

Nature-based solutions reusing Scottish canal sediment for topsoil and sand in a circular economy

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Presentation outline

- Bio-conditioning of dredged lowland canal sediment – Bowling Basin case study
- Recovery of aggregates from dredged Caledonian Canal sediments – Laggan case study
- Lessons for nature based solutions

Case study 1 – Bowling Basin, Dumbartonshire

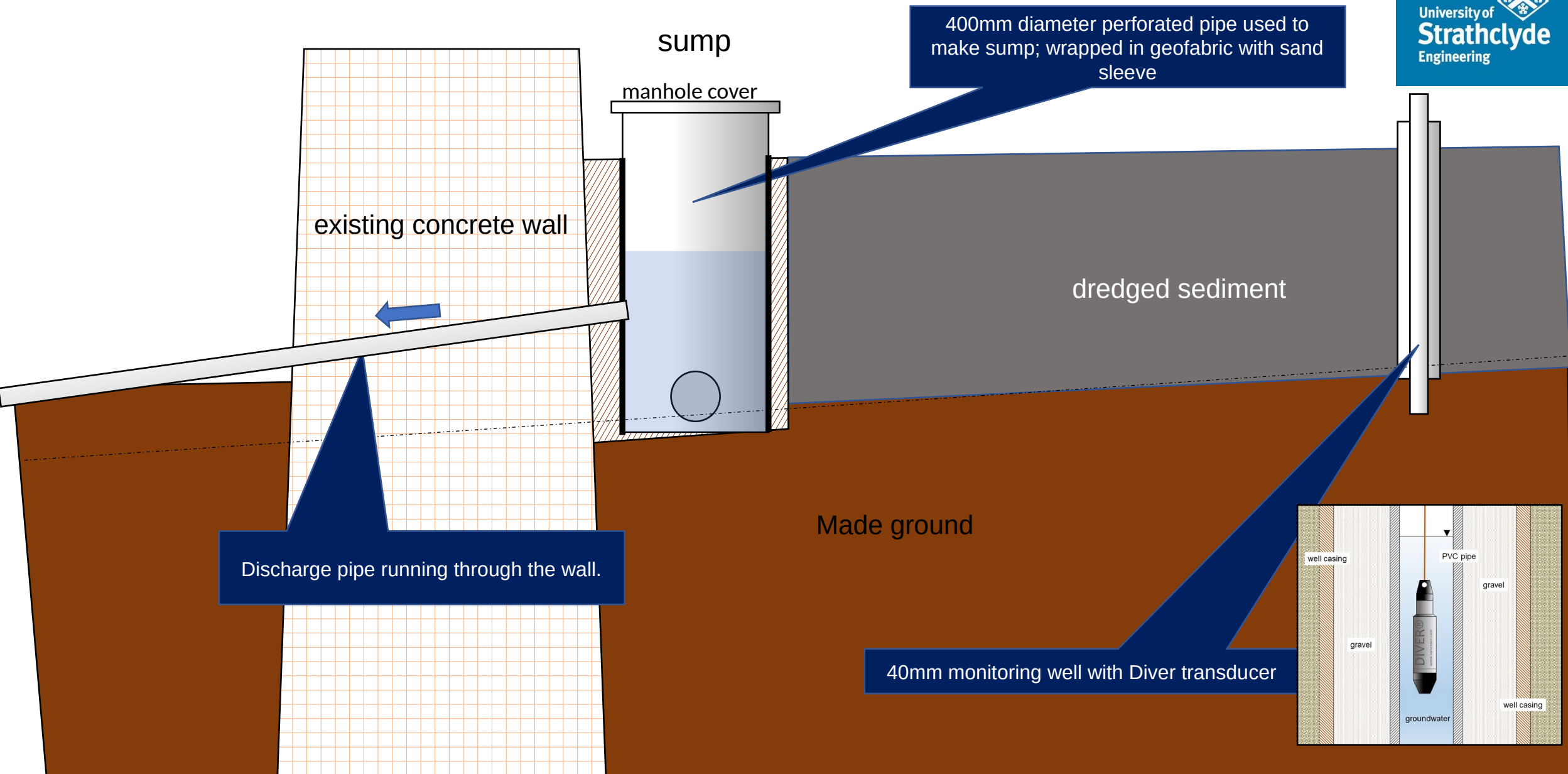




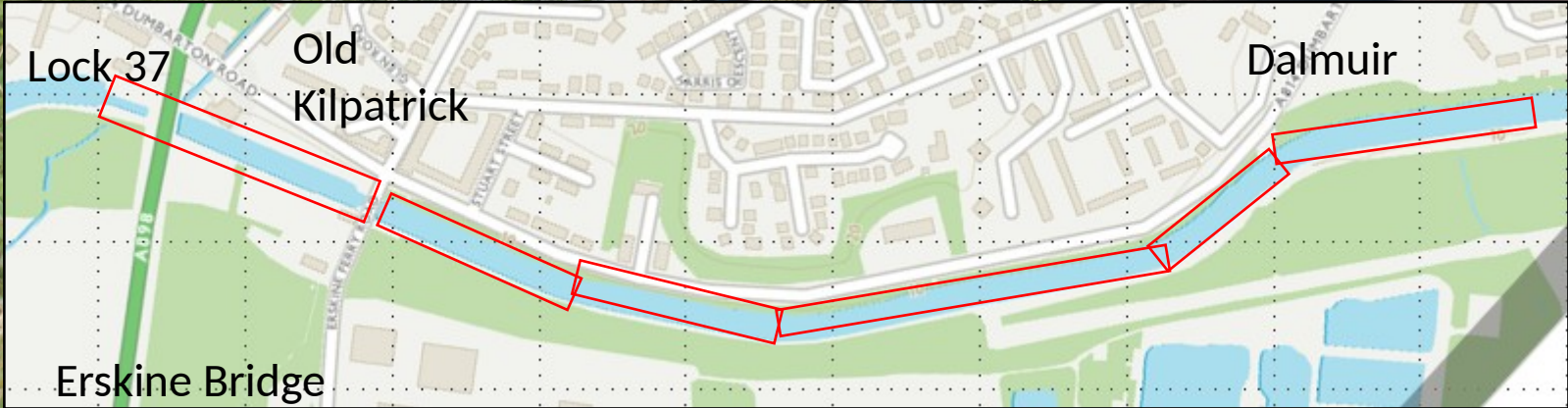
Design of treatment cell



Design of treatment cell



Forth & Clyde dredging





Earthworks to create basin




Partially filled with dredged sediment



Basin lined with geofabric and wells installed



Complete

A worker wearing a white hard hat and an orange safety vest is operating a black front loader. The loader is positioned in a large basin filled with dark grey sediment. The basin is bordered by white plastic sheeting. In the background, there are green trees and a fence. The scene is outdoors during the day.

Sediment placed into basin from Sept 2 – 19, 2020

GG6 Banks seed mix, 35g per m³

Capriccio	Chewings Fescue	25%
Herald	Strong Creeping Red Fescue	60%
Canon	Flattened Meadow Grass	10%
Highland	Browntop Bent	5%

with 6-9-6 fertilizer, 40g per m³

2 x annual rye grass mix,
Italian & Westerwolds
varieties; 35g per m³

Grass seed sown Sept 29th; visible growth by Oct 22nd.

Erosion issues



Site looking west towards harbour



Exposure of harbour wall through erosion



Site looking northeast towards canal



Erosion of the bank



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Partially filled with dredged sediment



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SOIL THAT TELLS A STORY!

The grass you see here may seem unremarkable, but its soil is pretty special! This soil was created out of material dredged from the Forth & Clyde Canal.



Historically, dredged material is classified as a waste product and must be disposed of either in a landfill site or dumped back into the Forth & Clyde Canal. In 2015, with the intention of making Europe's largest canal project a greener one, design teams set out to explore how dredged material can be used to create the greenest project of its kind.

The solution was to use dredged material to create a 'soil' that could be used on the banks and in the middle of the canal. This soil is known as 'dredged soil' and is made up of a mix of dredged material and compost. It is a 'soil' that tells a story of how the canal is being made greener.

WILD SCIENCE IN ACTION

Circular economy

A circular economy is one that produces no waste and pollution, by design or otherwise. It keeps products, parts and materials at their highest use and value at all times. It does this by continuously reusing, repairing, refurbishing and recycling materials to extend their life cycle.

The Scottish Government has developed a strategy to reduce waste and meet the targets for a circular economy. Construction projects for a half of all new roads that are planned in Scotland will be required to use recycled materials for some of their roads. By reusing materials for some of their roads, Scottish Canals is helping to reduce the impact of materials on the environment and contributing to the creation of a circular economy.




MACKENZIE
STATE OF THE WATERSHED

Interreg 
North-West Europe
SURICATES Project

Project objectives: beneficial reuse of dredged canal sediments for erosion control and flood protection.

Co-funded by the
European Union

 Scottish Canals 

www.interreg.eu



2021 Pilot study – Laggan, Caledonian Canal



Laggan Spout



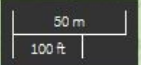
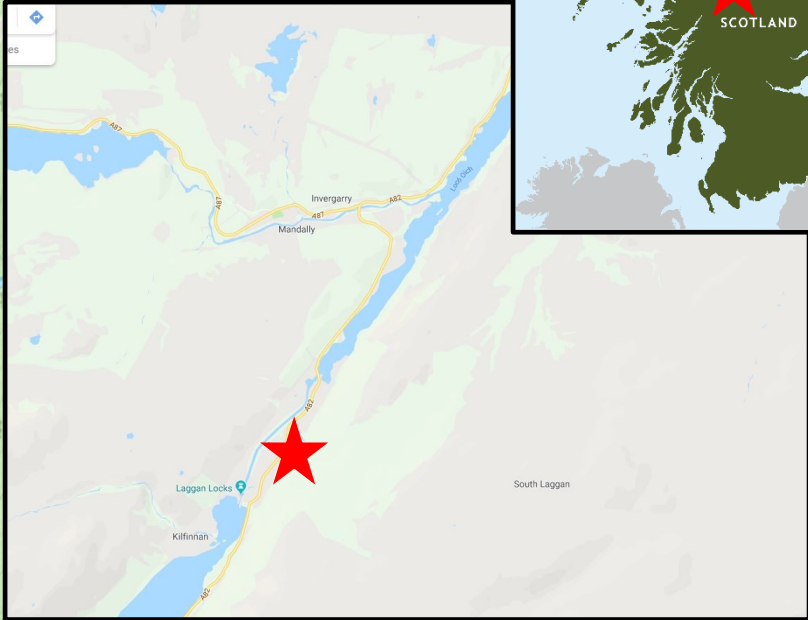
Project overview

- The Caledonian Canal, operated by Scottish Canals, runs through the Great Glen from Fort William to Inverness.
- The Allt an Laggain stream enters the Caledonian Canal at the Laggan Spout, north of the Laggan Locks at the north end of Loch Lochy.
- Gravel, sand, and silt deposited by the stream has formed a deltaic sediment fan that is impeding navigation on the canal.
- In 2021, approximately 11,000 cubic metres of sediment from the canal were suction dredged and placed into constructed cells.
- The design of the cells sorted sediment into different size fractions using gravity, which will be reused for construction projects in the area.

Sediment fan in the Caledonian Canal

...it should be
4.5 metres in
depth at this
point

Laggan Spout Site Map





A82



Suction dredging by Royal Smals, with pipeline to cells

Initial sediment screening

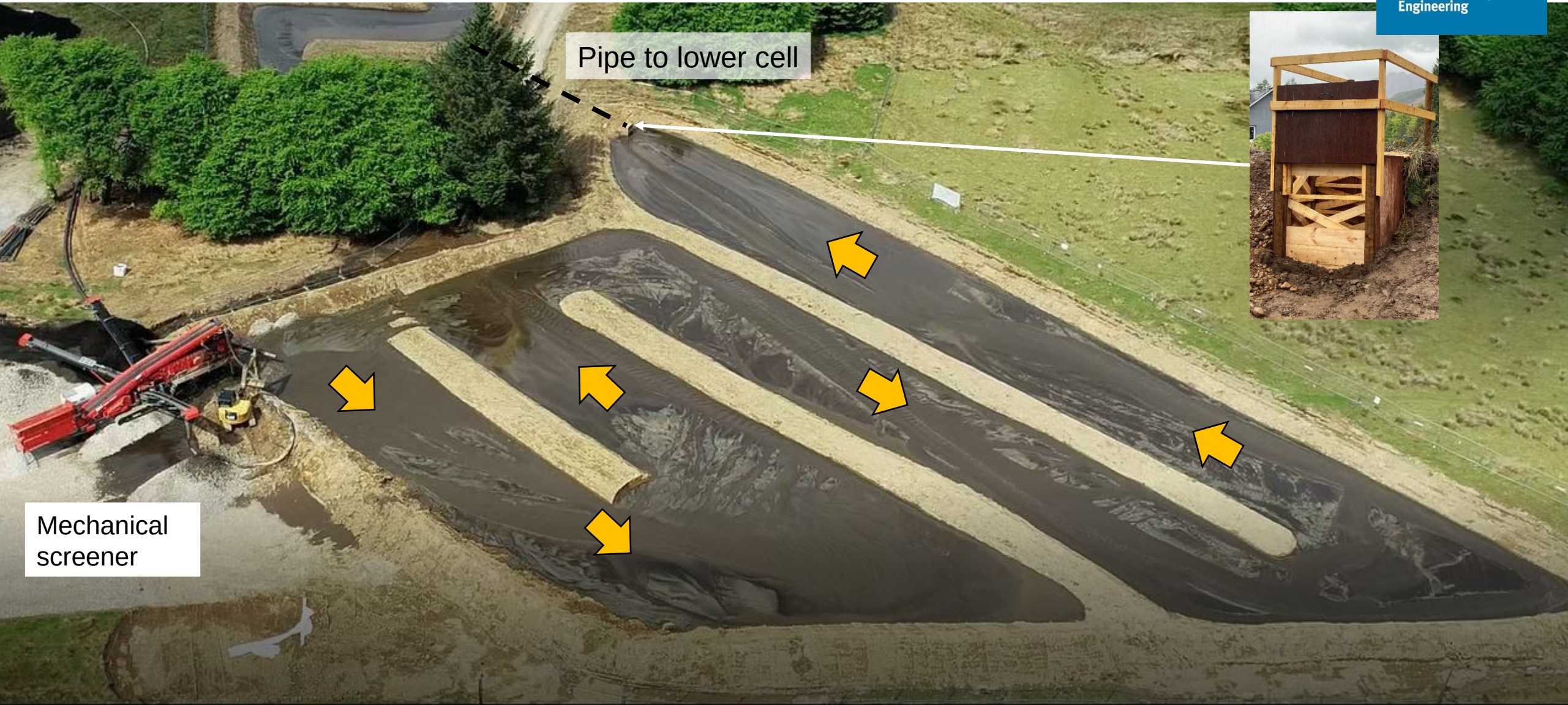


Screening to remove cobbles and gravel



Sand and finer fractions to the cells.

Upper cell



Pipe to lower cell

Mechanical
screener



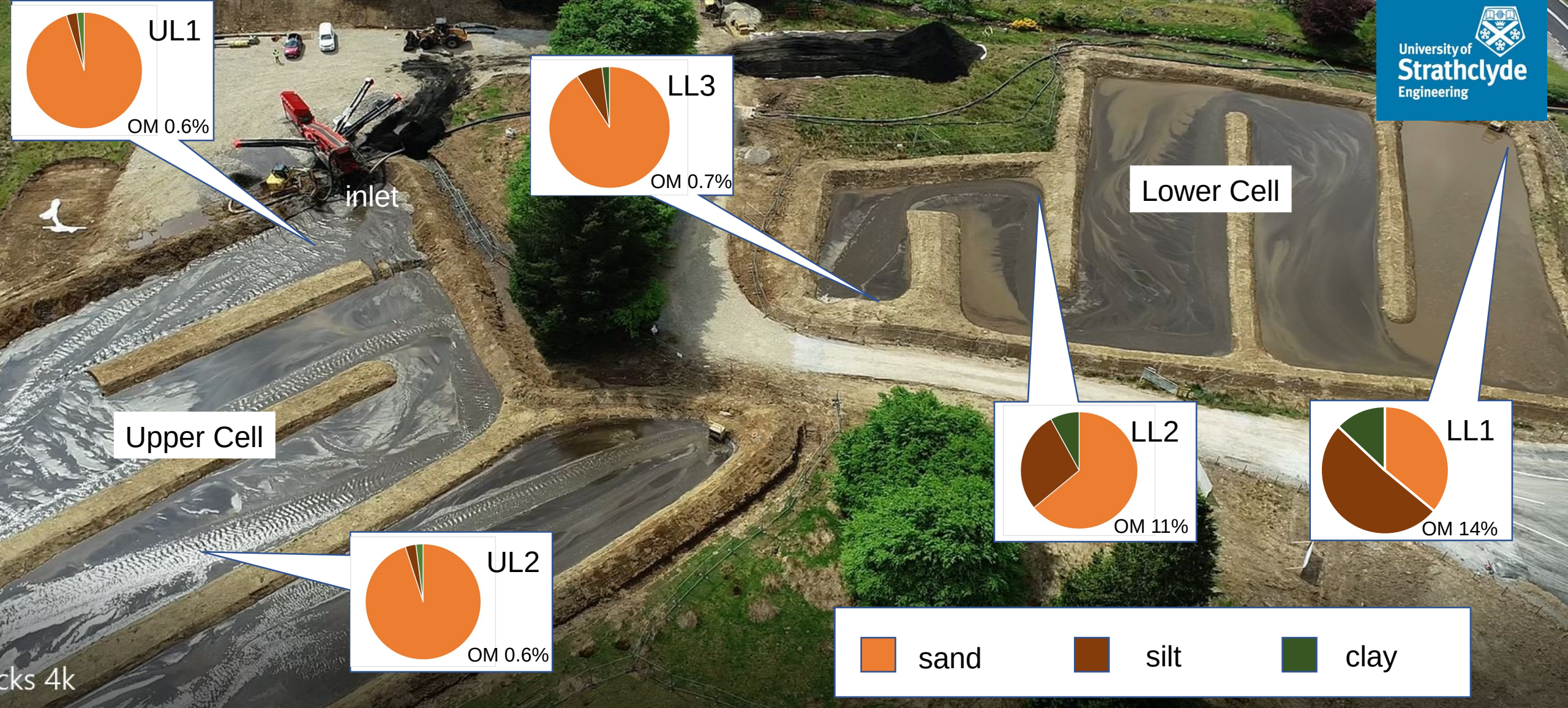


Lower cell





Laggan – Sediment Particle Size Distribution



Samples collected 7th June 2021

Sediment recovery



Sediment recovery

Upper cell

Fraction	Size	Source	Volume (dry)	Reuse
Large cobbles	>50mm	Screeners	25 m ³	Drainage
Medium cobbles	>20mm	Screeners	70 m ³	Drainage
Gravel	>2mm	Screeners	300 m ³	Drainage
Coarse organic fraction	>2mm	Screeners	655 m ³	Mixed with fines in lower cell
Coarse sand	<2mm	Upper cell	5,750 m ³	A82 upgrade

Lower cell

1,800 m³ of sand, silt and clay. Mixed with the coarse organic fraction and graded in-situ for agricultural improvement. Meets BS 3882:2015 specification for topsoil.

Beneficial sediment reuse outcomes



Proposed A82 road re-alignment - Laggan

- Cobbles will be used for drainage on the proposed A82 road alignment (~2024), with the aggregates used for embankment grading.
- Fine silt was mixed with the organic fractions and used to improve the arability of the field.
- Sand and gravel will be used to make concrete blocks to reduce erosion along the banks of Allt an Laggain.

Concrete made from the dredged sediment



30kg concrete block for retaining wall –
flood control



1600mm long concrete 'lego' block

Questions?



Photo credit: Scottish Canals

Questions?