

Appendix 1 Key characteristics of the soils of the Motueka Catchment (from Chittenden et al. 1966; New Zealand Soil Bureau 1968)

SOIL MAP UNIT NAME#	SOIL CLASS*	AREA (km <sup>2</sup> )	PARENT MATERIAL	ANNUAL RAINFALL (mm)	FERTILITY	DRAINAGE CLASS
<b>SOILS OF THE FLOODPLAINS AND LOW TERRACES</b>						
Riwaka zl and sl (98a)	RFW (Recent)	40	Alluvium (from greywacke, granite, limestone, quartzite, and basic igneous rocks)	1000–1300	Moderate to high	Well drained
Riwaka zl (wet phase) (98a)	GOO (Gley Recent)	2	Alluvium (from greywacke, granite, limestone, quartzite, and basic igneous rocks)	1000–1300	Moderate to high	Poor
Sherry s&sl (98c)	RST (Recent)	31	Alluvium (from granite)	1000–2500	Low	Well drained
Wangapeka st sl (99c)	RFW (Recent)	11	Alluvium (from greywacke, argillite, quartzite, limestone, granite)	1500–2000	Low to moderate	Well drained
Tapawera sl (33g)	RFW (Recent)	13	Alluvium (from greywacke, argillite, sandstone, ultrabasic rocks, Moutere gravels)	890–1150	Low to moderate	Well drained
Motupiko l (33g)	RFMW(Recent-YBE)	64	Alluvium (from Moutere gravels, greywacke, argillite, sandstone)	890–1150	Low	Well drained
Braeburn sl (89d)	RFMA (Gley)	2	Alluvium (from Moutere gravels)	890–1150	Very low	Imperfect
Braeburn cy l (89d)	GRA (Gley)	1	Alluvium (from Moutere gravels)	890–1150	Very low	Poor
Dovedale gr l (33g)	RFMW (Recent-YBE)	30	Alluvium (from Moutere gravels)	890–1150	Low	Well drained
Motukarara zl (92)	GRQ (Saline Gley Recent)	1	Alluvium and marine sediments	635–1000	Low (and saline)	Poor
<b>SOILS OF THE INTERMEDIATE AND HIGH TERRACES</b>						
Matariki zl (33g)	BOA (YBE)	4	Alluvium (from greywacke, argillite, quartzite, granite)	890–1150	Very low	Well drained
Matariki zl, rolling phase (33g)	BOA (YBE)	6	Alluvium (from greywacke, argillite, quartzite, granite)	890–1150	Very low	Well drained
Haut sl (27c)	BOT (YGE-YBE)	0.7	Alluvium (from greywacke, argillite, quartzite, limestone, granite, basic igneous rocks)	1000	Low	Well drained
Graham zl (33g)	BOT (YBE)	2	Alluvium (from granite)	890–1150	Low	Well drained
Kikiwa zl (34b)	BOA (YBE)	20	Alluvium from Moutere gravels	1000–1500	Low	Imperfect
Kikiwa zl, rolling phase (34b)	BOA (YBE)	23	Alluvium from Moutere gravels	1000–1500	Low	Imperfect
Atapo st zl (33g)	BOT (YBE)	6	Alluvium (from greywacke)	890–1150	Low to moderate	Well drained

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<b>SOILS OF THE FANS</b>						
Tophousezl (52a)	BLA (HCYBE)	13	Alluvium (from greywacke)	1500	Low	Well drained
Katrine sl, zl, st sl (53b)	BLA (HCYBE)	2	Greywacke till	1300–2500	Low	Well drained
<b>SOILS OF THE COASTAL SANDS</b>						
Tahunanui s sgr (68c)	RST (YBS)	2	Sand and gravel from greywacke and granite	900	Low	Well drained
<b>SOILS OF THE ROLLING AND HILLY LANDS</b>						
<i>with a subhumid climate</i>						
Mapuas (32)	UEM (YGE-YBE)	0.5	Moutere gravels	890–1000	Very low	Imperfect
<i>with a humid climate</i>						
Rosedale zl (37H)	BFA (YBE)	0.9	Moutere gravels	1150	Very low	Moderately well drained
Rosedale hill (37H)	BFA (YBE)	60	Moutere gravels	1150	Very low	Well drained
Stanley zl (35cH)	BFA (YBE)	10	Moutere gravels	1150–1270	Moderate to low	Moderately well drained
Stanley hill (35cH)	BFA (YBE)	65	Moutere gravels	1150–1270	Moderate to low	Well drained
Spooner hill (37aH)	BFA (YBE)	143	Moutere gravels	1150–1270	Low	Well drained
Korere hill (45H)	BOA (YBE)	194	Moutere gravels	1270–1400	Very low	Well drained
Hope hill (45bH)	ZXP (YBE)	165	Moutere gravels	1500–1780	Very low	Well drained
Howard zl, cy l and Howard hill (45a, 45aH)	BOA (YBE)	5	Alluvium and till (from greywacke and basic igneous rocks)	2000	Low to moderate	Moderately well drained to well drained
Orinoco zl (37bH)	BMT (YBE)	4	Granodiorite and diorite (of Separation Point suite)	1000–1140	Moderate	Well drained

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Orinoco hill (37bH)	BMT (YBE)	8	Granodiorite and diorite (of Separation Point suite)	1000–1140	Moderate	Well drained
Tadmor zl (44cH)	BOA (YBE)	5	Siltstone and sandstone (Miocene-Eocene)	2000–2500	Moderate to low	Moderately well drained
Tadmor hill (44cH)	BOA (YBE)	71	Siltstone and sandstone (Miocene-Eocene)	2000–2500	Moderate to low	Well drained
Kaiteriteri sl (37cH)	UYT (YBE)	7	Weathered granite (Separation Point suite)	1300–2000	Very low	Well drained
Kaiteriteri hill (37cH)	UYT (YBE)	41	Weathered granite (Separation Point suite)	1300–2000	Very low	Well drained
Brooklyn hill (77dH)	BMT (BGC)	14	Basic igneous rocks (gabbro, diorite – Riwaka metavolcanics)	1000–1500	High	Well drained
Pelorus hill (65c)	BOA (HCPYBE)	7	Old greywacke, argillite, sandstone (Permian – Maitai Group)	2000–2500	Low	Well drained
Kaituru complex (44d)	ERT (YBE)	7	Marble	1270–1520	Low to moderate	Well drained
<b>SOILS OF THE STEEPLANDS</b>						
Ngatimoti steeppland (37bH)	EMT (YBE)	34	Granodiorite and diorite (of Separation Point suite)	1000–1150	High	Well drained
Kawatiri steeppland (47e)	BOA (YBE)	6	Diorite, granodiorite	2000–2500	Low	Well drained
Brooklyn steeppland (77d)	BMT (BGC)	88	Gabbro, diorite (gabbro, diorite – Riwaka metavolcanics)	1000–1500	High	Well drained
Heslington steeppland (74b)	BOT (Rend-YBE)	3	Calcareous sandstone and shale (Mt Arthur Group)	890–1000	Moderate	Well drained
Wakaramara steeppland (65d)	BLAD (HCPYBE)	205	Old greywacke (montane; Greenland Group)	1500–5000	Low	Well drained
Lewis steeppland (65)	ZOT (HCPYBE)	4	Greywacke (montane; Torlesse Group)	1800–3800	Very low	Well drained
Spenser steeppland (58)	ZOT (HCPYBE)	28	Greywacke (subalpine; Maitai Group, Mt Arthur Group)	2000–4000	Very low	Well drained
Whitcombe steeppland (67)	BAM (HCPYBE)	30	Greywacke and schist (Mt Arthur Group)	2500–7500	Very low	Imperfect
Patriarch steeppland (57g)	BLA (HCYBE)	22	Old greywacke, argillite, sandstone (Permian – Maitai Group)	1500–2500	Very low	Well drained
Hauptiri steeppland (65b)	BOA & ZPT (HCPYBE)	89	Old greywacke, argillite, quartzite (Devonian – Mt Arthur Group)	2000–2500	Low to moderate	Well drained
Pelorus steeppland (65c)	BOA (HCPYBE)	97	Old greywacke, argillite, sandstone (Permian – Maitai Group)	2000–2500	Low	Well drained

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Pikikiruna steeppland (74c)	ERW (Rend-YBE)	121	Marble and limestone (Mt Arthur Group)	1000–3050	Low to moderate	Moderately well drained
Matiri steeppland (65f)	ZOH (HCPYBE)	25	Sandstone and mudstone (Miocene-Oligocene)	1500–3800	Low	Well drained
Dun steeppland (79)	BMG (BGC)	74	Ultramafic rocks (Dun Mountain ultramafics)	1000–2000	Very low	Well drained
Hohonu steeppland (67b)	ZOT (HCPYBE)	10	Weathered granite (subalpine-alpine; Separation Point suite)	1500–5000	Extremely low	Well drained
Pokororo steeppland (41e)	BOA (YBE)	134	Weathered granite (montane; Separation Point suite)	1270–1500	Very low	Well drained
Glenhope steeppland (66a)	BOA (HCPYBE)	120	Weathered granite (montane; Separation Point suite)	2000–5000	Very low	Well drained

### Key

# Texture

zl = silt loam, sl = sandy loam, cl = clay loam, l = loam, gr = gravel, st = stony.

Numbers are map unit numbers shown on maps in New Zealand Soil Bureau (1968).

\* Soil class

RFQ = Weathered Fluvial Recent, RST = Typic Sandy Recent, RFAW = Acidic-weathered Fluvial Recent, RFMA = Mottled-acidic Fluvial Recent, GRA = Acidic Recent Gley, GRQ = Saline Recent Gley, GOO = Peaty Orthic Gley, BOA = Acidic Orthic Brown, BOT = Typic Orthic Brown, BFA = Acidic Firm Brown, BLA = Acidic Allophanic Brown, BMG = Magnesian Mafic Brown, BMT = Typic Mafic Brown, BLAD = Acidic-pedal Allophanic Brown, BAM = Mottled Acidic Brown, UEM = Mottled Albic Ultic, UYT = Typic Yellow Ultic, ZXP = Placic Pan Podzol, ZOT = Typic Orthic Podzol, ZOH = Humose Orthic Podzol, ZPT = Typic Perch-gley Podzol, EMT = Typic Mafic Melanic, ERW = Weathered Rendzic Melanic, ERT = Typic Rendzic Melanic (Hewitt 1992)

YBE = Yellow Brown Earth, YBS = Yellow Brown Sand, HCYBE = High Country Yellow Brown Earth, HCPYBE = High Country Podzolised Yellow Brown Earth, YGE = Yellow Grey Earth, Rend = Rendzina, BGC = Brown Granular Clay (New Zealand Soil Bureau 1968)

## Appendix 2 Sites of special wildlife interest, Motueka Catchment (Walker 1987)

Walker (1987) identifies and ranks the following sites within the Motueka:

### FOREST SITES

- Kahurangi National Park (outstanding value): wide variety of birds (including kākā, yellow-crowned parakeet, falcon, kiwi, blue duck, fernbird, robin, rock wren, kea, long-tailed cuckoo) and large land snails (*Powelliphanta*).
  - Big Bush (high value): 18 recorded species of bird including kākā, yellow-crowned parakeet, falcon, fernbird, and robin.
  - Donald Creek (high value): 16 recorded species of bird including kākā, parakeet, falcon, and robin.
  - Mt Richmond Forest Park (high value): 25 recorded species of birds (including kākā, yellow-crowned parakeet, falcon, blue duck, robin, kea) and large land snails (*Powelliphanta*).
  - Many other sites of moderate-to-high value that are generally smaller in size or have been modified but still contain a wide variety of birds, and some have large land snails. Many of these are lowland sites.
- Golden Downs village wetland with fernbird and other common birds (moderate value).
  - Motueka rivermouth sites with waterfowl and other common birds (moderate value).
  - Waiwhero Creek and other forest wetlands with fernbird, waterfowl, pūkeko and other common birds (moderate value).

### COASTAL WETLAND SITES

Three sites on the Motueka River delta are listed: the rivermouth and sandspit (high value) and the Kumeras tidal flats and saltmarsh (moderate-high value). At the Motueka rivermouth 42 bird species have been recorded, with 31 recorded at the sandspit, and 25 at the Kumeras. This area is the most important feeding area in western Tasman Bay, has the largest high-tide roost site (with over 10,000 birds in midsummer), the most birds in Tasman Bay, and is an important feeding area for a variety of birds (including international migratory waders). It provides roosting and breeding areas for a large variety and number of birds, including estuarine-edge species (banded rail, and South Island fernbird until recently), waders (South Island pied oystercatcher, Eastern bar-tailed godwit, turnstones, banded dotterel, wrybill, New Zealand dotterel, royal spoonbill, white heron), coastal species (shags, gannets, gulls, white-fronted tern, black-fronted and Caspian terns). These coastal areas are some of the most threatened (from stock grazing, drainage and land development) wildlife areas in the catchment. The Department of Conservation regards the Motueka delta as being of national importance (Davidson et al. 1993).

### FRESHWATER WETLAND SITES

- The middle braided reaches of the Motueka riverbed around Tapawera (moderate-to-high value). Used seasonally for breeding by coastal species including the banded dotterel, pied stilt, Paradise shelduck, South Island pied oystercatcher and black-fronted tern.

## Appendix 3 Outstanding natural features and landscapes in the Motueka Catchment (Kenny and Hayward 1993)

### INTERNATIONAL IMPORTANCE

- Nettlebed Cave (the deepest and second-longest cave in Southern Hemisphere, with the largest chamber and deepest karst circulation in New Zealand; a multiple-level phreatic system with speleotherms)
- Pearse Resurgence (a large spring that drains water from under Mt Arthur and including all the caves there)
- Mt Owen karst (one of the two best examples of glaciated karst in the Southern Hemisphere)
- Baton River Devonian fossil fauna (classic Devonian-age sequence for New Zealand with very diverse fauna)
- Tomo Thyme cave system (third-longest cave system in New Zealand, a complex system linked to the Pearse Resurgence, with multiple shaft entrances intersecting horizontal phreatic passages on several levels).
- Bulmer caverns (longest and second deepest cave in New Zealand, large and varied speleotherms, complex cave system).

### NATIONAL IMPORTANCE

- Falcon Cave (fifth-deepest cave in New Zealand, with a series of shafts from a single entrance)
- HH Cave (third-deepest cave in New Zealand, with vadose development)
- Moutere gravel glacial/interglacial sediment sequences at Hope Saddle (allows correlation with key sequences in the Wanganui area)
- Mt Patriarch to John Reid Hut Paleozoic fossil fauna (unique section through upper Cambrian and lower Ordovician carbonate facies rocks, with conodonts, trilobites and molluscs).
- Ellis Basin and Horseshoe Basin karst (glaciated

karst with superb solution features).

- Owen ice cavern (best ice cave in New Zealand).
- Riwaka wollastonite (one of largest known occurrences of wollastonite).

### REGIONAL IMPORTANCE

- Graham Valley pyroxenite (most-common rock type in the Cretaceous Riwaka igneous complex)
- Graham Valley nickel (example of nickel mineralisation in the Riwaka igneous complex)
- Rolling River gold mining area (good example of early attempt at quartz gold mining)
- Upper Tadmor Valley Eocene–Oligocene sediments (sequence of marine and non-marine sediments on basal unconformity, and an example of stream capture)
- Baton River–Moran Creek Paleozoic sediments (only-known exposure of the base of lower Paleozoic Baton Group rocks)
- Beebys conglomerate Cretaceous terrestrial sediments (remnants of late Mesozoic terrestrial fluvial sediments)
- Blue Creek cave (excellent example of phreatic maze development)
- Kaka clay mine (active underground kaolin mine)
- Kaka lime kiln and quarry (brick kiln built into a rock face to burn local limestone)
- Gogoroth Cave (a deep shaft system of caves from two adjacent entrances).
- Mt Patriarch limestone summit folding (large folds and thrusts in calcareous rocks of Eastern Belt of Nelson)
- Waimea Fault, Tophouse (offset of Tophouse surface along Waimea Fault).
- Waimea Fault, faulted terraces (small graben along offset of Waimea Fault in Motupiko valley).

### COVER STOCK

Freelife Vellum 320gsm

80% recycled pre-consumer waste

15% woodpulp chlorine free

5% extra pure cotton fibre



### PAPER STOCK

Onyx Recycled 135gsm

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Totally chlorine free

