# BLACKROCK GEOTECHNICAL

A division of Blackrock Mining Solutions Pty ltd (ABN 91 383 829 253)
Providing - Geotechnical site investigation services
- Geotechnical drilling and trenching services
- Full analysis and reporting

# Blackrock Geotechnical – Wind Farm Site Investigation Services

## Introduction

The design and construction of a wind farm requires extensive knowledge about the subsurface conditions of which the turbine foundations will be constructed on. Foundation design, construction consistency, project risk and project execution speed are all driven by the type and design of the turbine foundations. In addition, geotechnical investigations are required for road deigns, earthworks volume calculations and selection of substation locations and general laydown areas. A multitude of skills and experience is required when undertaking in the necessary geotechnical investigations and engineering design, in order to minimise the overall cost of the project. It is also important that these investigative exercises are completed at the "right" point in the project development lifecycle, in order to highlight any anomalies within the subsurface conditions and take advantage of value engineering opportunities that can greatly influence overall projects balance of plant costs.

## Blackrock Geotechnical

Blackrock Geotechnical, a subsidiary of Blackrock Mining Solutions Ltd, is a specialist geotechnical consulting firm which has been providing professional consulting and contracting services since 2007. The Site Investigation Division specialise in providing independent and thorough geotechnical site investigations with an extensive and reliable range of site investigation techniques. In particular, Blackrock Geotechnical offers specialist services investigating wind farm turbine footing geotechnical conditions and preliminary advice of suitable foundation types. Blackrock Geotechnical has the ability to deliver the full range of services from desk top site selection, field mapping, drilling and trench excavation and full reporting of results.

With our experienced senior level staff and wide range of equipment, we have the ability to carry out site investigations in any environment. In addition, our drilling equipment is adequate to reach depths in excess of 200m, in order to better ascertain subsurface conditions at any likely anchor depth.

**Blackrock Geotechnical can provide the following services to your wind farm project:**

- Project management and planning for the geotechnical investigation process
- Preliminary Geotechnical Investigation – desktop research and field mapping
- Geotechnical drilling and trench excavation
- Secondary (final) Geotechnical Assessment
- Environmental Impact Studies and Assessments
- Foundation Type Suitability Assessments
- Design Risk Assessments

1. ***Preliminary Geotechnical Investigation:***

- Desktop site selection & field mapping
- Assessment of the geological variability across the study area
- Assessment of the nature and strength of the near surface materials at selected turbine locations
- Assessment of slope stability in the proposed wind farm location
- Preliminary assessment of design parameters for turbine footing foundations and anchor support
- Preliminary advice for the construction of roads that provide access to the turbines
- Undertake investigations on historical developments within the lease area
- Detail and design site drainage requirements around both access roads and footing foundations
- Provide a detailed Geotechnical report, for use in the attainment of building permits etc.

Field work associated with this preliminary geotechnical investigation may include digging test pits and drilling of a number of boreholes over a representative selection of turbine sites. These investigations will assist in the development of a site cross-section, to be able to interpolate the subsurface geology at depth. The test pits and boreholes will be logged and photographed, to NZ/AS standards, by an experienced geotechnical engineer.

Laboratory testing will be completed on representative core samples and will be tested to NATA certified standards. These tests will comprise point load strength index tests, as well as unconfined compressive strength (UCS) tests, to gain a full understanding of the strengths of the rock/soil across the site.

Field observations and a desk top study of the geology and geomorphology of the land are also assessed for broader site stability issues. This will include an investigation into the groundwater conditions also.

2. ***Secondary Geotechnical Investigation:***

This more detailed investigation of the site, to further assess the subsurface conditions, allow assessment of areas that remain in doubt from earlier work and to assess the general scope of the civil construction requirements as a whole. This will include:

- In depth geomorphological study
- Further test pit excavations , to significantly add to the geological knowledge of each specific turbine location,
- Further laboratory testing
- Infill borehole drilling and logging

3. ***Environmental Impact and awareness studies***

The planning approval processes required for construction of a wind farm invariably require geotechnical information to inform environmental impact assessments, including bulk earthwork volume calculations,, planning of road layouts and description of traffic movements. The geotechnical information is also required for the development of Environmental Management Plans. It is important to assess these impacts both during implementation of the project and during the service life. Knowledge of the subsurface conditions as well as the design process is fundamental in the development of such an environmental impact statement.

### *4. Foundation Type Suitability Assessments*

Blackrock Geotechnical can perform conceptual foundation designs for developers, turbine manufacturers and foundation contractors as an input to project planning and economic evaluation. Typical foundation types will include mass concrete gravity, monopile and rock anchor with either embedded steel rings or foundation bolts, depending on the selected turbine manufacturer.

### *5. Design Risk Assessment*

Typically wind turbines are installed in harsh environments, where climatic conditions, site access, proximity to emergency services and bush fire risk can influence the safety of the site and affect construction outcomes. A safe working environment is important for staff and contractors and therefore a design risk assessment is required to comply with the Health & Safety regulations in most host countries legislation. Blackrock Geotechnical, as a multidisciplinary company, has extensive experience in the undertaking of such design risk assessments – the end result in each case having the risks mitigated to an acceptable level.

## Contact

For more information please visit our website at http://blackrockmining.net/ . Feel free to contact us for a free consultation, either through our website or simply by emailing Richard Campbell on r.campbell@blackrockmining.net