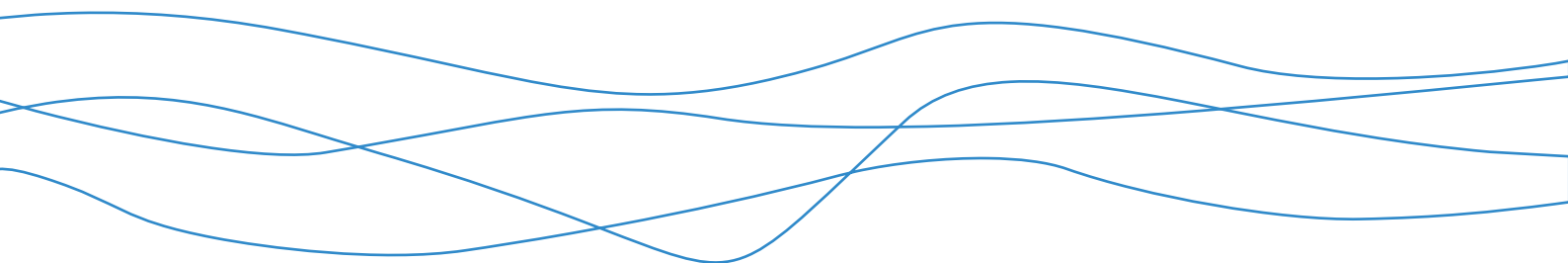




Bowdun Offshore Wind Farm, Onshore EIA Report

Volume 2, Appendix 10.1: Hydrogeological
Characteristics of Superficial and Bedrock
Geological Units

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Contents

List of Tables	iii
Glossary	iv
Acronyms	iv
Table of Units	iv
1 Introduction	1
2 References	6

List of Tables

Table 1.1: Summary of Key Desktop datasets and reports for Hydrogeological Characteristics of Superficial and Bedrock Geological Units.....	1
Table 1.2: Hydrogeological Characteristics of Superficial and Bedrock Geological Units and their Value/Importance	2

Glossary

Defined Term	Definition
Alluvial	Describes sediments that have been transported and deposited by running water.
Diamicton	Geological term used to describe unconsolidated and poorly sorted sediment that contains a wide range of particle sizes (from clay to boulders) supported in a fine-grained matrix.
Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Proposed Development may be experienced by the relevant receptors (i.e. Zone of Influence).

Acronyms

Acronym	Definition
BGS	British Geological Survey
SEPA	Scottish Environment Protection Agency

Table of Units

Units	Definition
%	Percent
km	Kilometre
L/s	Litres per second

1 Introduction

- 1.1.1 This Appendix identifies and discusses the bedrock and superficial deposits present within the Study Area for the onshore infrastructure of the Bowdun Offshore Wind Farm ('the Project'). The onshore infrastructure of the Project, landward of Mean Low Water Springs (MLWS), is referred to as the 'Proposed Development'.
- 1.1.2 This Appendix provides the hydrogeological characteristics of the geological units identified within the 1 km Study Area set out in Volume 1, Chapter 10: Geology and Ground Conditions, discusses the potential for groundwater connectivity using information adapted from the BGS Scotland 1:625,000 aquifer classification data (Scottish Government, 2025) and assigns a value/importance based on the criteria presented in Table 10.8 within Volume 1, Chapter 10: Geology and Ground Conditions.
- 1.1.3 Information sources used to identify the geological units present within the Study Area are summarised in Table 1.1.

Table 1.1: Summary of Key Desktop datasets and reports for Hydrogeological Characteristics of Superficial and Bedrock Geological Units

Title	Source	Extent	Year	Author
BGS Geoindex 1:50,000 Geological maps	https://mapapps2.bgs.ac.uk/geoindex/home.html	United Kingdom	2020	BGS
BGS Geoindex 1:625,000 Hydrogeology	https://mapapps2.bgs.ac.uk/geoindex/home.html	United Kingdom	2020	BGS
SEPA Water Classification Hub	https://informatics.sepa.org.uk/RBMP3/	Covers Scotland	2023	SEPA
Scotland's Aquifers and Groundwater Bodies	https://www2.bgs.ac.uk/groundwater/waterResources/ScotlandsAquifers.html	Covers Scotland	2015	O Dochartaigh, Macdonald and Ward
BGS Paper Hydrogeological Map of Scotland	https://largeimages.bgs.ac.uk/iip/hydro maps.html?id=scotland.jp2	Covers Scotland	1988	BGS

Table 1.2: Hydrogeological Characteristics of Superficial and Bedrock Geological Units and their Value/Importance

Geological Unit	Geological Characteristic	Hydrogeological Characteristic	Value / Importance
Superficial Deposits			
Raised Marine Deposits of Holocene Age	Gravel (shingle), sand, silt and clay; commonly charged with organic debris (plant and shell).	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	Medium
Alluvium	Alluvium is a general term for clay, silt, sand and gravel.	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	Medium
Alluvial Fan Deposits	Clay, silt, sand and gravel deposited by streams at the mouths of tributary valleys.	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	Medium
Peat	Peat is a partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.	Typically intergranular flow with low permeability. Usually comprises 90 % water and acts as an aquitard, limiting groundwater discharge. Permeability varies with the degree of decomposition and soil compression and often reduces with depth	Low
River Terrace Deposits	Sand and gravel, locally with lenses of silt, clay or peat.	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	Medium
Banchory Till Formation	Gravelly and sandy diamicton	Typically intergranular flow with varying permeability. Usually dominated by low permeability but can locally comprise productive sand and gravel horizons, which may yield limited amounts of groundwater, although groundwater abstraction is unlikely	Low
Drumlithie Sand and Gravel Member	Sand and gravel, red-brown, with clasts predominantly of Devonian sandstone, mudstone and andesite. Locally with lenses of silt and clay.	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	High

Geological Unit	Geological Characteristic	Hydrogeological Characteristic	Value / Importance
Lochton Sand and Gravel Member	Sand and gravel	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	High
Mill of Forest Till Formation	Sandy diamicton, red-brown with clasts predominantly of Devonian rocks.	Typically intergranular flow with varying permeability. Usually dominated by low permeability but can locally comprise productive sand and gravel horizons, which may yield limited amounts of groundwater, although groundwater abstraction is unlikely	Low
Raised Marine Deposits, Devensian	Gravel (shingle), sand, silt and clay; commonly charged with organic debris (plant and shell).	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	Medium
Till	Diamicton (poorly sorted sediment containing a range of particle sizes from clay to boulders).	Typically intergranular flow with varying permeability. Usually dominated by low permeability but can locally comprise productive sand and gravel horizons, which may yield limited amounts of groundwater, although groundwater abstraction is unlikely	Low
Ury Silts Formation	Laminated silt and clay, generally red-brown.	Typically intergranular flow with varying permeability. Usually dominated by low permeability but can locally comprise productive sand and gravel horizons, which may yield limited amounts of groundwater, although groundwater abstraction is unlikely	Low
Hummocky Glacial Deposits	Composed of rock debris, clayey till and poorly- to well-stratified sand and gravel.	Intergranular Flow, High to low permeability. Where sand/gravel layers are thick and continuous, groundwater yields will be high.	Medium
Bedrock			
North Britain Siluro-Devonian	Intrusive igneous rocks (no description available).	Flow is virtually all through fractures and other discontinuities. Small amounts of groundwater in	Low

Geological Unit	Geological Characteristic	Hydrogeological Characteristic	Value / Importance
Calc-Alkaline Dyke Suite		near surface weathered zone and secondary fractures.	
Cromlix Mudstone Formation	Characteristically soft, generally massive but often thinly laminated, poorly-sorted, fine-grained silty sandstones, sandy siltstones, siltstones and mudstones.	Flow is virtually all through fractures and other discontinuities. Locally yields up to 12 L/s in parts of Strathmore.	Low
Arbuthnott-Garvock Group	Sandstones, in places flaggy, with siltstones, mudstones and conglomerates and interbedded lavas, locally yield moderate amounts of groundwater.	Flow is virtually all through fractures and other discontinuities. Locally yields moderate amounts of groundwater.	Medium
Deep Conglomerate Formation	A pebbly and cobbly, well-rounded, clast-supported conglomerate of lava, psammite, quartzite and feldspar-porphyry in a matrix of poorly-sorted, fine-to medium-grained lithic sandstone, commonly with lenses of trough cross-bedded pebbly sandstone.	Flow is virtually all through fractures and other discontinuities. Locally yields moderate amounts of groundwater.	Low
Catterline Conglomerate Formation	A clast-supported conglomerate with clasts mainly of lava, but also containing psammite, quartzite, vein-quartz and feldspar in sandstone matrix	Flow is virtually all through fractures and other discontinuities. Locally yields moderate amounts of groundwater.	Low
Montrose Volcanic Formation	Andesite, basaltic andesite, other andesitic rocks, volcanoclastic conglomerate and sandstone.	Flow is virtually all through fractures and discontinuities. Small amounts of groundwater are present in the near surface weathered zone and secondary fractures.	Low
Crawton Volcanic Formation	Macroporphyrific shoshonite lavas, aphyric and microporphyrific olivine basalt and basaltic andesite lavas, tuffs and volcanoclastic sedimentary rocks.	Flow is virtually all through fractures and other discontinuities. Locally yields moderate amounts of groundwater.	Low
Whitehouse Conglomerate Formation	A massive, thickly bedded, or weakly cross-stratified, clast supported conglomerate, and pebbly sandstone.	Flow is virtually all through fractures and other discontinuities. Locally yields moderate amounts of groundwater.	Medium
Water of Dye Granite	Granite	Flow is virtually all through fractures and discontinuities. Small amounts of groundwater in near surface weathered zone.	Low

Geological Unit	Geological Characteristic	Hydrogeological Characteristic	Value / Importance
Dunottar-Crawton Group	Conglomerate, clast-supported, with angular to well-rounded boulders, cobbles and pebbles.	Flow is virtually all through fractures and other discontinuities. Locally yields moderate amounts of groundwater.	Medium
Cowie Sandstone Formation	A fine- to medium-grained, locally pebbly, lithic sandstone interbedded with minor conglomerate, siltstone, mudstone and acid lavas.	Flow is virtually all through fractures and discontinuities. Locally yields moderate amounts of groundwater.	Medium
Glen Lethnot Grit Formation	Mixed psammite, semipelite and pelite.	Flow is virtually all through fractures and other discontinuities. Yields small amounts of groundwater.	Low

2 References

Scottish Government (2025) British Geological Survey Scotland 1:625,000 aquifer classification data.

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