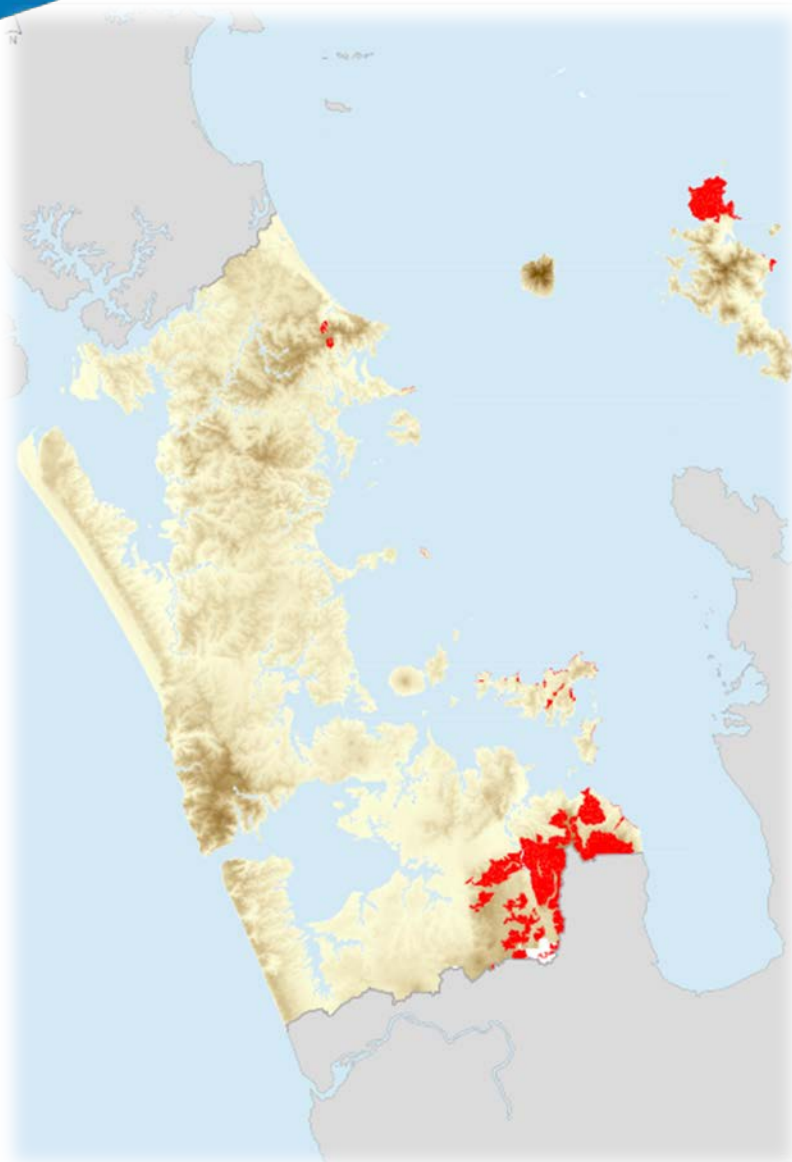


Soil Information Inventory:

Opapeke, Te Ranga and related soils

October 2018

Soil Information Inventory 13





Soil Information Inventory 13: Opaheke, Te Ranga and related soils

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Auckland Council
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1 Introduction

With Auckland's expected growth from 1.7 to 2.0 million people in the next 30 years (The Auckland Plan 2050) and a goal to double New Zealand's agricultural exports by 2025 (Ministry for Primary Industries), an understanding of Auckland's soil resources is essential for planning urban growth, and sustaining if not expanding rural production, while managing the impacts of both on our region's environment.

Existing information on Auckland's soils is difficult to assess and interpret. Electronic versions of soil maps are available on research institute websites. Some have been uploaded into Auckland Council's geographic information system (GIS, GeoMaps) for use by council staff and for public viewing. However, the GIS maps and their attached attribute lists cannot be understood or used without referring to background information which is dispersed across old maps, publications, or unpublished reports. Many of these documents are now hard to find.

Auckland Council has undertaken to compile old information for the region's main soils into single documents called soil information inventories (SIIs). These may be viewed on Knowledge Auckland, www.knowledgeauckland.org.nz council's research and technical publications website, downloaded and printed. It is expected that there will be gaps in each inventory. The gaps will be filled as new information becomes available. Each inventory is a repository for information old and new and will be a "living document".

Their intent is to:

- ease access to soil information
- enable better understanding of the soils' properties
- enhance public awareness about the location of productive or problematical soils
- improve awareness of the soils' potential and limitations, amongst consultants and planners
- help council staff provide better advice, and make more informed decisions.

Our role has been document compilers, not authors. We have selected information which appears useful for landowners, farm, forest, environmental or planning consultants, and the council staff who deal with them. While we regard the selected information as reliable, responsibility for accuracy of contents rests with the organisations which originally collected and published the maps or documents which we cite. Auckland Council makes the information available on the Knowledge Auckland website with this understanding.

Acknowledgments are due principally to old soil surveyors of the DSIR's Soil Bureau, who collected most of the information reproduced here, notably Charles Sutherland, Charles Wright, Norman Taylor, Edward Cox, and Gary Orbell.

Assistance from Mandy Holt (cross-section), Tyana Rowe-Kurene, Tony Edhouse and Linda Wallis (document editing and layout), Fiona Curran-Cournane (internal publication referee) and Malcolm McLeod (external publication referee) is also acknowledged.

Michael Martindale, Douglas Hicks and Peter Singleton
June 2016, October 2018

2 Published maps

South of Auckland DSIR's older maps (1:253,840) distinguish three series i.e. soils with distinct profiles and parent materials labelled as:

41b, 41bH	Opaheke clay loam or clay
122b, 122bS	Te Ranga clay loam, stony loam or steepland soil
123, 123S	Rimutaka stony loam or steepland soil

Opaheke and Te Ranga series names correspond with areas that were largely pasture, scrub or cut-over bush at date of mapping in the 1940s. The Rimutaka series name appears restricted to steep bush-clad ranges where field investigation of soils was perhaps limited.

In a few areas re-mapped at larger scale, notably a recent map of Manukau city (1:20,000), the soils are separated into seven mapping units that contain spatially associated soil types. These are assigned the following alphanumeric labels:

EG1	Opaheke silt loam
EG2	Opaheke clay loam
EG4	Opaheke - Marua brown complex
EG5	Opaheke - Marua complex
EG6	Te Ranga stony loam and Te Ranga brown stony loam
EXG2	Marua - Opaheke complex
EXG3	Marua - Te Ranga complex

Similar soils are depicted on the DSIR's published soil maps of North Auckland (1:100,000) as one series, divided into two types i.e. soils with differences in texture or other characteristics:

TR, TRS	Te Ranga clay loam, stony clay loam or steepland soil
TRu, TRuS	Te Ranga brown clay loam, stony clay loam or steepland soil

These labels usually appear on map polygons singly e.g. TR, TRS, TRu or TRuS. It is rare for them to appear combined e.g. TR + TRu or associated with other soils e.g. TR + MRH (Marua hill soil).

Sourced from:

*Soil maps of Maungaturoto-Kaipara area; Mangawhai-Warkworth area; Helensville-Waitakere area; Whangaparaoa-Auckland area
NZ Soil Bureau maps 189, 190, 220, 221*

Soil information inventory 13: Opaheke, Te Ranga and related soils

Soil map of the North Island, sheets 2 and 3 (Auckland and Waikato)

NZ Soil Bureau maps 11/2, 11/3

Soil map of part Franklin county

Soil map of Manukau City

NZ Soil Bureau map 149/1

NZ Soil Bureau map unpublished

3 Online maps

Landcare Research's online soil map (S-map, 1:50,000) re-names and re-labels the soils as follows:

TR, TRS	Mataikona family, sibling 28
TRu, TRuS	Mataikona family, sibling 28
41b, 41bH	No family or sibling name assigned
122b, 122bS	No family or sibling name assigned
123, 123S	No family or sibling name assigned
EG1	Kohu family, sibling 1, Takanini family, sibling 1, and Baton family, sibling 14
EG2	Mataikona family, sibling 2, Baton family, sibling 14, and Whangaripo family, sibling 11
EG4	Mataikona family, sibling 2 complexed with other soils
EG5	Mataikona family, sibling 2 complexed with other soils
EG6	Oronoko family, sibling 68 and Whangaripo family, sibling 1
EXG2	Whangaripo family, sibling 11 and Baton family, sibling 14
EXG3	Whangaripo family, sibling 1, Oronoko family, sibling 68 and Part family, sibling 7

Reasons for the basis of S-map can be found in the S-map database manual. The names and numbers were assigned by computer-matching local soil properties with different soils in other parts of the country.

Sourced from S-map Online – Home <http://smap.landcareresearch.co.nz/home>

4 Farm-scale maps

Few farms where published map polygons indicate Te Ranga (TR), Opaheke (OP) or related soils (EG1 etc.) have been mapped for private landowners or for Auckland Council, because the soils are mainly on scrubby or bush-clad terrain. On farm-scale maps (1:5,000 - 1:10,000) the soils are labelled as just two series divided into four soil types:

Tr	Te Ranga stony loam or stony clay loam
Op	Opaheke clay loam or clay

On these and other farms, published map polygons labelled MRH or 35H (Marua hill soil) and RAH or 41H (Rangiora hill soil) contain just small areas of Marua or Rangiora clay loam on stable ground. When re-mapping at farm scale, they are differentiated and labelled accordingly. Most of any such polygon turns out to be occupied by shallow soils on slopes disturbed by gullies or mass movement (slips, slumps). For the time being these are labelled as:

Mru'	Marua brown stony clay loam (shallow)
Mr'	Marua stony clay loam (shallow)
Ra'	Rangiora clay loam (shallow)
Rac'	Rangiora stoney clay (shallow)

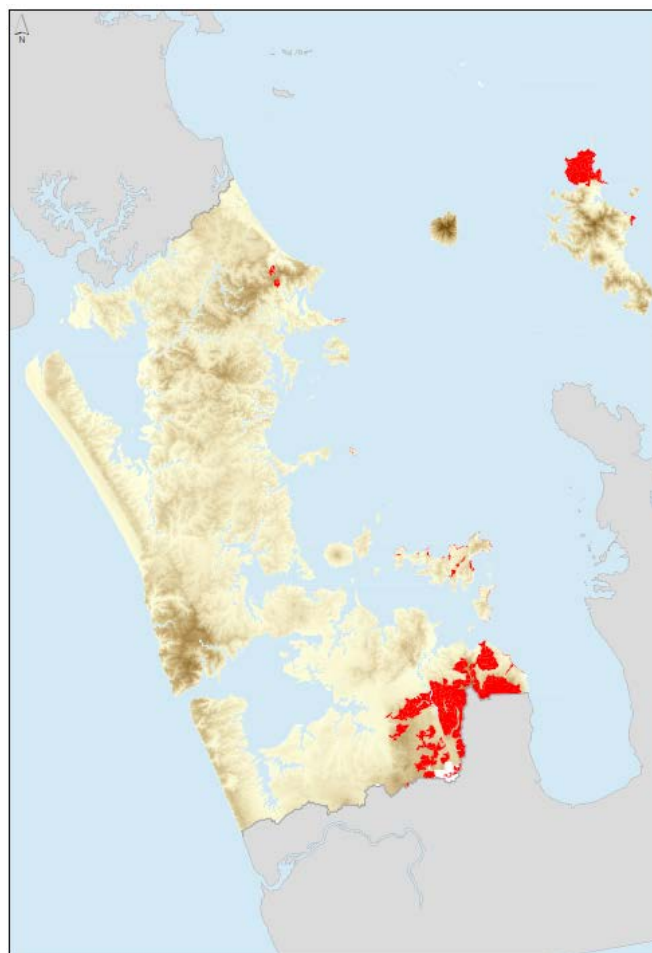
A local soil mapper (DLH) considers them similar to the soils labelled Te Ranga (Tr) on steep faces or Opaheke (Op) on elevated plateaux. So, there could be a case for re-labelling as hill phases within the Te Ranga and Opaheke series.

Local series names have been retained on Auckland Council's farm-scale maps for continuity with published nomenclature.

Sourced from 1995-2015 farm-scale maps and soil notes prepared for private landowners, Auckland Regional Council or Auckland Council

5 Where the soils occur

Throughout eastern parts of the Auckland region, initially as pockets on steep faces within hill country from Te Arai to Leigh, also between Maraetai and Clevedon; then on steep faces and elevated plateaux south through the Hunua hills and ranges. As steep parts of the Hauraki Gulf islands, immediately offshore (Kawau, Tiritirimatangi, Motutapu, Waiheke, Ponui) and outer (Great Barrier, Mokohinau).



Location of Opaheke and related soils

Opaheke and related soils are mapped on 25,200 hectares (5% of Auckland region). About 16,000 hectares (60% of the area mapped) are in productive use, as drystock pasture or forest plantations (estimated from overlay of Agribase 2010 on Fundamental Soils Layer). <http://intermaps.arc.govt/AucklandCouncilViewer/>

Soil information inventory 13: Opaheke, Te Ranga and related soils



Te Ranga soil occurs on steep greywacke slopes which rise above (or fall away from) ridges and plateaux *Photo: D Hicks*



Opaheke soil occurs on elevated ridges and plateaux (foreground and distance) interspersed by various alluvial soils in valley bottoms *Photo: H Moodie*

5.1 On what landform

Rolling downlands and moderate hillslopes with clay regolith weathered from Waipapa Group metasedimentary rocks. Commonly referred to as greywacke (the most common rock is hard grey sandstone), these formations are inter-bedded siltstone, sandstone and tuffaceous sandstone, plus basalt or andesite volcanics, conglomerate, chert, and limestone. They differ from Waitemata Group sediments in age (Permian to Jurassic), structure (deformed beds, dipping steeply, folded or contorted), and strength (indurated to weakly metamorphosed). They are the Auckland region's "basement rocks", present at depth throughout, but outcropping only where uplifted and stripped of younger sediments.

Sourced from Edbrooke, S. W., 2001, Geology of the Auckland Area, Institute of Geological and Nuclear Sciences 1:250,000 map 3 and accompanying bulletin

5.2 How they differ from other soils

On elevated plateaux within in the Hunua hills south of Auckland, the parent material of Opaheke soil is greywacke weathered to "rotten rock" i.e. clay in which traces of the original rock strata remain visible. Profiles differ depending on mineralogy of the parent material. Their common characteristics are deep subsoil and clay texture.

On steep ground in ranges or along the coast south and north of Auckland, also on Gulf Islands, the parent material of Te Ranga soil is slightly weathered greywacke. Here the profiles contain less clay than Opaheke, weathered stones are usually visible in shallow subsoil, and unweathered rock may be exposed in outcrops.

Sourced from:

*Purdie, B. et al 1982, Manukau Soil Survey. District Office Report Hv5 Soil Bureau, DSIR
Wilson, A.D. and Cox, J.E., Soils of Rodney County, Unpublished report, Soil Bureau DSIR*

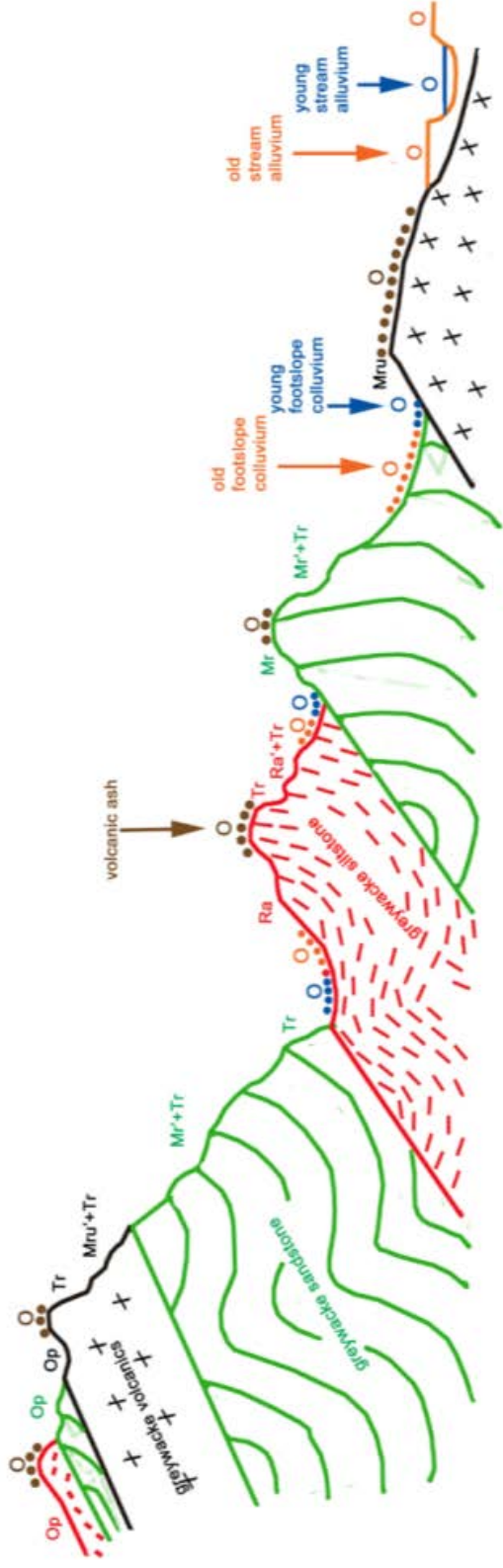
6 Classifications

NZ genetic (NZG):	Northern or central yellow-brown earth
NZ soil (NZSC):	Typic or acid orthic brown, mottled yellow ultic, mottled orthic recent http://soils.landcareresearch.co.nz/contents/SoilNames_NZSoilClassification_SoilOrders.aspx
Soil Taxonomy (USDA):	Typic or lithic dystrochrept, lithic udorthent http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051544.pdf
World Soils (FAO):	Entisol or leptosol http://www.fao.org/3/a-i3794e.pdf

DSIR replaced the NZ genetic classification dating from 1930s with the NZ soil classification in 1990s. DSIR's soil scientists considered that Soil Taxonomy did not work well in New Zealand, nor did World Soils. Soil Taxonomy and World Soils remain internationally accepted classifications.

Soil information inventory 13: Opaheke, Te Ranga and related soils

Cross section showing Opaheke, Te Ranga, and related soils' position in the landscape



On elevated plateaux:
Op, Op, Op Opaheke clay loam (undifferentiated)

On steep faces (unstable):
Tr, Tr, Tr Te Ranga stony loam (undifferentiated)

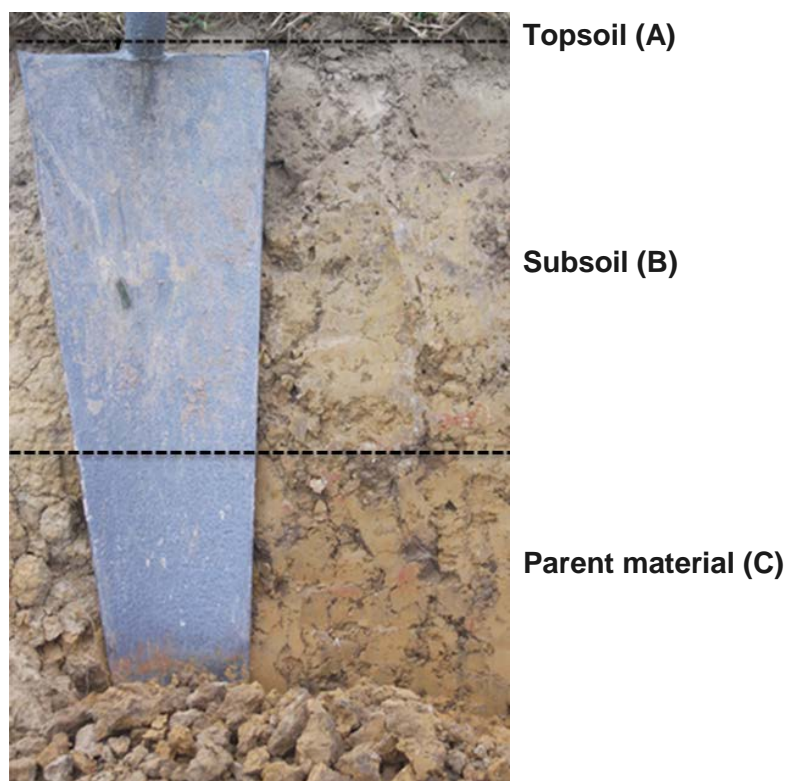
On moderate hillslopes (parts unstable):
Ra+Tr Rangiora stony clay loam + patches Te Ranga
Mr+Tr Marua stony clay loam + patches Te Ranga
Mru+Tr Marua stony brown clay loam + patches Te Ranga

On rolling lower slopes, upper slopes & ridges (stable):
Ra Rangiora clay loam
Mr Marua clay loam
Mru Marua brown clay loam

o, o, o Other soils (refer to relevant soil information inventory)

Soil type labels on the cross-section are sourced from Auckland Council's farm-scale maps

7 Soil profile descriptions



Opaheke clay loam Photo: D. Hicks

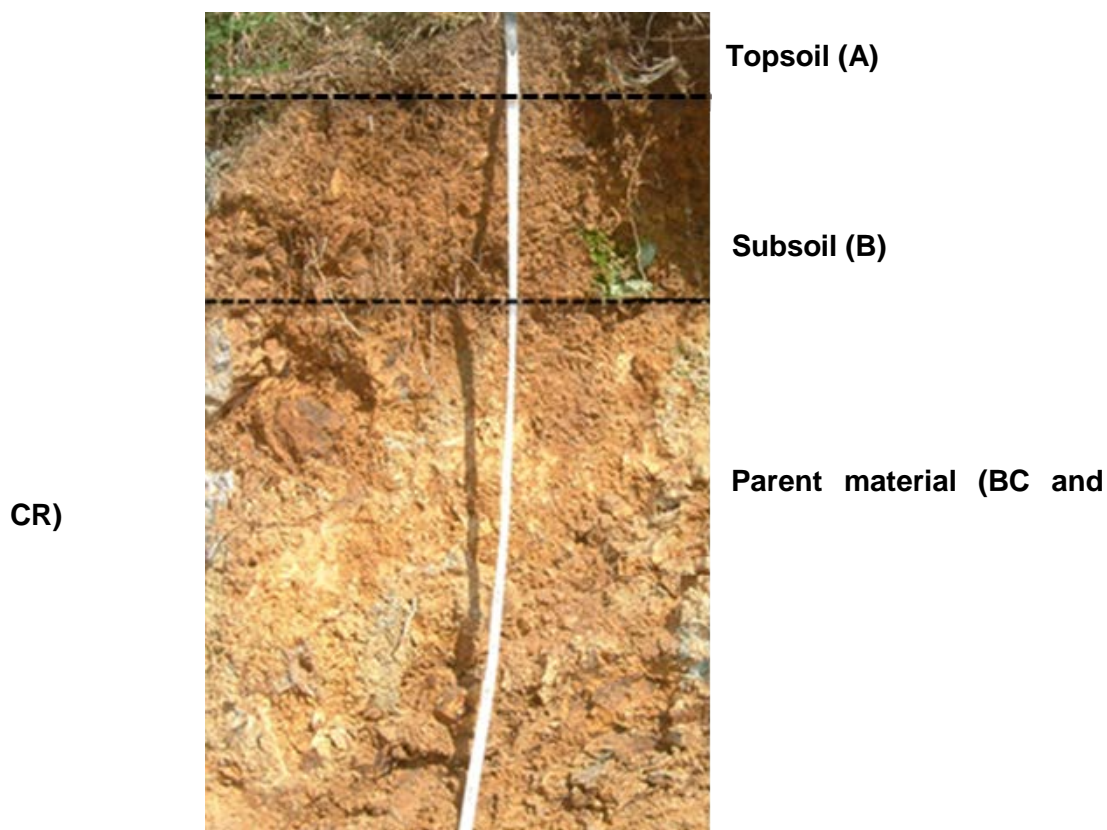
DSIR appears not to have prepared a type profile for Opaheke clay loam or clay. Soil Bureau Bulletin 5 contains the following brief description:

Opaheke clay loam

Horizon	Depth (cm)	Description
A	0-12	Grey crumbly clay loam.
B	12-22	Flecked grey-brown clay.
C	on	Yellowish clay.

The soil is described as occurring as “strongly rolling or moderately steep” terrain on “greywacke, deeply weathered”. A local soil mapper (DLH) considers that this type profile omits several key features: upper subsoil is brown with grey mottles and has polyhedral to blocky structure; lower subsoil is yellow with red mottles, in places grading to red-weathered clay (parent material) with traces of greywacke rock bed structure still visible in the clay.

Soil information inventory 13: Opaheke, Te Ranga and related soils



Te Ranga stony clay loam Photo: A Thompson

The DSIR's unpublished type profile is:

Te Ranga stony clay loam

Horizon	Depth (cm)	Description
A	0-3	Dark greyish brown (10YR4/2) gravelly clay loam; friable; moderately developed fine subangular blocky structure; medium packing; common strongly weathered greywacke fragments; abundant grass roots; in places this horizon is absent.
Bw	3-18	Brownish yellow (10YR5/4) gritty and stony clay; humus stained, friable; moderately to strongly developed coarse subangular blocky structure; medium packing; common weathered greywacke fragments; many grass roots.
BC	18-36	Yellow (10YR7/6) gritty and stony clay; strongly developed very coarse blocky structure; firm to very firm packing; common strongly weathered greywacke fragments; few grass roots.
CR	on	Yellow (10YR8/6) gritty and stony clay; strongly developed fine to coarse blocky structure; very firm; contains abundant weakly to strongly weathered greywacke fragments.

Soil information inventory 13: Opaheke, Te Ranga and related soils

It is accompanied by a second, more detailed profile “on a small area of steep slopes within moderately steep lands of the Rangiora hill soils... “to show that within ... hill soils of the Rangiora soil type ... there are in places, small areas of skeletal steep slopes typical of any modal Te Ranga soil type”:

Horizon	Depth (cm)	Description
A	0-5	Dark greyish brown and light yellowish brown (10YR4/2 + 6/4) gritty clay loam; friable; weakly developed very fine and fine subangular and subrounded polyhedral and fine cast structures; common strongly weathered fragments of greywacke and abundant grass roots; diffuse boundary.
AC	5-21	Intermingled colours of yellowish brown and dark greyish brown (10YR5/8 –4/2) gritty clay loam; friable; low packing in place, almost loose; weakly to moderately developed very fine and fine subangular and subrounded polyhedral structure; common strongly weathered fragments of greywacke; abundant scrub roots; diffuse boundary.
CR1	21-44	Brownish yellow (10YR6/8) gritty clay; friable; low packing in place; moderately and weakly developed fine and very fine polyhedral structure, faint greying on some of the faces of the aggregates; many strongly weathered fragments of greywacke; abundant scrub roots; diffuse boundary.
CR2	44-72	Brownish yellow (10YR 6/8) clay; friable; low packing in place; weakly and some moderately developed very fine subangular and fine subrounded polyhedral structures; many strongly weathered fragments of greywacke and abundant scrub roots.
R	on	As above but containing increased quantities of weathered greywacke.

This deeper profile description resembles the soil currently labelled as shallow Marua stony clay loam (Mr') on farm-scale maps. See section 4 (Farm-scale maps) for discussion of its identity.

Te Ranga brown stony clay loam

There is no type profile for Te Ranga brown stony clay loam amongst the DSIR's unpublished descriptions. It appears to be a type weathered from volcanic beds - tuffaceous sandstone, basalt or andesite - within the greywacke group of rocks (analogous to Marua brown clay loam cf. Marua clay loam).

Sourced from:

*Gibbs, H. (ed), 1954, General Survey of Soils of North Island, Soil Bureau Bulletin 5, DSIR
Sutherland C.F., Cox, J.E., various dates, Type profile descriptions for North Auckland Soil Survey, Unpublished documents, DSIR Soil Bureau*

8 Properties of typical profile

Properties of typical profiles are best indicated by analysis results for the sites where Te Ranga and Opaheke soils were first defined and described. Data for other sites will vary somewhat, particularly where sandy clay loam and sandy loam types are found.

8.1 Chemical

<http://soils.tfrec.wsu.edu/mg/chemical.htm>

No chemical analysis for either soil appears in the online version of National Soils Database (NSD). No old analysis for Opaheke clay loam is given by Soil Bureau Bulletin 5. It contains a single analysis for Te Ranga stony clay loam:

Opaheke clay loam

Property	Topsoil	Subsoil	Units
Acidity	-	-	pH
Total carbon	-	-	%
Total nitrogen	-	-	%
Available phosphorus	-	-	%
P retention	-	-	%
Available sulphur	-	-	%
Cation exchange capacity	-	-	me %
Base saturation	-	-	%
Calcium	-	-	me %
Magnesium	-	-	me %
Potassium	-	-	me %
Sodium	-	-	me %

Sourced from laboratory analysis SBXXX, DSIR Soil Bureau

Te Ranga stony clay loam

Property	Topsoil	Subsoil	Units
Acidity	6.4	5.1	pH
Total carbon	10.4	-	%
Total nitrogen	0.52	-	%
Available phosphorus	0.006	0.000	%
P retention	-	-	%
Available sulphur	-	-	%
Cation exchange capacity	36.6	17.9	me %

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Base saturation	86	14	%
Calcium	23.0	2.0	me %
Magnesium	-	-	me %
Potassium	-	-	me %
Sodium	-	-	me %

8.2 Physical

<http://soils.tfrec.wsu.edu/mg/chemical.htm>

No physical analysis for either soil appears in the online version of NSD. Soil physical data are not tabulated in Soil Bureau Bulletin 5, but the following estimates are sourced from Fundamental Soils Layer (FSL) and relevant S-map factsheets:

Opaheke clay loam

Property	Topsoil	Subsoil	Units
Stones	0-4	-	%
Sand	-	-	%
Silt	-	-	%
Clay	-	-	%
Dry bulk density	-	-	g/cm ³
Total porosity	-	-	%
Macroporosity	5.0-14.9	-	%

Sourced from FSL table and S-map factsheet, Landcare Research

Te Ranga stony clay loam

Property	Topsoil	Subsoil	Units
Stones	0-4	10-30	%
Sand	15-25	15-30	%
Silt	35-49	20-49	%
Clay	36-40	36-50	%
Dry bulk density	1.08	1.26	g/cm ³
Total porosity	-	-	%
Macroporosity	5.0-14.9	-	%

Sourced from FSL table and S-map factsheet, Landcare Research

8.3 Irrigation and drainage

<http://irrigationefficiency.co.nz/assets/Uploads/Farmers-Guide.pdf>

No soil moisture analysis for either soil appears in the online version of NSD. Soil irrigation and drainage properties are not tabulated in Soil Bureau Bulletin 5, but the following estimates are sourced from FSL and relevant S-map factsheets:

Opaheke clay loam

Property	Topsoil	Subsoil	Units
Field capacity	-	-	% w/w
Wilting point	-	-	% w/w
Plant-available water	-	-	% v/v
Plant-available water	-	25-74	mm
Depth to slowly permeable layer	-	0.45-1.19	m
Perm. at slowly permeable layer	-	<4	mm/hr

Sourced from FSL table and S-map factsheet, Landcare Research

Te Ranga stony clay loam

Property	Topsoil	Subsoil	Units
Field capacity	-	-	% w/w
Wilting point	-	-	% w/w
Plant-available water	-	-	% v/v
Plant-available water	36	28	mm
Depth to slowly permeable layer	-	>1	m
Perm. at slowly permeable layer	-	<4	mm/hr

Sourced from FSL table and S-map factsheet, Landcare Research

8.4 Topsoil properties under different uses

Local management practices affect the properties of soil, so the history of land use needs to be considered. For many Auckland soils, an indication is provided by soil test results collected by Auckland Council from sites known to have been under the same use long-term. These sites are being re-sampled at five to ten year intervals to detect any trends. Opaheke and Te Ranga soils were not initially sampled as part of the 500 Soils Project, so there are no comparative analyses of topsoil properties under different uses. Several sites with Te Ranga soil beneath bush or scrub were sampled as part of a second round in 2012.

Samples collected from Marua and Rangiora soils provide the closest soil quality data to Opaheke or Te Ranga soils under pasture or forest plantation (refer to Soil Information Inventory for Marua and related soils). Opaheke clay loam is similar to Rangiora, though occurs on elevated sites with high rainfall, so may be poorer-draining and more leached. Te Ranga soils are similar to Marua but younger, have lower clay content and are less leached; so they may be expected to have higher nutrient status, greater porosity, and better structure. However, their soil quality is limited by shallow topsoil on steep slopes, plus subsoil truncated by erosion (mass movement) where faces are unstable. Local management practices affect the properties of soil, so the history of land use needs to be considered. For many Auckland soils, an indication is provided by soil test results collected by Auckland Council from sites known to have been under the same use long-term. These sites are being re-sampled at five to ten-year intervals to detect any trends. Kaipara and related soils have been sampled at two sites in the Auckland region, corresponding to the main land uses which are dairy and drystock pasture. A control site in wetland has yet to be established.

Soil information inventory 13: Opaheke, Te Ranga and related soils

Land Use		Natural cover		Pasture	Forest
Type:		Bush	Scrub	Drystock	Pine
Sample number-		2012/101	2012/99	-	-
Acidity	pH	5.1	5.2	-	-
Total carbon	%	10.0	12.5	-	-
Total nitrogen	%	0.6	0.7	-	-
Available nitrogen	µg/ cm ³	153.3	138.8	-	-
Available phosphorus	µg/ cm ³	2.2	2.9	-	-
Cation exchange capacity	cmol/cm ³	no data	-	-	-
Base saturation	%	no data	-	-	-
Calcium	cmol/ cm ³	no data	-	-	-
Magnesium	cmol/ cm ³	no data	-	-	-
Potassium	cmol/ cm ³	no data	-	-	-
Sodium	cmol/ cm ³	no data	-	-	-
Bulk density	t/ m ³	0.60	0.56	-	-
Particle density	t/ m ³	2.50	2.30	-	-
Aggregate stability	mm mwd	no data	-	-	-
Total porosity	%	76	77	-	-
Macroporosity	%	9	7	-	-
Total available water	%	no data	-	-	-
Readily available water	%	No data	-	-	-

Sourced from Sparling, G. et al, various dates, 500 Soils Project, Landcare Research Reports to Auckland Council and Soil quality of indigenous sites in the Auckland region 2012

9 Land use capability

Land use capability is a classification of land according to properties that determine its capacity for sustained primary production. Classes 1 to 4 are arable, classes 5 to 8 non-arable. Class 1 is versatile i.e. capable of many uses, with negligible limitations to any use. Class 8 is land with extreme limitations that preclude productive use.

<http://www.landcareresearch.co.nz/publications/books/luc>

Three factors - geology, soil and slope - are considered when assigning land use capability classes. Another two - erosion and vegetation - may be recorded but rarely affect the decision. On regional-scale maps, notably the 1: 50,000 New Zealand Land Resource Inventory (NZLRI), limitations to use are indicated by four subclasses, c (climate), w (wetness), s (soil) or e (erosion). Unit numbers (1, 1b etc.) are used as labels for areas of land (map polygons) with the same geology, soil and slope, which are considered to have similar productive potential and management needs. General descriptions of productive potential and management needs are attached to NZLRI unit numbers.

NZLRI sub-classes and unit numbers were used for farm-scale land use capability maps (1:5,000 - 1: 10,000) prepared by Auckland Regional Authority or Auckland Regional Council between 1979 and 2010. On farm-scale soil maps prepared for Auckland Council since 2011, the four sub-classes are now replaced by twenty specific limitations. NZLRI unit numbers and their attached general descriptions are replaced by farm-specific tables.

Landform	NZLRI	Farm	Main limitation	Sustainable uses
Moderate slopes, slip-prone	6e9, 6e3 and 6e14	6g+l	Moderate slip and gully risk	Semi-improved pasture, woodlots
Moderate slopes, earthslip-prone	Incl in 6e9, 6e3 and 6e14	6g+u	Moderate earthslip and gully risk (old slump debris)	Semi-improved pasture, woodlots
Moderate to steep slopes, including coastal	6e10,6e17	6r+l	Coastal exposure plus moderate slip and gully risk	Semi-improved pasture, conservation uses
Steep faces	7e5, 7e8	7l, 7u	Severe slip, earthslip and gully risk	Tree plantations, conservation uses
Steep faces, shallow or stony	-, 8e2	7r+k	Shallow soil plus severe debris avalanche risk	Tree plantations, conservation uses
Steep faces, coastal	7e5b, 7e8b, 8e3	7r+c, 8r+c	Coastal exposure plus severe debris avalanche risk	Conservation uses

Sourced from: Harmsworth, G.R. 1996, *Land use capability classification of the Northland region*, Publication 9, Landcare Research; Anonymous 1979, *NZLRI Waikato region land use capability extended legend*, Water and Soil Division, MWD; Jessen, M.R. 1984, *Additions to NZLRI Waikato Region land use capability extended legend*, Water and Soil Division, MWD; Hicks, D. and Vujcich, 2017, *Farm-scale land use capability classification for Auckland*. Auckland Council Technical Report TR2017/016.

10 Past and present land uses

Historically the Opaheke and Te Ranga soils have not been used for commercial horticulture or grain cropping, being perceived as too elevated or too steep for cultivation. In the 1980s, several landowners planted grape vines and olive groves around footslopes of the Hunua Range, also on Waiheke Island, mostly on Marua or Rangiora soils. Where they extend onto pockets of Opaheke or Te Ranga, vine and tree growth does not appear as good.

Pockets of Opaheke clay loam or Te Ranga stony loam are interspersed where livestock farms were established on Marua or Rangiora soils 1850s onwards. Opaheke soil, on elevated plateaux and easy-contour ridges, has usually remained part of grazed paddocks on these farms. Te Ranga soil, on steep faces where grazing access and weed control are difficult, has generally reverted to scrub (a mix of exotic and native species) or been planted in pine woodlots.

Few areas of steep country, where the soil is predominantly Te Ranga, were ever brought into pasture. They were either cut over for timber and reverted to scrub or were left untouched. Starting in the 1960s, some areas where Te Ranga or Opaheke soil is extensive - the hills between Whitford and Clevedon, valley sides leading into the Hunua Range, rolling ridges around the Hunua water supply catchments - were converted from scrub (or reverting pasture) into commercial pine plantations. Most have now been harvested and re-planted with a second rotation of pines.

Even on steep land that wasn't converted to pasture, the bush was harvested for timber. Production of native timber from the Hunua and Great Barrier forests peaked in early years of the 20th century, though persisted into the 1970s. Small pockets of intact bush were left on steep or inaccessible land, surrounded by tracts of mixed scrub regrowth (manuka-kanuka, broadleaved, exotic) through which regenerating bush trees now emerge. Such areas are now reserved as the Hunua water supply catchments, or within Department of Conservation reserves on Great Barrier Island, or as bush remnants, scrub reversion, and regenerating forest patches on hill country drystock farms. These conservation uses account for most of the area in Te Ranga, and much of the area in Opaheke soil.

Te Ranga soils are on areas that are too steep for urban development. Opaheke soils are too distant from the city edge. There are issues with house sites on lifestyle blocks: moderate to steep-contour areas are at risk from shallow landslides (on Te Ranga) or deeper earthslips (on Opaheke). Te Ranga stony clay loam or stony loam are sufficiently permeable for stormwater drainage and effluent soakage; Opaheke clay loam and clay marginally so.

Sources: D Hicks pers. obs.

10.1 Typical vegetable, crop, and pasture and tree plantation yields

Pasture	Yield	Units
Improved pasture (drystock)	7.8-8.6 (attainable only on ridges and spurs)	t dm/ha/yr
Semi-improved pasture	5.4-6.7	t dm/ha/yr
Un-improved pasture	3.6-4.5	t dm/ha/yr

Source: MAF and Dexcel trials cited in Lincoln Farm Technical Manual 2008; various papers in NZ Journal of Agricultural Research

Timber	Yield	Units
Radiata pine (clearwood regime)	?	m ³ /ha
Radiata pine (unpruned pulpwood)	?	m ³ /ha
Macrocarpa cypress (woodlot)	?	m ³ /ha
Eucalypt (woodlot)	?	m ³ /ha
Acacia (woodlot)	?	m ³ /ha

Source: FRI trials cited on SCION website; various papers in NZ Journal of Forestry and NZ Farm Forestry

11 Information about soil management

Te Ranga and Opaheke soils are of limited use. They sustain few uses other than drystock grazing or commercial forestry, both of which are limited in extent. However, they are significant soils for conservation use; public water supply in particular.

Key management issues that may arise are:

- Adequate fertilizer to replace nutrient uptake (where in pasture)
- Developing and keeping deep topsoil on slopes (where in pasture)
- Difficulty forming tracks on steep slopes (where in tree plantation)
- Controlling runoff and sediment loss from tracks (where in tree plantation)
- Slips, slumps and gullies in wet weather (under any use)
- Maintaining quality of runoff (in water supply catchments)

Te Ranga and Opaheke soils, despite their different parent materials, have similar management needs to recent brown (stony) or immature ultic (clay) soils that have weathered from marine sedimentary rocks, on pockets of steep hill country from Northland through Auckland to the northern Waikato. Tips for managing soil structure and nutrients, for controlling erosion in farmland, also for tree plantation harvest and replanting, are contained in:

- *Soils on hill country* *Soil Information Sheet 14, Auckland Council*
- *Soils on ranges* *Soil Information Sheet 15, Auckland Council*
- *Code of Practice for Nutrient Management* *Fertiliser Association*
[\(Code of Practice for Nutrient Management\)](#)
- *Forest harvest guidelines* *TP223, Auckland Regional Council*
[\(AC Technical publications and research\)](#)
- *Streamside planting guide* *Auckland Council*
- *Native forest restoration guide* *Auckland Council*

Soil information inventory 13: Opaheke, Te Ranga and related soils

Find out more: phone 09 301 0101, email rimu@aucklandcouncil.govt.nz or visit aucklandcouncil.govt.nz and knowledgeauckland.org.nz