Digital Engineering at Cumbrae Slipway

USING BIM, 3D MODELLING AND 4D SEQUENCING TO IMPROVE PLANNING, STAKEHOLDER CONFIDENCE AND DELIVERY CERTAINTY ON A LIVE MARINE INFRASTRUCTURE PROJECT.

SPECIAL REPORT | Marine infrastructure • Digital engineering • Construction sequencing

Project	Client
Cumbrae Slipway Reconstruction	**Caledonian Maritime Assets Ltd**
Digital tools **BIM, 3D modelling and 4D sequencing**	**Core outcome** Improved planning, visual communication and risk control

EXECUTIVE OVERVIEW

The Cumbrae Slipway Reconstruction project shows how digital engineering can strengthen decision-making when it is introduced early in the project lifecycle. By developing a detailed 3D model and connecting it to programme sequencing, George Leslie created a practical visual planning tool for a complex ferry-terminal environment.

The approach helped communicate construction methodology, temporary works interfaces and operational constraints more clearly than drawings alone. For an engineering audience, the value was not simply visualisation; it was the ability to test, explain and coordinate project activity before and during delivery.

PROJECT CONTEXT

Cumbrae Ferry Terminal is a strategically important marine asset serving one of CalMac's busiest routes. The existing slipway, originally constructed in the 1970s, required replacement to support future vessel requirements and improve long-term resilience.

The scope included a larger slipway, upgraded passenger and marshalling areas, foundations for terminal facilities, coastal protection, drainage and utility improvements. The works also required careful management of live ferry operations and protection of a critical Scottish Water main passing through the site.

Engineering challenge
Deliver new marine infrastructure in a constrained coastal setting while maintaining ferry service resilience, managing public interfaces and coordinating critical buried services.

DIGITAL APPROACH

A geometrically accurate 3D model was created to represent the proposed slipway and surrounding infrastructure. This model allowed the project team to interrogate the relationship between permanent works, temporary works, utilities, access routes and marine operational constraints.

4D sequencing connected the model to the construction programme, translating activity logic into a time-based visual simulation. This supported planning workshops, stakeholder briefings and method reviews by showing how the works would progress across key phases.

Engineer's note
The principal benefit was the creation of a shared visual reference that linked design intent, sequencing, access constraints and operational interfaces in one coordinated environment.

DELIVERY VALUE

The model improved understanding of a complex marine construction sequence being delivered beside live ferry operations. It enabled the team to communicate phasing, temporary arrangements and construction interfaces in a format that was accessible to technical and non-technical stakeholders.

For the project team, the digital approach supported earlier identification of constraints, clearer discussion of buildability and stronger alignment between design, planning and site delivery. For the client, it provided greater confidence in how the works would be delivered while preserving operational continuity.

OUTCOME AND FUTURE VALUE

The Cumbrae Slipway Reconstruction project demonstrates how BIM, 3D modelling and 4D sequencing can turn complex technical information into an effective engineering and communication resource. Beyond construction planning, the model creates a foundation for future asset information management, helping extend digital value beyond the delivery phase.

Key takeaway: Early digital engineering improved project understanding, strengthened stakeholder engagement and supported more confident planning for a constrained live marine works environment.

GEORGE LESLIE