ONL and most in reserve.
One Tree Point interglacial beach and dune deposits	Map tweaked to remove unnecessary private land and confine to esplanade reserve and intertidal
Onemama Point sedimentary rock sequence, Whangarei Harbour	Map modified to accurately reflect rock outcrop in foreshore and extended to include limestone and tuff sequence exposed on theaunu north side of Onemama Pt in two QE2 covenanted pieces of private land, as substitute for Paradise Quarry feature.
Pakaurangi-Puketi Miocene fossiliferous sequence, Kaipara Harbour	Mapped area tweaked to better match cliffs and rocks but outside private land.
Parengarenga - Te Pokere Miocene fossils	Mapped area adjusted very slightly to include all cliffed exposure and more intertidal area.
Parengarenga-Paratoetoe Miocene sequence	Map adjusted to include more intertidal platform and less private land.
Parua Bay basal allochthon melange, Whangarei Harbour	Map adjusted to include more foreshore exposure.
Pukepoto scoria cone	Map corrected to exclude non cone farmland and include cone reserve
Puketutu (Puketona) volcanic cones	Omitted scoria cone in perfect condition added.
Reserve Point Eocene sedimentary sequence, nephelite flows and garnet andesite, Whangarei Harbour	Combined with Reserve Pt Eocene sedimentary sequence site; all in intertidal and Esplanade reserve.
Tauanui scoria cone and dammed lake	Dammed lake behind cone added - not privately owned
Te Puke scoria cones, Waitangi	Map extended to more accurately include all of each scoria cone - all in crown land.
Titoki Natural Bridge	Map corrected to cover where bridge actually is and restricted to bush filled steep-sided gully on each side and extended upstream to include second dry bridge and underground passages.
Waiwhatawhata Coast conglomerate, basalt flows and lignites, Hokianga	Map shifted seaward to cover the outcrop rather than landward strip and northward to include Hokianga South Head rocks.
Whangaroa North Head ring plain deposits and rocky pinnacled ridge crest.	Map extended to include Taupo Bay rocks and rocky pinnacles and domes on ridge crest. All in ONL.

Appendix 5

Suggested improved wording and assessments for sites currently scheduled and mapped as Outstanding Natural Features for Northland Region.

Name	District	Northland		Significance statement	Brief description	Location	Volcanic			Refs
		Category	Object				Importance	Map No.	RPS	
Ahipara basal Tangihua melange	FNth	D	E	Best exposure in Northland of the basal melange of the Tangihua obducted ophiolites (ocean floor volcanic rocks).	Exposures of complexly faulted and sheared basaltic lavas and dolerites.	3 km of coastal rocks centred on Mokorau Beach, east of Tauroa Point, Ahipara.	B	2	168	L1
Aurere Beach allochthon, pillow lavas and tombolo, Taipa	FNth	D	E	One of the best exposed sequences showing relationships within the Northland Allochthon. Excellent exposure of displaced pillow lava. One of best small tombolos in Northland.	Here Tangihua Volcanics nappe is sheared over folded Cretaceous Awapoko Formation sandstone overlying a thick sheared melange dominantly of late Cretaceous conglomerate and mudstone (Ngatuturi Siltstone).	From 50 m inside Awapoko River mouth, around Aurere Beach to Puketutu Island and the west side of Otenga Bay..	B	2	206	I3
Baylys Beach dune sand and lignite	Kaip	E	E	Excellent exposures through Quaternary dune sand and lignite sequences preserving history of rises and falls in sea level and vegetation change.	Lignites and dunesand sequences exposed in eroding sea cliffs at the back of the beach.	Three sections of sand dune cliffs between south end of Baylys Beach and 4 km south.	B	2	93	P2
Coppermine Island copper mineralisation	Whg	E	E	Best example of a porphyry copper deposit in northern New Zealand.	Pyrrhotite-chalcopyrite hydrothermal mineralisation in pyroxene diorite and dacite breccia.	West end of Coppermine Island, Chickens Group.	B	2	9	T3
Coppermine Island diorite intrusion	Whg	D	E	Only diorite plutons in Whangarei Heads region.	A dark coloured, coarse grained, pyroxene diorite, with weak foliations parallel to the margins.	Coastal cliffs on the western end of Coppermine Island.	C	2	9	W4
Glenbervie (Maruata) volcanic cones	Whg	V	B	A well preserved young volcanic centre with two scoria cones.	Two cones approximately 650 m apart. The older cone lies to the west of the main cone, Maruata. Maruata had two eruption points with the youngest, largest crater being breached to the S. The centre is approximately 2-3 km in diameter and it rises 80 m above the surrounding area. Maruata cone has a distinct volcanic form and is bush covered. On the north side a small forestry settlement has been established.	This centre lies between Maruata Road and Puketotara Road, approximately 5 km NE of Kamo.	C	2	30	A1, M1
Hokianga sand dunes	FNth	C	C	One of just a few large remaining areas of active sand dunes in New Zealand. Provides spectacular vista from Omapere Hill across the harbour.	Quaternary sand dunes form the northern barrier across the entrance to Hokianga Harbour and rise to an elevation of 200 m.	A 5 x 3 km area on the north side of the entrance to Hokianga Harbour. Not stabilised by planted vegetation or exotic pine forestry.	B	1	119	I1
Hurupaki scoria cone	Whg	V	B	The highest scoria cone in the Kamo area, forming an iconic bush-covered peak when viewed from the east and south.	A steep sided, partly bush covered cone, 1-2 km in diameter, breached to the SE, that stands 350 m ASL and is extensively quarried on the W side.	Between Three Mile Bush Road and Dip Road, approximately 1.5 km W of Kamo township.	C	1	31	M1, S3, W3

Kai Iwi dune-dammed lakes	Kaip	A	A	The two deepest dune lakes in New Zealand, Lake Taharoa at 37 m and Lake Waikeri at 30 m. Group of lakes formed by the movement and buildup of sand dunes during the Quaternary.	None have any surface inlet or outlet.	Taharoa Lake, Waikere Lake, Shag Lake, 10 km SW of Kaihu, 30-35 km north of Dargaville of State Highway 12.	B	2	99 100	I1
Lake Ohia Pleistocene fossil forest	FNth	E	D	Well preserved and now partly exhumed buried late Quaternary kauri forest. 30,000 years old.	Numerous tree stumps stick up out of the lake bed.	On south east fringe of Lake Ohia, often partly submerged. Visitor area is one kilometre along road to Whatuwhiwi from Highway 10 turnoff, on west side of road.	C	1	205	
Manaia stratovolcano breccia pinnacles	Whg	B	D	Spectacular and most prominent exposures of volcanic breccia in the Whangarei Heads area and the best of three areas of ridge crest pinnacles.	Weakly stratified andesite breccia forming bluffs and spectacular pinnacles along Manaia ridge - remnants of the cone of a 18 million year old stratovolcano.	Forming Mt Manaia and ridge to the north, Whangarei Heads.	B	3	14	H14
Mangonui Miocene coconut beds, Coopers Beach	FNth	E	E	Best known and best preserved fossil coconuts in New Zealand. Of historical and paleoclimatic importance.	Outcrops of fossil forest, siderite flower concretions and coconut-bearing lignites periodically exposed beneath beach sands and in low cliffs behind Coopers Beach.	From 200 m west of stream mouth to 200 m west of east end of beach.	B	2	206	B7, B19, E2
Marble Bay Permian fusulines, corals, spillite and melange	FNth	E	E	Best exposure of very few known localities of Permian age in the North Island. Best of only three known New Zealand localities containing the biostratigraphically important, tropical, larger foraminiferal group called fusulines. Extremely important for reconstructing the paleogeographic history of NZ at this time. Shows the association of seafloor pillow lava with Permian Tethyan facies and melange.	Spilitic basalt, Tethyan fossils and marble in complicated melange association. Also contains Permian corals. Melange exposed in the coastal rocks from Te Anina Point, west end of Marble Bay.	In shore platform and maritime zone of Wherowhero Point, at east end of Marble Bay, East of Whangaroa Harbour entrance.	A	2	200	H23, S6
Matai Bay beaches	FNth	A	C	Unusual double bay formation. One of the most scenic gems in Northland, the beach and bay setting is unspoiled by development, in a near pristine condition.	A 2 km by 1 km bay with narrow entrance to the open sea. The Bay is divided into two semicircular beaches by a central headland.	On the NE coast of Karikari Peninsula, 6 km NE of Whatuwhiwi.	C	2	221 226	
Maungakaram ea scoria cone	Whg	V	B	A well preserved, unquarried scoria cone. The southernmost young (Quaternary) volcano in Northland.	A steep sided, forested scoria cone standing approximately 150 m above the surrounding plateau. Mostly covered with native bush, however some pines have been planted. Has a large flow to the SE (4-5 km).	Lies between O'Carrol Road and Crawford Road, approximately 1 km W of Maungakaram ea township.	C	1	17	A1, H22
Maungakawakawa scoria cone	FNth	V	B	A very good example of small breached scoria cone in the Kaikohe Volcanic Field. Prominent on the skyline when viewed from the east.	A complex elongate scoria cone 60 m high, 340 m ASL; breached to the NE, and twice on the southern flank; covering an area of 2.2 square km. The cone is centrally located with flows running radially from the vent.	2 km E of Lake Omapere; 2 km S of Te Ahuahu on Hariru Rd.	C	2	145	A1, M8
Maungarahoa dike	Kaip	B	D	Best example in New Zealand of a high protruding rocky rib formed of an erosion-resistant dike of andesite lava rock.	Forms a prominent ridge (200 m high) of the resistant dike surrounded by eroded softer sedimentary rocks. Andesite rock contains crystals of the unusual mineral harmotome.	Maungarahoa peak and ridge, 500m south-east of the end of Silis Road, Mititai and 10km South of Dargaville.	B	2	91	B9, T2

Maungatapere volcanic cone	Whg	V	B	An almost perfect, steep-sided volcanic cone, not farmed or quarried. Largest and best preserved in the Whangarei Volcanic Field.	A steep-sided scoria cone, standing 185 m above the surrounding plateau and approximately 1-1.5 km diameter, with scrub and native bush cover. Small shallow crater on top.	East of the intersection of Snooks Road and State Highway 14, approximately 3 km SSW of Maungatapere township.	B	2	22	A1, F1
Maungaturoto volcanic cone	FNth	V	B	Well preserved scoria cone with unbreached crater. Prominent volcanic peak near main highway.	A small scoria cone 100 m high, 285 m ASL, 500 m in diameter, with a circular, unbreached central crater 10 m deep. Flows cover 6.5 square km of surrounding land. This cone is a well preserved volcanic land form, at present being farmed. Slightly altered by Maori terracing.	2 km South of Ohaeawai, on north side of Waitaheke Rd.	C	2	145	A1, M8
Maunu volcanic cone	Whg	V	B	A well preserved and prominent, steep-sided scoria cone.	A 1-2 km diameter scoria cone, which stands 395 m ASL and is breached to the west. The cone is steep-sided, particularly in the south. There is a small quarry on the toe of the breached material which has been worked for private and for farm use. The west side is farmed but E and S slopes are covered with bush and pines. The cone rises 150 m above the surrounding plateau, while flows extend approximately 6 km East from the centre, almost to Whangarei City.	Northeast of the intersection of Kara Road and State Highway 14, approximately 2.5 km NE of Maungatapere township. Access to the summit is via Millington Rd.	C	2	27	A1, F1
Motukokako (Piercy) Island skarn and sea arch	FNth	B	E	One of New Zealand's most spectacular and most visited sea arches. Well exposed example of Pb-Zn skarn. New Zealand's best ilvaite exposure occurs with the best of three babingtonite occurrences.	Sea arch with deep water passage that tourist boats pass through. Large crystals (3-5 mm) of babingtonite in a Pb-Zn skarn in Tertiary limestone with associated ilvaite, garnet, hedenburgite, epidote and axinite.	Skarn in northern half and arch southern half of Motukokako (Piercy) Island, a steep rocky island just off of Cape Brett in the Bay of Islands.	A	2	180	B13
Ngararatunua scoria cone	Whg	V	B	Prominent scoria cone breached to south and rising 125 m above surrounding land.	The centre is a horseshoe-shaped scoria cone, breached to the S with small flows to the S and NE. It is a composite scoria cone with an early cone to the N and a second higher cone to the S, which buried most of the first one before being breached. It is farmed on the W side and the E side is bush covered. The height of the cone is 325 m ASL. The cone is approximately 1.2km in diameter. It is the western most cone of a line of three centres.	This centre lies between Three Mile Bush Road, Church Road and Rotomate Road, approximately 3.5 km W of Kamo.	C	1	31	A1, F1
Ngunguru Sandspit	Whg	C	C	An excellent example of an unmodified sand barrier beach and dune field separating a tidal estuary from a broad open bay. Significant example of a rapidly disappearing coastal feature.	Barrier sandspit approximately 2.5km long and 300-600m wide at the mouth of Ngunguru River. The spit encloses the estuary of the Ngunguru River, which empties into Ngunguru Bay through a stable outlet channel. The sandspit is vegetated with typical coastal dune plants. The sand spit is a significant recreational and aesthetic feature for both coastal holidaymakers and residents.	Ngunguru sand spit, Ngunguru, 28km North east of Whangarei.	C	2	29, 34, 35	

North Cape ultramafic/gabbro complex and North Cape Island tombolo	FNth	D	E	Only ultramafic/gabbro ophiolite complex in northern New Zealand. Excellent example of cobble tombolo linking North Cape Island to mainland.	Intertidal and coastal cliff exposures of sequence of pillow lavas, sheeted dikes and ultramafic serpentinite. Spillite cobbles and boulders derived from local cliffs form a 100 m long tombolo rising to storm high tide level.	In cliffs and intertidal rocks right around North Cape block and island, and in abandoned serpentinite quarried area on top of Kerr Cliffs.	B	3	249	B15
One Tree Point interglacial beach and dune deposits	Whg	E	E	Well exposed Late Pleistocene regressive coastal sand sequence with spectacular intertidal trace fossils. Only remaining exposures in the area that are not obscured by coastal foreshore protection works. Contains some of the best New Zealand examples of unusual shallow marine trace fossils.	Coastal cliff and foreshore exposures show a shallowing upwards regressive sequence from shallow marine sand through beach sand to coastal foredune, with overlying swamp deposits in interdune hollows. Excellent trace fossil assemblages characterise each paleo-environment.	Southern shore of Whangarei Harbour from One Tree Point southwestwards for 1 km.	B	1	15	G2
Onemama Point sedimentary rock sequence, Whangarei Harbour	Whg	E	E	Excellent exposures documenting earliest allochthon emplacement in this region. Includes exposure of unusual zeolite-rich volcanic ash bed.	Allochthonous olistostromes within earliest Micoene bioclastic sandstone facies overlain by flaggy limestone with rhyolitic tuff above. Type section of Onemama Formation.	From tip of Onemama Point to 1.5 km to NW, including the section on the north side of Onemama Pt hill.	B	2	21	W3
Pakaurangi-Puketi Miocene fossiliferous sequence, Kaipara Harbour	Kaip	E	E	Richest fossil locality (most diverse molluscan shell species) in New Zealand and most complete sedimentary sequence through Hukatere Subgroup. Type locality of many fossil species.	Complete exposure of shelf sequence of volcanoclastic fossiliferous sandstone and siltstone of the Pakaurangi Formation and marginal marine to non-marine Puketi Formation.	Pakaurangi Point to Puketi, southeast corner of Hukatere Peninsula. Fossil locality runs along west side of Pakaurangi Point.	B	2	71 72	J1
Parengarenga - Te Pokere Miocene fossils	FNth	E	E	Diverse, warm-water, early Miocene molluscan fossil fauna.	Fossiliferous siltstone and fine sandstone sequence in eroding cliffs and shore platform.	1.2 km stretch of shoreline of north Parengarenga Harbour, below Te Pokere pa and between Waitapu Stm and Maungaroa Pt.	B	2	244 245	B15
Parengarenga silica sand spit	FNth	C	C	The largest unvegetated barrier sand spit in New Zealand. The most extensive and highest grade silica sand deposit in New Zealand.	Sand very high in silica (in excess of 95%).	Parengarenga Peninsula/Kokota Spit, northwest coast of Great Exhibition Bay.	B	2	238 241	H4
Parengarenga - Paratoetoe Miocene sequence	FNth	D	E	Best exposed sedimentary rock sequence through most of the upper Parengarenga Group: Type Paratoetoe Formation. Diverse, warm water early Miocene molluscan fauna.	Dipping fossiliferous siltstones and fine sandstones of shelf origin.	5 km of north Parengarenga Harbour coastline from Porutu Stream to Paramatetaha Point.	B	2	244 245	B15
Parua Bay basal allochthon melange, Whangarei Harbour	Whg	E	E	One of the classic rock localities in Northland showing the base of the allochthon as sheared melange overlying early Miocene deepwater sedimentary rocks and greywacke.	Melange overlying decollement cut into c.5m of Miocene Waitemata Group bioclastic limestone and flysch, unconformable upon greywacke basement.	At eastern end of Parua Bay extending 500 m along foreshore North of Nook Road	B	2	19	S9, S8

Pouerua (Pakaraka Mountain) scoria cone, lava flow field and lava-dammed lakes	FNth	V	B	A prominent, well-preserved scoria cone clearly visible from SH1. Deeply breached crater. Cone surrounded by the best preserved lava flow field in Northland and rare rafted scoria mounds and tumuli. Includes two lava-flow dammed lakes.	A scoria cone, 750 m in diameter, which stands 135 m high, 275 m ASL and has a 100 m deep summit crater breached to the SW. Rafting of part of the cone has resulted in debris mounds below the SW side of the cone. Stoney rises, 1-10 m high, are distributed over much of the field and W of the cone sub-circular mounds 0.5 to 1.5 m high and 2 m in diameter, called tumuli, are abundant. Rafted scoria mounds to the E of the centre reach 18 m high. The longest flow, 4 km long flowed to the NE. The lava field covers an area of 13.5 square km. The largest pa and stone fields prehistoric site remaining in New Zealand. Includes Lake Owhareiti and Jacks Lake.	2 km SW of Pakaraka, extending from Hwy 1 across Ludbrook Rd to Lake Owhareiti.	B	2	135 136 145 146	H18, S12
Pouto sand dunes	Kaip	C	C	An excellent, unmodified example of the North Kaipara Head active dunelands system.	Extensive area of mobile, consolidated and old sand dunes at dynamic north head of Kaipara Harbour with associated wetlands and numerous small shallow dune lakes.	Sand dunes at southern end of North Kaipara Head.	B	1	59 60 61	E1
Pukepoto scoria cone	Whg	V	B	A prominent, small, breached scoria cone beside the road to Tutukaka.	A steep-sided, mostly bush-covered scoria cone, stands 60 m above the surrounding lava flow field. The crater has been breached to the South. Two periods of cone building resulted in three separate flows.	Adjacent to and N of Ngunguru Road, 7.5 km ENE of Kamo township.	C	1	30	F1, A1
Puketotara Peninsula Miocene sediments and erionite	Kaip	D	E	Most complete sequence through early Miocene sequence in Kaipara district; including excellent examples of the zeolites erionite and phillipsite in the lower eastern parts.	Almost complete exposure from Timber Bay distal flysch through Matapoura Conglomerate, large slump horizon, and into Pakaurangi and Puketi Formations.	Section for 2 km on either side of Timber Bay, Puketotara Peninsula, Kaipara.	B	3	66 67 72	S1
Puketutu (Puketona) volcanic cones	FNth	V	B	A group of six small scoria cones highly visible from main road to Waitangi.	A group of six cones and mounds overlying a more massive lava flow. The northern two and southernmost are untouched. One has been mostly quarried away and the other two slightly damaged by quarrying.	10 km W of Paihia and 2.5 km east of intersection of SH10 with Puketona Rd. On both sides of road.	C	1	154	A1, M8
Putahi rhyolite dome with associated halloysite	FNth	V	B	Prominent, easily accessible small rhyolite dome amidst basalt volcanic field. One of only two crystalline peralkaline rhyolite domes of Quaternary age in Northland. Good example of halloysite clay deposit.	Craterless dome (381 m ASL) rising 90 m above underlying basalt plateau. Several small (<6 m diameter) vents are noted (Letelier 1979). Covers an area of 4 square km. Halloysite clays derived from rhyolite by hydrothermal alteration are found around the Putahi Dome.	Putahi Trig, 1.6 km SE of Lake Omapere near junction of Lake and Te Pua roads.	B	2	144	A1,L 3,M 8
Rawhitiroa scoria cone	Whg	V	B	Only scoria cone in Northland with a lake/pond in its crater. Prominent middle cone of line of three west of Kamo.	A low 1 km-diameter scoria cone rising 90-120 m above the surrounding land. Cone is not breached and has a shallow crater lake/pond on top. One house on top.	Approximately 3 km W of Kamo township, between the end of Rotomate Rd and Pipiwai Rd.	C	1	31	F1, A1

Reserve Point Eocene sedimentary sequence, nephelinite flows and garnet andesite, Whangarei Harbour	Whg	E	E	Unusual in-situ shallow marine sedimentary sequence deposited in the Late Eocene, containing rare starfish and other fossils. Only known nephelinite flow in northern New Zealand, adjacent to garnet andesite intrusion rich in mantle xenoliths.	Greywacket stacks overlain by varied late Eocene sedimentary rocks (conglomerate, algal limestone), which pass up into fine grained glauconitic sandstones with textbook hummocky cross stratification. Sparse fossil starfish, echinoids, fish, shark and colonial coral present. Up to 4m thick columnar jointed, partly pillowed, nephelinite flow lens within the sequence. This sequence is intruded by garnet hornblende andesite rich in unusual mantle xenoliths.	Whangarei Harbour, 2 km section of coastal rocks and low cliffs on south and east side of Reserve Point.	B	2	19	B1
Strawberry Bay pillow lava	Kaip	E	E	Best example of Miocene pillow lavas in Northland. Some with multiple selvages.	Sequence of well developed pillow lava flows repeated over a syncline and anticline, overlying fossiliferous flysch. Intruded by a younger dike.	Exposed around the coast of Strawberry Bay and Pupuia Island on Hukatere Peninsula in low cliffs and intertidal rocks.	B	2	71	G1
Tarahi scoria cone	FNth	V	B	The highest and most prominent of the scoria cones in the Kaikohe Volcanic Field.	This steep-sided scoria cone (750 m diameter) is breached to the NNW, stands approximately 140 m above the surrounding flows, 390 m ASL, and is highest in the Kaikohe Volcanic Field.	3 km NW of Ohaewai and 3-5 km E of Lake Omapere. Near junction of Hariri and Remuera Settlement roads.	C	2	145	A1, M8
Tauanui scoria cones and dammed lake	FNth	V	B	One of the best preserved volcanic cones in Kaikohe Volcanic Field with a distinct crater and lava flows. One of three lakes in the Kaikohe area that have been formed by the damming of a valley by the volcano and its lava flows.	A circular scoria cone, 150 m high, 351 m ASL, located at the SE end of the lava field with a small lake at the S edge. The conical summit crater is approximately 12 m deep. A subsidiary cone is located 1 km to the NW and forms a 0.7 km long, 75 m high scoria ridge with associated explosion craters and lava channels. A large flow extends from the main cone W for 19 km to Taheke.	9-10 km southeast of Kaikohe, 1-2 km east of Mangakahia Rd.	B	2	124 129	A1, M8
Taurikura Bay natural jetty, Whangarei Harbour	Whg	B	E	Best natural jetty formed by a dike in New Zealand.	Two metre wide andesite dike intruding Northland Allochthon and forming a 50m long jetty into bay. Fifty cm wide zone of baked muddy limestone on either side.	Foreshore of Taurikura Bay, adjacent to Ody Road junction.	B	1	14	
Te Ahuahu volcanic cone	FNth	V	B	One of the five highest and most prominent steep-sided scoria cones in the Kaikohe Volcanic Field.	A single circular cone, 500 m in diameter, with an E-W trending flow covering a total area of 1.5 square km. The cone stands 100 m above the surrounding plateau, 373 m ASL, but the small crater is shallow, 10 m deep, and is 'breached' to the west by erosion. A small overflow stream channel runs down the slopes on N side. A very well preserved volcanic landform. There is a small farm quarry near the summit containing volcanic bombs amongst the scoria (Fig 6, Kear and Waterhouse 1961).	1.5 km E of Lake Omapere, on the northwest side of Hariru Rd.	C	2	145	A1, M8
Te Kopua Point Miocene volcanoclastic sedimentary structures, Kaipara Harbour	Kaip	E	E	Well exposed Puriri Formation within the top of the Northland Allochthon. Volcanoclastic sequence with good sedimentary structures, in deep marine environment.	Synclinally folded sequence of tuffaceous foraminiferal micrite and intercalated volcanoclastic mass flow deposits (volcanoclastic sandstone, liquefaction structures, ripples, etc), unconformably overlying Northland Allochthon.	Te Kopua Point and coast south, Kaipara.	B	3	72	B2

Te Paki sand dunes	FNth	C	C	Best preserved area of active sand dunes on Aupouri Peninsula. A major tourist attraction.	Approximately 20 sq km of dynamic sand dunes at the northern end of Ninety Mile Beach.	From Ninety Mile Beach extending 3 km inland on either side of Te Paki Stream.	B	1	236 239 240	B15
Te Puke scoria cones, Waitangi	FNth	V	B	Four of the youngest and best preserved scoria cones with craters in the Kaikohe-Bay of Islands volcanic field.	A line of four close-spaced small scoria cones (Fig.5 Kear and Waterhouse 1961). The main cone is 136 m ASL and stands 90 m above the surrounding plateau. Two flows were emitted from this centre, a 5 km long flow extended N down an existing valley, expanding laterally towards the Kerikeri inlet, and a 4 km long valley filling flow extending E forming the Brampton Reef.	5 km NW of Waitangi Treaty House on Te Araroa Walkway.	C	2	164 and 165	A1, M8
Titoki Natural Bridge	Whg	B	D	Best natural bridge formed in lava in New Zealand.	Stream flows through tunnel in basalt lava flow with natural bridge above. Tunnel is about 15m wide, 30m long and 10m high. 200 m upstream the stream disappears into jointed cavernous basalt and reappears 30 m downstream at foot of dry waterfall. Valley in regenerating bush.	On Waitomotomo Stream, 500m west of Pipiwai - Titoki Road / McCordle Road, 2km North of Tittoki.	B	2	28	H21
Tokatoka andesite plug	Kaip	B	D	Probably the most prominent and most conical volcanic plug peak in New Zealand. Largest and best exposed of numerous Miocene plugs in the Tokatoka area.	One of the largest and most prominent (180 m high) andesite plugs forming part of the subvolcanic plumbing that fed lava to the 20 million years ago Tokatoka Stratovolcano (now eroded off). The peak stands out because it is more resistant to erosion than the softer surrounding sedimentary rocks.	Volcanic plug forms Tokatoka peak and ridge extending west to Tokatoka Hotel and along east bank of Wairoa River.	B	2	89	B9, H14
Waikuku tombolo, sand dunes and dune-dammed swamp	FNth	C	C	One of best remaining areas of natural sand dune fields and dune-dammed swamps in New Zealand. Rich Holocene terrestrial fossil fauna (birds, marine mammals, land snails).	Unusual tombolo with a set of active sand dunes built up on the west and east sides trapping swampland in between. Largely unmodified by human actions. Includes extensive dune areas with subfossil flax snail and bone deposits.	All dune and swamp area between Tom Bowling Bay and Waikuku Beach, North Cape.	B	2	249	B15
Waimimiti scoria mounds	FNth	A	B	Part of an unusual segmented scoria ring (1.5 km diameter) and associated scoria mounds. One of two localities in Northland where abundant large, 1-10 cm, gabbroic inclusions can be found.	A segmented scoria ring, surrounding a cluster of approximately fifteen small scoria mounds, breached to the SE and NW, overlying Tarahi lavas in places. Inclusions may be found at a locality to the E of the centre.	Located 4 km ESE of Lake Omapere. Covers an area of c. 1.3 km x 1.3 km on the south side of Remuera Settlement Rd.	C	2	145	A1, M8
Waiwhatawhata Coast conglomerate, basalt flows and lignite, Hokianga	Far Nth	D	E	Excellent exposures of marine deltaic conglomerate and terrestrial volcanoclastic sequence. Best Miocene sequence in Hokianga district; includes most diverse fossil macroflora in North Island. Well exposed section through three Waipoua Basalt flows that form spectacular columnar-jointed reefs.	Distal flows of Waipoua Basalt interbedded with deltaic marine and non-marine Omapere Conglomerate, overlain by freshwater deposits of Pukorukoru Formation. Marine to non-marine regressive sequence. Lava flows dip southwest, forming a series of three southwest-dipping reefs. Spectacular sedimentary features in shallow marine and fluvial conglomerate and sandstone. Fossil palm, ferns and leaves in a number of places in Pukorukoru Formation.	South of Hokianga Harbour mouth, along 5 km of coastline, between Waiwhatawhata Stm mouth and 1 km north of Waimamaku River mouth. Includes section of coastal rocks and cliffs around Hokianga South Head.	B	2	114 115	H6, H14

Waro karst, Hikurangi	Whg	B	D	One of best examples in Northland of karst pinnacles. Easily seen and accessible from main highway.	In Oligocene Whangarei Limestone. Large lake at back was pit where Whangarei Marble building stone was extracted.	1 km north of Hikurangi town in Waro Reserve.	C	2	42	E1, K5
Whakatereki a Stream Eocene rock sequence, Whangaroa	FNth	D	E	Type section of Mangapa Mudstone, and possibly the thickest in situ Eocene in Northland.	Nearly complete exposure of ca 300 m of in situ greensand and calcareous siltstone resting on greywacke and beneath the Northland Allochthon.	From just above road bridge, east of Mangapa upstream to concrete ford atop high falls on forestry road.	B	3	173	B21
Whangaroa North Head ring plain deposits and rocky pinnacled ridge crest.	FNth	B	E	Best exposures of Miocene ring plain deposits in northern New Zealand, including several paleogullies and their walls. Most easily accessible exposures (Taupo Bay). Includes outstanding rocky ridge crest with mushroom rock on top.	Laharic breccias, reworked breccias, minor fluvial sediments and a flow confined in paleogullies eroded in breccias. Pyroclastic dikes intrude laharic breccias at south end of Taupo Bay. Ridge crest above has numerous rocky knolls, pinnacles and a mushroom rock all in laharic breccia.	In cliffs from inside Whangaroa Harbour entrance west to south end of Taupo Bay and on ridge crest extending south east to the head of Pekapeka Bay.	B	3	200 209	H9, H10
Whatitiri shield volcano	Whg	A	A	Best example in New Zealand of a small shield volcano. Only example in Northland of an almost concentric shield volcano with gentle slopes.	A small concentric shield volcano with very gentle slopes and a diameter of 5-6 km. Reaches a maximum height of 351 m (ASL) and stands 150 m above the surrounding landscape. Completely covered by farming and forested areas. Many houses and farm roads, but no quarries.	3.5 km WNW of Maungatapere Mountain, approximately 5 km WSW of Maungatapere township.	B	2	22 23 27 28	A1,F 1

Appendix 6

References that contain further information, descriptions or photographs of the ONFs.

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