A FLOOD DEFENCE WITH OFFSETS AIMS TO GROW THE AVONMOUTH ECONOMY

ASEA's new, hybrid glass-panel sea defences on the Severn

The west of England's largest ecology mitigation and flood-defence project is taking shape in Avonmouth. **Ursula Stevenson** has a progress report

Since spring, birds and other wildlife have been sheltering in more than 80 ha of new wetland habitats along the Severn Estuary, equivalent to 112 football pitches.

The wetlands are part of Avonmouth Severnside Enterprise Area (ASEA) Ecology Mitigation and Flood Defence project. The biggest scheme of its kind ever in the west of England demonstrates how better flood protection can also boost nature and wildlife.

The project area stretches along the estuary from Aust in South Gloucestershire to Lamplighter's Marsh in Bristol. It takes in ASEA, a designated enterprise area that includes Avonmouth, one the largest brownfield sites in Europe.

In a delicate balancing act between climate and commerce the Severn Estuary, with its uniquely rich biodiversity, is a close neighbour. It is protected by high-level designations including Ramsar wetlands, a special protection area (SPA) for birds and several sites of special scientific interest (SSSIs).

The Severn Estuary has one of the highest tidal ranges in the world. But that can also be challenging for flood risk. As Environment Agency senior flood and coastal risk-management advisor Colin Taylor explains: "Before we started construction the existing tidal flood defences were not at a consistent level, meaning there were areas at risk of flooding.

"As climate change continues to drive sea-level rise, the risk will increase to the communities along the Severn Estuary. Without significant improvements to flood defences, much of the area would be inundated in the event of a one-in-200-year – ie, a 0.5 per cent annual exceedance probability (AEP) – flood over the coming decades."

The tidal flood defences were last improved significantly in the 1990s. But flood-defence techniques have advanced. The £80 million ASEA project is a major

upgrade, combining flood-defence structures to suit each location.

These include earth embankments where space is available, sheet pile walls (steel sheets driven directly deep into the ground), precast concrete units and glass panels where space is more limited. The existing outfall structures are being improved too, new flood gates offering continuous flood defence.

Once complete in 2026-2027, the project will provide 17km of new and improved flood defences, to reduce flood risk for around 2,500 homes and businesses over the scheme's lifetime. The project should also boost the regional and national economy, supporting development within the ASEA. This aims to unlock 12,000 new jobs by 2026.

FUNDING

Most of the project funding comes from the West of England Local Enterprise Partnership Economic Development Fund, administered by West of England Combined Authority. Other backers include the Department for Environment, Food and Rural Affairs (Defra) and Wessex Regional Flood and Coastal Committee.

A partnership between South Gloucestershire Council, Bristol City Council and the Environment Agency is delivering the project. They initiated the project in 2015, fusing two goals; better flood defences and ecological mitigation for the enterprise area. Partnership working enables experts from across the three organisations to advise the project, including ecologists.

Better flood protection, done sensitively and in tune with the surrounding environment, can go hand-in-hand with ecological mitigation

The partnership has a strategic directors' board representing the partners and West of England Combined Authority. The ground rules are set out in a collaborative working agreement and a legal agreement shaping information-sharing and effective partnership.

Including the two local-planning authorities supports joined-up working. However, the scale of the project has made planning applications complex and challenging.

These were submitted to both councils in 2018. The proposals required an environmental-impact assessment and, reflecting the potential impacts on European protected sites in the Severn Estuary, a habitats-regulation assessment.

The scheme also required consents from the Marine Management Organisation, environmental permits from the Environment Agency, agreements from Network Rail and protected-species licences from Natural England.

CREATING NATURAL REFUGES FOR WILDLIFE

An ASEA hibernaculum

THE ASEA PROJECT has created a network of natural new refuges for local wildlife as part of its work on wetlands at Northwick. The refuges are made from grass, mud and other natural materials.

Also known as hibernacula, they make a warm, moist and safe habitat for great crested newts, other amphibians, reptiles and insects. Hibernacula create well-stocked larders, attracting earthworms, slugs and spiders on offer, and provide protection from predators.

During winter, the hibernaculum offers a safe place for hibernation. But hibernacula are useful at other times of year too. They offer shelter for breeding and from hot weather. The network at Northwick will give animals safe passage from the refuges to other areas. The hibernacula are an important part of the project's work to create and provide locations for wildlife to thrive.

The consenting process continues. Design tweaks and value engineering along the project route trigger new applications for variations to planning conditions and Marine Management Organisation and Environment Agency flood-risk permits.

PROGRESS

Bristol City Council granted planning permission in 2018 and South Gloucestershire Council in 2019. The project then appointed BAM Nuttall Mott MacDonald (BMMJV) as joint venture contractor to undertake the detailed design of the flood defences and construction.

Site mobilisation began that year starting with ecology and land surveys, ground investigation and vegetation clearance. Work started on site in 2020 at Northwick and Passage Road in South Gloucestershire.

The project has progressed, despite the pandemic. All earthworks have been completed, including a substantial embankment between Cake Pill and Chestle Pill in South Gloucestershire.

Earth embankments make up around half the total flood defences, as natural defences that respect the existing environment and reduce the project's carbon footprint. However, this doesn't suit smaller, more confined locations. Here, other techniques such as precast concrete flood-defence units, work better.

Pre-cast concrete units have been installed as flood-defence walls to protect the residential area north of Severn Beach and will be installed south of Severn Beach. Pre-cast units are less disruptive than having to pour concrete directly on site.

February brought a new milestone when works started in Bristol's port area at Avonmouth and at Lamplighter's Marsh to the south. A sheet-piled wall flood defence has been constructed north of Avonmouth, in Chittening.

The new wetlands at Northwick in South Gloucestershire and Hallen Marsh in Bristol are nearly complete. To enable ASEA's economy to grow without adverse effects on the Severn Estuary, the project provides ecological mitigation, through the newly created wetland habitat.

The habitats are designed for wildlife, attracting waders and ducks including

BABY OWLS AT HALLEN MARSH

ECOLOGISTS WORKING ON the project last summer discovered three barn owl chicks at Hallen Marsh, north of Bristol. Lead ecologist Kath Thorne and ornithologist Ed Drewitt found the feathery trio nesting in one of two boxes they had installed.

"We installed the owl boxes away from our new wetlands working area in disused buildings and a nearby tree so they could nest without being disturbed," Thorne says. "We are all so pleased and excited that the owls have successfully raised these three chicks."

Having ringed, weighed and determined the chicks' age, the ecologists sent the data to the British Trust for Ornithology.

the European white-fronted goose, shelduck, gadwall, dunlin, redshank, wigeon, teal, pintail, pochard, ringed and grey plover, curlew and whimbrel.

The wetlands are formed from a new network of ponds and scrapes, shallow water that dries up in summer. Wetland birds use the scrapes to feed and rest at high tide when the mudflats and saltmarsh in the Severn Estuary are submerged.

To create the scrapes, the project team reprofiled the land and worked with the natural drainage system to trap rainwater. Soil dug out for the wetland will be used elsewhere, building up earth embankments.

Wetland birds avoid areas with large trees that provide roosts for their natural predators. Wetland grasses have been planted to give the birds the habitat they need when the high tide has covered the mud flats where they feed.

The project aims to boost nature and wildlife in other ways, minimising the impact of the work on existing species. Ponds have been created for great crested newts in Northwick Marsh and behind the flood defences near Pilning.

A replacement holt ensures that otters can continue to use an established commuting route. At Northwick the project has created a network of natural new refuges for local wildlife.

Several of the new flood-defence walls have built-in oak habitat shelves for plants. Natural materials such as oak create a better, more sustainable habitat as they suit small amounts of natural planting and because invertebrates prefer them. The project team has installed more than 100 bat boxes and two barn owl nest boxes across the project area.

There is still more to do including the stretch of defences between Avonmouth and Lamplighter's Marsh and improving various outfall structures.

The project's objective is to ensure a thriving environment for people and for wildlife, this century and beyond. We are already proving that better flood protection, done sensitively and in tune with the surrounding environment, can go hand-in-hand with ecological mitigation to boost nature and wildlife.

Ursula Stevenson is client representative for South Gloucestershire Council and Bristol City Council