# SITE CLASSIFICATION
# LOT 8933 AH-KET AVENUE
# LLOYD NSW 2650

March 2020

**Project brief**
At the request of Peter Fitzpatrick of the Diocese of Wagga Wagga, soil sampling, analysis and reporting was carried out to assess the site for a proposed residential development on 30 October 2019. The document provides information about the site and soil conditions from field observations and laboratory analysis.

**Site identification**
**Address**: Lot 8933 Ah-ket Avenue Lloyd NSW 2650
**Real property description:** Lot 8933 Subdivision of DP 1262050
**Centre co-ordinate:** 530748 6109690 MGA GDA z55
**Property size**: 887m$^2$ approximately
**Owner**: c/o Diocese of Wagga Wagga
**Local Council Area**: Wagga Wagga City Council
**Present use**: Vacant Block
**Development Application Reference:** not known
**Report Number:** 6435_Lot 8933
**Site Classification: M-D – Moderately reactive clay or silt sites (deep drying)**

**Certification**

| Name | Signed | Date | Revision Number |
|---|---|---|---|
| **David McMahon**<br>BAppSc SA<br>GradDip WRM<br>MEnvMgmt |  | 4/03/2020 | 0 |

**Physical characteristics of the site**
A desktop review and investigation of the topography, hydrology, soil, lithology, geology and hydrogeology of the site has been undertaken and are as follows:

**Topography**
The Lake Albert 1:25,000 Topographic Map (Sheet 8327-1S) indicates that the site is located at an elevation of approximately 235m AHD. The site landform is classed as a simple slope and the slope class is gently inclined.

**Vegetation**
The site is devoid of vegetation.

**Hydrology**
The nearest named waterway is Stringybark Creek located 3414m to the south east of the site. Due to the relative incline of the site, rainfall is likely to both run off and infiltrate into the relatively permeable topsoil.

**Weather**
The average rainfall for Wagga Wagga is approximately 526.8mm per annum, with the wettest months being October, June and July. Annual mean evaporation for the region is 1715.5mm with mean daily evaporation ranges from 1.2mm in July to 9.2mm in January. Wagga Wagga is characterised by cold wet winters and hot dry summers with mean maximum temperatures ranging from 12.9ºC in July to 31.9 ºC in January and mean minimum temperatures ranging from 1.3ºC in July to 15.9ºC in February. Rainfall, temperature and evaporation data from Wagga Wagga Agricultural Institute 73127 (www.bom.gov.au).

**Soil & Landform**
The site lies within the mapping unit ld from the Soil Landscapes of the Wagga Wagga 1:100 000 Sheet (DLWC, 1997). The map unit ld is described as:

***ld – Lloyd (Erosional Landscapes)***
*Landscape*: rolling low hills on Ordovician metasedimentary rocks. Local relief 30–90 m; slopes 10–20%. Broad crests and ridges; long waning mid to lower slopes; broad drainage depressions. Variable rock outcrop 0–50%. Extensively to completely cleared mid to high open-forest.
*Soils*: shallow (<0.5 m), moderately well-drained Paralithic Leptic Rudosols (Lithosols) on some crests, ridges and upper slopes; deep (1.0–1.5 m), imperfectly drained Red Kurosols (Red Podzolic Soils) on other crests and upper slopes; moderately deep (0.5–1.0m), moderately well-drained Red Chromosols and Kurosols (Red Podzolic Soils) on mid to lower slopes; and moderately deep (0.5–1.0 m), imperfectly drained Brown Kurosols (Yellow Podzolic Soils) in drainage lines.
*Limitations*: high erosion hazard; steep slopes (localised); localised rock outcrop; localised poor drainage; localised waterlogging; foundation hazard (localised); mass movement; shallow, stony and strongly acid soils (on ridges and upper slopes); localised aluminium toxicity; localised salinity.

**Lithology and Geology**
Undivided Ordovician metasedimentary rocks—thinly interbedded siltstones, shales and phyllites, with minorschists and minor quartzites. Lithology is highly variable over a short distance. Relatively thick (1 m to several metres) colluvial and slopewash clayey sediments occur on lower slopes and in drainage depressions. There is generally no rock outcrop, but occasionally <50% (at sites usually underlain by sandstone).

**Hydrogeology**

From the Geoscience Australia hydrogeology dataset, the groundwater beneath the site is described as porous, extensive highly productive aquifers

**Site Condition**

Through site investigation, field observations, in situ tests and laboratory analysis the following site geotechnical model has been developed. Details of the general conditions encountered with a field description of the soil, engineering properties and the location of the boreholes can be seen as follows, Table 1, Figure 1.

**Table 1:** *Site geotechnical model with field description and observations*

| Soil Origin | Depth (m) | Class (AS1726 -2017) | Soil Name / Description | Grain Size | Primary Colour | Mottle Colour | Mois-ture | Plas-ticity | Consis-tency | Observations and/or comments | Engineering Properties |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Borehole 1** | | | | | | | | | | | |
| FILL | 0.0-0.1 | CL | CLAY | Fine | Reddish Brown | Nil | D | Low | Firm | - | - |
| FILL | 0.1-0.3 | GM | Gravelly SILT | Fine | Light/ Pale Yellowish Brown | Nil | D | Low | Stiff | - | - |
| Residual | 0.3-0.6 | CI | CLAY | Fine | Reddish Brown | Nil | D | Low-Med | Stiff | - | Ys Expansivity 20-40mm |
| Residual | 0.6-3.0 | CI | CLAY | Fine | Dark Brownish Yellow | Nil | D | Low-Med | Stiff | - | |


**Figure 1:** *Annotated site plan overlain on aerial photograph depicting borehole locations*

**Site Classification**

Based on the field assessment and laboratory data and assumptions therein the site is classified as **M-D – Moderately reactive clay or silt sites (deep drying), which may experience moderate ground movement from moisture changes** by reference to AS2870:2011.

**Assumptions**

Site investigation and classification was carried out by reference to AS2870:2011.
The proposed building is a single storey residential development.
This classification is based on the footings being founded into the underlying residual 'CI' clay soils. If the footings are not into the specified material the site classification will need to be reassessed.
FILL materials where identified on this report are considered as ‘controlled fill’ in accordance with AS3798 and can be considered suitable for use as foundation/subgrade. Fill certification report ID ‘FC19-06’.
Footings may be founded partly on fill and partly on natural material depending on founding depths. As such, footing design may require careful consideration by the structural engineer to minimise potential differential settlement.
An allowable bearing pressure of up to 50kPa and 100kPa for raft slab beams and strip footings respectively may be adopted.
If more than 0.4m of uncontrolled fill is present or placed, or if depth of excavation within the building area extends more than 0.5m below the existing surface, the above classification will need to be reassessed.
Any earthworks on site will be carried out by reference to AS3798: 2007.
If any unconsolidated or saturated soils are encountered during excavation, or conditions that are not alike the above description, the site supervisor should be informed, the work stopped and this office be contacted immediately for further evaluation.
Where trees and large shrubs are removed from the site all roots are to be removed and voids replaced with compacted fill by reference to AS3798:2007.
The soils investigated are all natural ground and no free groundwater was encountered at the time of the investigation.
Site drainage and vegetation limitations are adhered to as per the CSIRO Foundation Management and Footing Performance: A Homeowner’s guide, BTF-2011

## Notes Relating to Results

| Log Column | | Symbol | Definition |
|---|---|---|---|
| **Soil Origin** | | TOPSOIL | Mantle of surface and/or near-surface soil often but not always defined by high levels of organic material, both dead and living. Remnant topsoils are topsoils that subsequently been buried by other transported soils. Roots of trees may extend significantly into otherwise unaltered soil and the presence of roots is not a sufficient reason for describing a material as topsoil. |
| | | FILL | Any material which has been placed by anthropogenic processes |
| | | Alluvial | Deposited by streams and rivers |
| | | Colluvial | Soil and rock debris transported down slope by gravity, with or without the assistance of flowing water and generally deposited in gullies or at the base of slopes. Colluvium is often used to refer to thicker deposits such as those formed from landslides, whereas the term 'slopewash' may be used for thinner and more widespread deposits that accumulate gradually over longer geological timeframes. |
| | | Extremely weathered material | Formed directly from in situ weathering of geological formations. Although this material is of soil strength, it retains the structure and/or fabric of the parent rock material. |
| | | Residual | Formed directly from in situ weathering of geological formations. These soils no longer retain any visible structure or fabric of the parent soil or rock material |
| **Class (AS1726-2017)** | Coarse grained soils | GW | Gravel and gravel-sand mixtures, little to no fines |
| | | GP | Gravel and gravel-sand mixtures, little to no fines, uniform gravels |
| | | GM | Gravel-silt mixtures and gravel-sand-silt mixtures |
| | | GC | Gravel-clay mixtures and gravel-sand-clay mixtures |
| | | SW | Sand and gravel-sand mixtures, little to no fines |
| | | SP | Sand and gravel-sand mixtures, little to no fines |
| | | SM | Sand-silt mixtures |
| | | SC | Sand-clay mixtures |
| | Fine grained soils | ML | Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity |
| | | CL, CI | Inorganic clays of low to medium plasticity, gravelly clay, sandy clay |
| | | OL | Organic silt |
| | | MH | Inorganic silt |
| | | CH | Inorganic clays of high plasticity |
| | | OH | Organic clay of medium to high plasticity, organic silt |
| | | Pt | Peat, highly organic soil |
| **Soil Name/ Description** | | SAND | Coarse grained soil |
| | | SILT | Fine grained soil – low dry strength, low wet toughness and dilatancy |
| | | CLAY | Fine grained soil – high dry strength, high wet toughness and plasticity |
| **Grain Size** | | Coarse | >2mm |
| | | Medium | 0.06 – 2mm |
| | | Fine | <0.06mm |
| **Moisture** | | D | Dry |
| | | T | Moderately Moist |
| | | M | Moist |
| | | W | Wet |
| **Plasticity** | | Non-plastic | Not applicable |
| | | Low | Only slight pressure is required to roll the thread of soil near the plastic limit. The thread and lump are weak and soft. The dry specimen crumbles into powder with some finger pressure. |
| | | Medium | Medium pressure is required to roll the thread of soil to near the plastic limit. The thread and lump have medium stiffness. The dry specimen breaks into pieces or crumbles with considerable finger pressure. |
| | | High | Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness. The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface. |
| **Consistency** | | Very Soft (VS) | Exudes between fingers when squeezed in hand |
| | | Soft (S) | Can be moulded by light finger pressure |
| | | Firm (F) | Can be moulded by strong finger pressure |
| | | Stiff (St) | Cannot be moulded by fingers |
| | | Very Stiff (VSt) | Can be indented by thumb nail |
| | | Hard (H) | Can be indented by thumb nail with difficulty |
| | | Friable (Fr) | Can be easily crumbled or broken into small pieces by hand |

**Disclaimer**

The information contained in this report has been extracted from field and laboratory sources believed to be reliable and accurate. DM McMahon Pty Ltd will not assume any responsibility for the misinterpretation of information supplied in this report. The accuracy and reliability of recommendations identified in this report need to be evaluated with due care according to individual circumstances. It should be noted that the recommendations and findings in this report are based solely upon the said site location and the ground level conditions at the time of testing. The results of the said investigations undertaken are an overall representation of the conditions encountered. The properties of the soil within the location may change due to variations in ground conditions outside of the tested area. The author has no control or liability over site variability that may warrant further investigation that may lead to significant design changes.

**Notice of Copyright**



**Reference**

Chen X.Y. and McKane D.J., 1997, Soil Landscapes of the Wagga Wagga 1:100,000 Sheet map and report, Department of Land and Water Conservation, Sydney

CSIRO Foundation Management and Footing Performance: A Homeowner's guide, BTF-2011

Geeves GW, Craze B and Hamilton GJ 2007a. Soil physical properties. In 'Soils – their properties and management'. 3rd edn. (Eds Charman PEV and Murphy BW) pp. 168-191 Oxford University Press Melbourne

Geology information: Copyright Commonwealth of Australia (MDBC) 1999

Office of Environment and Heritage (OEH) (2017) eSpade v2.0 <http://www.environment.nsw.gov.au/eSpade2WebApp>

Standards Australia AS 1726 – 2017 Geotechnical Site Investigations

Standards Australia AS 2870 – 2011 Residential Slabs and Footings - Construction

Standards Australia AS 3798 – 2007 Guidelines on earthworks for commercial and residential developments