Gleann Astaile Dam - Design and Construction of a Geomembrane Lined Embankment Dam

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SYNOPSIS Gleann Astaile Reservoir was formed by raising a natural lochan to provide storage in support of a 2 MW hydropower scheme on the Isle of Jura, Scotland. The scheme was promoted by Inver LLP and is thought to be one of the largest privately developed hydropower scheme in the UK in recent times. The reservoir will have a storage volume of 0.7Mm³ and is impounded by a 9m high and 280m long earthfill embankment dam.

The geology at the site comprises Peat overlying Glacial Till and Quartzite bedrock - the Glacial Till being characterised by a silty-sandy gravel and cobbles. The lack of cohesive soil materials at the site meant that dam designs were based around artificial waterproof elements, including concrete core wall and geomembranes. Early contractor involvement was initiated by the Client to provide constructability, schedule and cost input at the conceptual design stage. An embankment dam incorporating an upstream geomembrane was ultimately selected on economic and constructability grounds.

The dam incorporates an upstream sloping HDPE geomembrane connected at the upstream toe via a concrete plinth founded on bedrock. The geomembrane was covered by a transition layer of fill and rip rap to provide greater protection against puncture and aging.

This paper describes the field investigation, design and construction of the dam and appurtenant works, with particular emphasis on the waterproof geomembrane works.