

# Scour and River Bank Protection in the United Kingdom

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### Introduction

The United Kingdom has seen over the last several years some significant storm events. Storm Desmond broke the United Kingdom's 24-hour rainfall record, with 341.4 mm of rain falling at Honister Pass, Cumbria, on 5 December 2015.

Storm Desmond was an extratropical cyclone and the fourth named storm of the 2015–16 UK and Ireland windstorm season. Desmond directed a plume of moist air, known as an atmospheric river, which brought record amounts of rainfall to upland areas of the UK and subsequent major floods.

There was major disruption to rail services in the north of England and in Scotland on 5 and 6 December, affecting services operated by Abellio ScotRail, First TransPennine Express, Northern Rail and Virgin Trains, as well as the Caledonian Sleeper. As a result of flooding and landslides along the West Coast Main Line between Preston and Carlisle, all services between northern England and Scotland via the WCML were suspended on 6 December, with passengers advised not to travel.

Dozens of domestic, UK and international flights were cancelled at Dublin Airport on 5 December due to high winds, severely affecting carriers such as Aer Lingus and Ryanair.[41] Strong crosswinds caused difficult conditions for landing aircraft at many airports, including Leeds Bradford Airport,[42] although many UK airports escaped significant disruption regardless. A 200-year-old bridge in the Isle of Man collapsed amid severe flooding

This has resulted in Projects for both protection and repair on major rivers in the North West of England. Increase urbanization has also meant new schemes to protect residential developments for a minimum of a 100 year storm event, but for critical pieces of infrastructure up to 1 in 1,000 years

### Eden Brow

In February 2016, a 500,000 ton landslip closed the Carlisle to Settle railway near Armathwaite. The damage occurred following Storm Desmond which devastated Cumbria and hit other parts of the UK in December 2015.

This site had a complicated history. It is located between two geological faults and during the construction of the railway in the late 1800s, a failure occurred which 'pushed the river into the next Parish'. This historic landslide was 'reactivated', causing movement around 15 meters deep between the River Eden and the railway. The railway line is located 200 meters away from the river and 60 meters above it.

The Engineering works involved in the repairing of the historic railway involved:

- 1 mile of access roads installed
- 16000ton of spoil removed from site
- 95m long x 4m high retaining wall installed
- 6000ton of backfill installed
- 490m of track reinstalled and 2400m of track re-aligned with slues up to 400mm

## **River Mersey**

To the south of this the Environment Agency submitted a planning application to Warrington Borough Council to construct a Flood Risk Management Scheme (FRMS). The proposed FRMS would reduce the risk of flooding to people, property and the environment to a to 1% chance of flooding in any one year to areas of Warrington, Cheshire.

A new flood wall would be built to the rear of properties along Weir Lane/Edward Gardens up to a height 1.4m above ground level with pedestrian access to riverside footpath via new steps and new close boarded fencing to a height of 1.8m above ground level to provide security to properties. The new flood wall would run along the riverside track south of the disused New Cut Canal at a height of 0.4m to 0.93m above ground level with access steps and vehicle floodgate to reinstate paths. A short length of flood embankment, to a height of 0.87m to 2.08m above ground level would be constructed within open ground adjacent to Woolston Weir with ramps to reinstate paths. Chapter 2 – Background to the Proposed primary author will attest that any people named as coauthors have seen the final version of the extended abstract and agreed to its submission for publication.

## **Geosynthetic Requirements**

In both cases working space at the riverside was limited, and the embankments first required excavation in preparation for placement of separation and filtration layer, prior to final installation of rip rap and rock armour. With operating space at a premium, and as an alternative to the labor-intensive, high-cost installation of a conventional granular filter layer, AECOM, at Eden Brow and the Environment Agency at Warrington proposed a geosynthetic solution, and specified a non-woven, needle-punched geotextile, which is designed specifically for separation and filtration in hydraulic engineering applications. Fines are allowed to migrate and build up a filter behind the geotextile, yet the extremely robust material can be covered directly with stone, and ensures long term scour protection.

Supplied on 4.8 meter wide rolls, the geosynthetic was simply rolled out, in-situ, using an excavator with spreader bar attachment. Due to its integral sand ballast layer the geosynthetic exhibits negative buoyancy and can be placed into water and rolled out into the anchor trench even with the limited space available at the riverbank, the contractor installed the geotextile layer with relative ease.

## **CONCLUSION**

The presentation will show the ease and cost savings achieved for an installation in relatively high energy environment.