

HWB Hardwicke Bay Land System

This system consists mostly of low lying plains. It has two major parts: modern coastal carbonate sand deposits forming flats and dunes adjacent to Hardwicke Bay; and older calcreted deposits in low lying areas further south.

Area: 58.3 km²

Landscape: The modern coastal carbonate sand deposits adjacent to Hardwicke Bay consist of coastal flats, coastal dunes and backswamps. Dunes situated inland from the coast indicate former coastlines. Over recent geological times sediments have been slowly depositing in this southern part of Hardwicke Bay, and the coastline has been steadily moving northward. Older calcreted sediments form the two low lying vague drainage areas, which are situated to the south of the coastal carbonate sand deposits. These areas consist of stony flats, salinised depressions, and some low stony rises. Much of this area is non arable to semi arable due to stony shallow soils and salinity.

Annual rainfall: 415 – 445 mm average

Main soils: **H1** carbonate sand (around 35% of area)
B1a-B2 shallow highly calcareous to calcareous loamy soil on calcrete (around 35% of area)

Minor soils: **N2** saline soil (around 12% of area)
A1-A4 highly calcareous to calcareous loams (around 7% of area)
B1b shallow carbonate sand on calcrete (approximately 1% of area)
 Note: around 9% of area is sub-tidal flat with no practical soil.

Main features: The modern coastal deposits are composed of carbonate sands, which are characterised by inherent infertility, the potential for wind erosion, and water repellence. The supply of manganese, zinc, and phosphorus in particular are restricted by such soils. Regular applications of manganese are necessary for adequate crop growth. Copper is also typically deficient in these soils, but can usually be adequately supplied by occasional applications.

The soils of the older calcreted areas further inland, differ from the modern coastal carbonate sand deposits through having loamy textures, lower carbonate contents, and usually calcrete at shallow depth. These soils also have nutrient imbalances associated with their high carbonate contents: particularly with manganese, phosphorus and zinc. Many soils are too stony or shallow for cultivated agriculture. High levels of the toxic elements boron and sodium are likely to occur in lower subsoils and under calcrete layers

Raised subsoil salinity levels are common, and there are many low lying areas which have marginal to high salinity levels.

Soil Landscape Unit summary: Hardwicke Bay Land System (HWB)

SLU	% of area	Main features #
QHA1	3.6	Plains and rises: dominated by shallow calcareous soils on calcrete.
QHO	11.8	Main soils: calcareous to highly calcareous loams (soil B1a-B2). Minor areas of deeper calcareous loams (soil A1-A4) especially in lower lying areas. QHA1 – non arable to semi arable stony low rises (slopes 0-2%, 1-2e, 2-3s, 5-4r). QHO – arable semi arable relatively low lying level stony plains with saline seepage (slopes
QHO1	2.0	
QHT	3.9	



		<1%, 3-4s ⁺ , 2-5% outcrop, 4r). QHO1 – non arable to semi arable stony plains with saline seepage (slopes <1%, 3-2s, 5-4r). QHT – semi arable low lying level stony plains with marginal salinity (slopes <1%, 4s ⁺ , 2-5% outcrop, 4r).
QDA QDO QDT	1.2 4.8 4.9	Plains and rises: with shallow calcareous soils on calcrete and deeper calcareous soils. Main soils: calcareous to highly calcareous loams (soil B1a-B2) and limited to extensive areas of deeper calcareous loams (soil A1-A4). QDA – mostly arable low rises and plains (slopes 0-2%, 1-2e, 2s, 2-10% outcrop, 3-4r). QDO – mostly arable flats or slight rises with some saline seepage (slopes <1%, 3-4s ⁺ , 2-10% outcrop 3-4r). QDT – non arable to semi arable low lying plains with marginal salinity (slopes <1%, 4s ^o , 10-20% outcrop, 3-4r).
MaYA MaYB	0.3 0.1	Old coastal dunes with shallow soil on calcrete: indicating former coastlines. Main soils: shallow highly calcareous loam to sandy loam on calcrete (soil B1a). MaYA – non arable low old coastal dune (slopes 0-1.5%, 2s, 5r, 2a). MaYB – non arable moderate height old coastal dune (slopes 0-2%, 1-2s, 5r, 3-2a).
WGD WGE WGEa WGQ WGQs WGQa WGR WGRa WGS WGs	0.1 2.9 11.0 2.9 9.0 1.5 1.2 <0.1 1.0 0.7	Coastal dunes, flats, and backswamps. Main soils: <i>carbonate sand</i> (soil H1). <i>Mostly parallel modern dunes:</i> WGD – non arable moderate height modern dunes: approx. 30% bare (7a, 1-2s). WGE – semi arable very low to low modern dunes: a sequence of parallel coastal dune deposits (4-5a, 2-3s ^o). WGEa – non arable to semi arable very low modern dunes: a sequence of parallel coastal dune deposits or a single dune ridge (5a, 2-3s ^o). <i>Mostly flats and backswamps:</i> WGQ – arable coastal flats: a vague pattern of curved very low coastal dunes can be seen from the air (3-2a, 2-3s ^o). WGQs – arable to semi arable coastal flats with saline seepage (mostly consisting of very low parallel coastal dune undulations: 4-3a, 3-4s ^o). WGQa – non arable to semi arable coastal flats/backswamp areas with saline seepage (which often consists of very low parallel coastal dune undulations: 4a, 3-4s ^o). WGR – semi arable to non arable salinised backswamps/flats (3a, 4s ⁺). WGRa – non arable salinised backswamps/flats (3-4a, 4-5s). WGS – mostly non arable backswamps (3-2a, 5-4s). WGs – non arable coastal flats with some low lying swampy areas (5-4a, 5-4s).
WKQ WKR	3.6 1.3	Older coastal flats. Main soils: <i>carbonate sand</i> with some <i>highly calcareous sandy loam</i> (soil H1 with some soil A1). With some areas of shallow highly calcareous loamy sand to sandy loam on calcrete (soil B1b). WKQ – arable to semi arable coastal flats with low lying marginally to highly saline areas (3a, 3-4s ⁺). WKR – semi arable low lying land with marginal salinity (2-3a, 4-5s).
WHC WHD WHDa WHE	0.8 0.6 0.1 0.3	Older coastal dunes: marking a former coastline. Main soils: <i>carbonate sand</i> or <i>highly calcareous sandy loam</i> (soil H1-A1) with some shallow highly calcareous loamy sand to sandy loam on calcrete (soil B1b). WHC – mostly non arable high older coastal dunes (7-5a). WHD – mostly arable moderate to low height older coastal dunes (4a). WHDa – mostly non arable moderate height older coastal dunes (5a). WHE – mostly arable low older coastal dunes (3-4a, 2-5% outcrop, 2s).
WN-	1.3	Saline backswamps (7-5s, 2-3a).
WU-	9.3	Subtidal to tidal sandy flats.
ZA1	0.5	Near coastal saline depressions: dominated by deep soils (5-4s).
ZA2	3.7	Inland saline depressions: dominated by shallow soils on calcrete (5-4s).
ZA3	13.3	Inland low lying salinised area: with approx. 55% saline flats or depressions; approx. 20% low very stony rises; and approx. 25% marginally saline semi arable stony flats.
ZB-	2.2	Highly saline shallow depression (7-5s).

Classes in the 'Soil Landscape Unit summary' table (eg. 2-1e, 3w, 2y, etc) describe the predominant soil and land conditions, and their range, found in Soil Landscape Units. The number '1' reflects minimal limitation, while increasing numbers reflect increasing limitation. Letters correspond to the type of attribute:

a - wind erosion e - water erosion f - flooding g - gullyng
r - surface rockiness s - salinity w - waterlogging y - exposure



Detailed soil profile descriptions:**Main soils:**

- H1** *carbonate sand* [Shelly Calcarosol]
A deep to moderate depth light grey loose fine loamy sand. The soil is dominated composed of carbonate particles. Soil colour lightens with depth. Soils are typically strongly water repellent. These soils are found on modern coastal deposits such as flats and dunes.
- B1a-B2** *shallow to highly calcareous to calcareous loamy soil on calcrete* [Petrocalcic Supravescent-Hypervescent Calcarosol]
A very highly to highly calcareous grey loam or fine sandy loam overlying calcrete at shallow to very shallow depth. The very highly calcareous types are dominated by carbonate particles (soil **B1a**). Surface soils are often powdery; and weakly structured surface soils occur. Surface soils can be water repellent. Hard carbonate rubble commonly occurs in the profile. Found on old relict dunes, on plains and low rises, and in low lying areas.

Minor soils:

- N2** *saline soil* [Hypersalic-Salic Hydrosol]
Saline and wet variants of all other soils found in the land system, in particular saline variants of soils **A1** and **A4**: especially since calcrete has often been 'dissolved' in low lying wetter areas.
- A1-A4** *highly calcareous to calcareous loams* [Supravescent-Hypervescent Calcarosol]
A moderate depth to deep very highly calcareous to calcareous grey loam, fine sandy loam, or silty loam grading to a loamy or clay loamy subsoil. Carbonate particles dominant the more highly calcareous soils (soil **A1**). Surface soils are often powdery; and weakly structured surface soils occur. The profile can contain various amounts of hard carbonate rubble, or is occasionally underlain by calcrete at moderate depth. These soils are often found in low lying areas where calcrete has been 'dissolved'.
- B1b** *shallow carbonate sand on calcrete* [Petrocalcic Shelly Calcarosol]
A shallow light grey loose fine loamy sand. The soil is dominated composed of carbonate particles. Soil colour lightens with depth. Soils are typically strongly water repellent. These soils are found on older coastal deposits such as flats and dunes.

Further information: [DEWNR Soil and Land Program](#)

