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GEOTECHNICAL

WATER RESOURCES

PAVEMENTS

Preliminary Geotechnical Review

Hokonui Hills Windfarm

Southland

Report prepared for:

Hokonui Hills Wind Farm Limited Partnership

Report prepared by:

GeoSolve Limited

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GEOTECHNICAL WATER RESOURCES PAVEMENTS

Table of Contents

1 Introduction

1.1 General

This report presents the results of a preliminary geological and geotechnical review of the proposed Hokonui Hills Windfarm project, Southland. GeoSolve Limited (GeoSolve) have completed this report to provide preliminary data for the proposed development and associated approval review process for consent.

This assessment has been undertaken for Hokonui Hills Wind Farm Limited Partnership in accordance with GeoSolve Ltd.'s proposal no. 250801 and dated 28 November 2025.

1.2 Development

Information provided to GeoSolve indicates the project comprises:

- Approximately 83 wind turbines. The turbine sites will generally be located in elevated topographical locations.
- Each turbine location will have a lay down area comprising a levelled surface suitable for crane movement and construction purposes.
- Substations, 2 locations are proposed.
- A datacentre.
- A transmission line connecting the new infrastructure to the existing grid.
- A network of connecting roads to access the turbines and associated infrastructure. The roads will cross existing and new bridges or culverts. Upgrade of existing bridges or culverts is expected.
- Earthworks will be required to accommodate the above infrastructure and is expected to comprise both cut and fill.

Figure 1a, Appendix A, shows the proposed infrastructure locations.

2 Site Description

2.1 General

The development site is located approximately 15 km west of Gore, Southland, in an area known as the Hokonui Hills. The existing land use comprises mostly farmland with rough pasture, forestry and shrubland in elevated areas. Photograph 2.1 below provides a general view of the site topography.

The topography is characterised by numerous parallel ridgelines and troughs, which trend roughly east-west, and a shallow basin in the central area where the Otapiri - Mandeville Road is present. The ridgelines typically reach RL's of approximately 350-600 m, with some local outliers. Topographic contours are provided on Figure 1a, Appendix A.

Numerous streams drain the many localised catchment areas that characterise the topography. Several of the streams converge in the central basin and flow north towards Mandeville via the Otamita Stream.

Photograph 2.1 – Typical view of the site topography.

3 Subsurface Conditions

3.1 Geological Setting

The proposed windfarm is situated in the Hokonui Hills on the northern limb of the Southland Syncline, a regional geologic structure which stretches from Fiordland in the northwest to the Catlins Coast in the southeast. The northern limb of the syncline is steeply dipping to overturned and folds Mesozoic age sedimentary rocks of the Murihiku Terrane.

The parallel strike ridges of the syncline are clearly visible on aerial imagery and contour plans rising above the surrounding plains and are the defining geomorphologic feature of the project area. The strike ridges are well defined due to the steep dip of the underlying bedding and differential erosion of alternating layers of sandstone and weaker mudstone.

The northern edge of the fold system is marked by the Murihiku Escarpment on the southern edge of the Waimea Plains. North of the escarpment rocks of the Southland Syncline disappear beneath recent alluvial sediment of the Waimea Plains derived from the Oreti, Mataura and Waikaia River catchments.

Beyond the plains to the north the Murihiku Terrane is juxtaposed against the southern extent of the Otago Schist.

The regional scale geology is shown on Figure 1b, Appendix A.

3.2 Seismicity

No active fault traces are known by GeoSolve to exist directly within the development area. The nearest known active fault, shown on published geological mapping, is an unnamed localised fault (no. 82432) located approximately 1.5 km beyond the northwestern corner of the development.

Multiple inactive faults have been identified across the development site as shown on Figure 1b, Appendix A.

A significant seismic risk exists in the region from strong ground shaking associated with rupture of the Alpine Fault, which is located along the west coast of the South Island. There is a high probability that a major earthquake of Mw 8 or greater will occur along the Alpine Fault within the next 50 years.

3.3 Subsurface Stratigraphy

Geological outcrops observed during our initial site overview inspection indicate the broad stratigraphy comprises:

- A superficial veneer of soil comprising topsoil, loess, colluvium and recent alluvial sediment in low lying areas. Windblown loess will vary in depth and extent depending on the local setting but tends to thicken in the lee of slopes. It is possible that some of the more subdued slopes and gullies on the southern side of the strike ridges are obscured by a blanket of loess, which can be several metres in thickness.
- Bedrock comprises variably weathered sandstone, mudstone and turbidite rock of the Southland Syncline. Bedrock exposures are relatively limited and generally confined to existing quarry sites and track cuttings. Spherical concretions are common within the mudstone beds.
- Turbidites are interbedded deep-water marine sediments exhibiting graded bedding between sandstone and finer-grained mudstones, indicating their original deposition in a submarine fan slope environment.

Examples of the observed site geology are shown on Photographs 3.1 and 3.2 below.

3.4 Groundwater

Groundwater occurrence will be variable and dependant on the topographic location. In elevated hillside locations groundwater is expected to be at depth. In lower lying areas, particularly around water bodies, shallow groundwater is likely to be encountered.

Photograph 3.1 – Topsoil and loess soils overlying moderately weathered bedrock exposed in a track cutting. Geological hammer for scale.

Photograph 3.2 – Interbedded brown sandstone and black mudstone turbidite layers exposed in a disused quarry pit.

4 Natural Hazards

No evidence of deep-seated landsliding was observed during our field inspection, and it is unlikely that basement rocks of the Southland Syncline are conducive to generating large deep-seated landslides. However, mass failure could potentially be possible if a steeply dipping mudstone layer were to coincide with a free face and/or elevated groundwater pressures.

Relatively superficial (shallow) landslides within soils overlying bedrock are expected on the steeper slopes.

Liquefaction won't be a consideration for structures founded on bedrock, or in elevated locations above the valley floor. Liquefaction will need to be considered during detailed investigation of low-lying structures, particularly if near waterbodies, or where groundwater coincides with sediments susceptible to liquefaction.

Flooding will need to be considered for structures in the vicinity of streams, overland flow paths or floodplains.

Given the age of the Southland Syncline and its long history of geologic uplift inactive faults are expected to be relatively common across the project area, and several are shown on Figure 1b, Appendix A. The closest mapped active fault is located immediately northwest of the site; however, it is probable that the Alpine Fault will provide the governing seismic risk for the development, as is common across the South Island of New Zealand.

No significant areas of rock fall or alluvial fan activity have been noted.

5 Preliminary Engineering Considerations

The recommendations and opinions contained in this report are preliminary and based on initial site walkover observations and general engineering experience in similar terrane. GeoSolve expect detailed investigations and geotechnical engineering assessment will be undertaken to determine specific design requirements for all key infrastructure elements.

The wind turbines will be located on or close to ridge crests and foundations are generally expected to target un-weathered to slightly weathered in situ bedrock. Rock will provide good bearing. Available bearing capacities on soils or highly weathered rock are expected to be poor in comparison. Structure-specific investigation will be required to determine a suitable bearing depth and geotechnical design parameters.

Excavations in both soil and rock materials are expected. Batter stability, particularly for access roads which will traverse steeper terrain, will need to be considered. Observations of existing batter cuts indicate that stable cut slopes will be achievable. Drainage may be locally required to control shallow seepages and maintain long term batter performance requirements.

A severe seismic risk is present in the region, as discussed above, and, as per building code requirements and recognised engineering practice, appropriate allowance should be made for seismic loading during detailed design of structures, foundations and earthworks.

Crushed sandstone will afford the highest quality site won aggregate for earthworks construction (engineered or controlled fill) based on crushing resistance. Blending of mudstone layers can also be suitable depending on the application and required project specifications.

Given the structure of the syncline the grading of sedimentary beds from north to south (perpendicular to bedding) could change relatively quickly over a short distance. Geotechnical rock parameters for design and aggregate quality for construction will therefore also change accordingly.

6 Conclusions

GeoSolve consider the proposed windfarm development and associated infrastructure to be feasible from a geotechnical perspective.

A regional seismic risk is present, as per the wider South Island, however no significant site-specific natural hazards have been identified that would preclude development, or which cannot be addressed by standard engineering assessment.

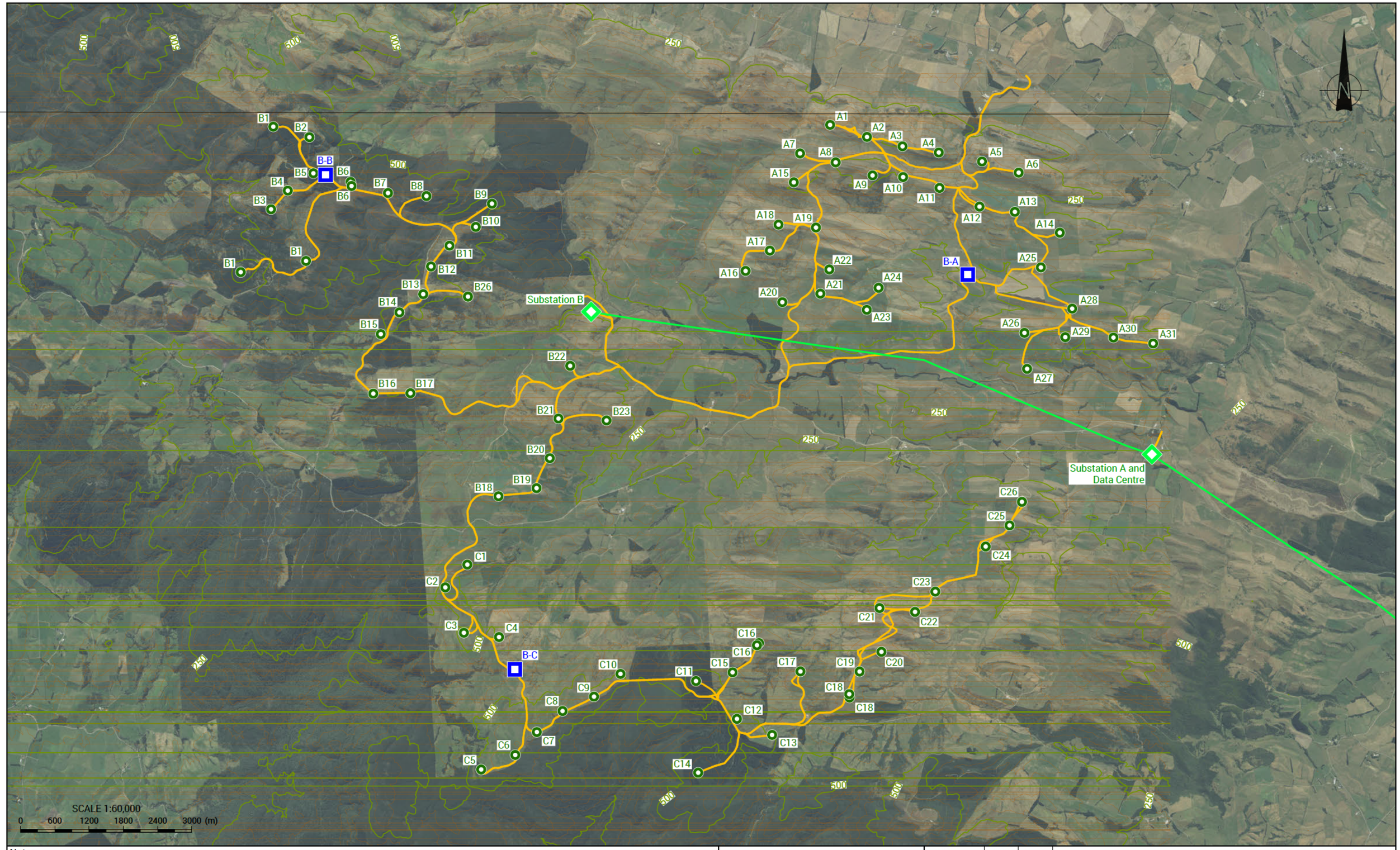
In general, no issues have been identified during our preliminary overview that could not be addressed by standard geotechnical engineering and assessment practice. In accordance with similar developments, specific geotechnical investigation and assessment will be required to complete the engineering design process and subsequent construction.

7 Applicability

This report has been prepared for the sole use of our client, Hokonui Hills Wind Farm Limited Partnership, with respect to the particular brief and on the terms and conditions agreed with our client. It may not be used or relied on (in whole or part) by anyone else, or for any other purpose or in any other contexts, without our prior review and written agreement.

Report prepared by:	Reviewed and authorised by:
.....	.....
James Stewart Engineering Geologist	Paul Faulkner Principal Engineering Geologist

Appendix A: Site Assessment Plans



Notes:
1. These drawings have been prepared for the benefit of Hokonui Hills Wind Farm Limited Partnership with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Legend:

- Proposed Turbine
- Proposed Batching Plant
- Proposed Road
- Lidar Contours, 50 m Minor, 250 m Major (Southland 1m DEM 2020-2024)
- Proposed Substation
- Proposed Transmission Line

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DRAWN	WCG	Mar.26
CHECKED	JAS	Mar.26
APPROVED	PGF	Mar.26

CAD File: 250801.dwg

Scale (at A3): 1:60,000

Project No.: 250801

Hokonui Hills Wind Farm Limited Partnership

Hokonui Hills Windfarm

Preliminary Geotechnical Inputs

Site Plan

Figure No.: Appendix A, Figure 1a

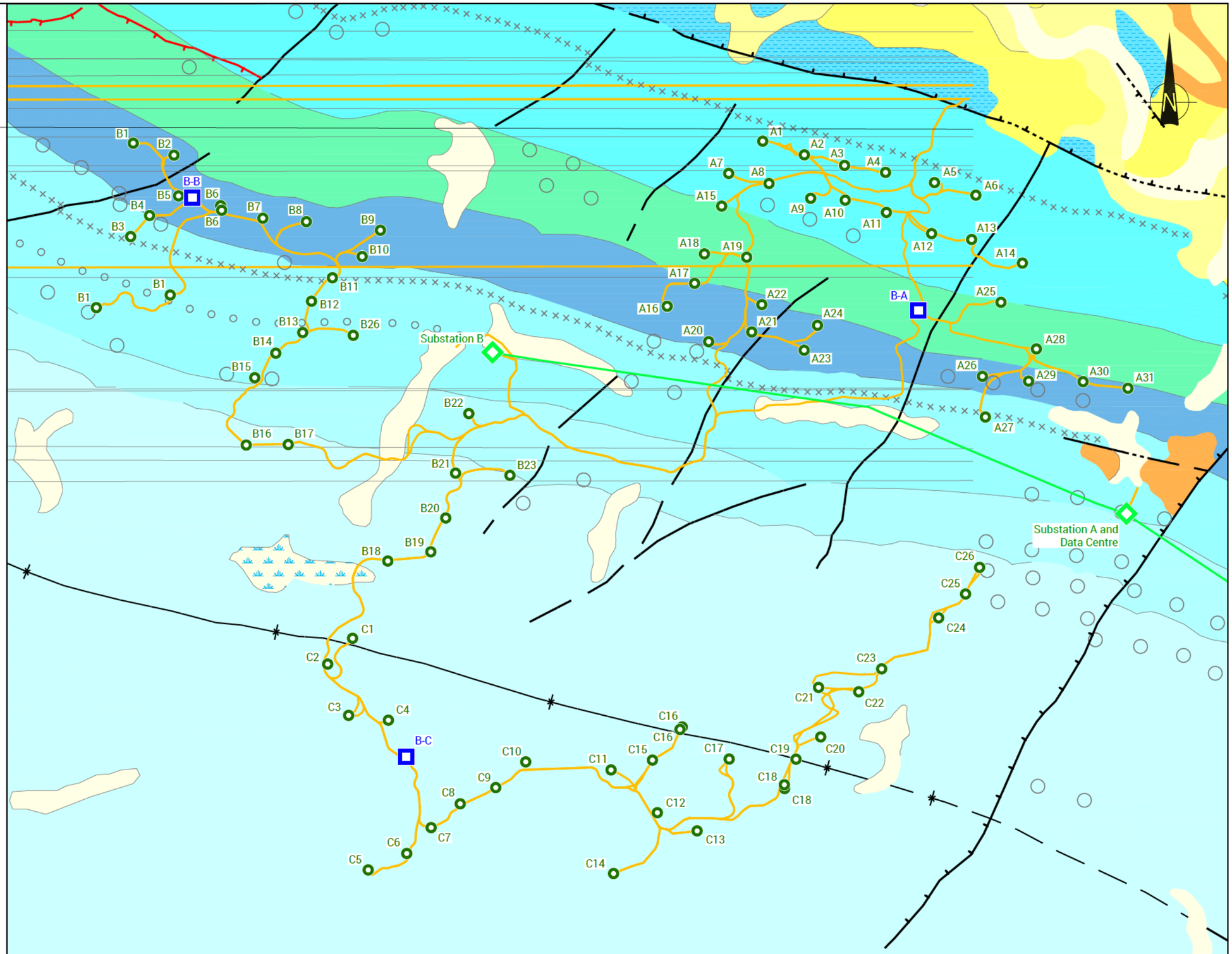
Revision: 0

Legend:

- Proposed Turbine
- Proposed Batching Plant
- Proposed Road
- Proposed Substation
- Proposed Transmission Line

GNS 1:250k Regional Scale Geological Mapping:

- Q1 OIS1 Holocene River Deposits
- Q1 OIS1 Holocene Swamp Deposits
- Q2 OIS2 (Late Pleistocene) Fan Deposits
- Q4, Q3, Q2 OIS4-OIS2 (Late Pleistocene) River Deposits
- Q6, Q7, Q8 OIS6 (Middle Pleistocene) River Deposits
- eJ Diamond Peak Group Sandstone
- lY, eTr Undifferentiated Maitai Group Siltstone
- lOl, eMi, mMi Gore Lignite Measures Sandstone (East Southland Group)
- lTr Taringatura Group Kaihikuan Sandstone
- mTr, lTr Taringatura Group Sandstone
- mJ Ferndale Group Sandstone
- mTr North Range Group Siltstone
- mTr Stag Stream Siltstone (North Range Group)
- Conglomerate Horizon
- Tuff Horizon
- Warepan Horizon
- Contact, Accurate
- Fold, Syncline, Accurate
- Fold, Syncline, Approximate
- Fault, Active, Accurate
- Fault, Inactive, Accurate
- Fault, Inactive, Approximate
- Fault, Inactive, Concealed



SCALE 1:60,000

0 600 1200 1800 2400 3000 (m)

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Geological Plan

Figure No.: Appendix A, Figure 1b

Revision: 0

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