Beachbuoy

How we model the impact of storm overflow releases on our bathing waters

WATER for LIFE®

from **Southern Water**®

Contents

Summary

In September 2022 we made some significant changes to the way Beachbuoy works and how you interact with it, making it more accurate and easier to use.

Previously if any of the outfalls associated with a bathing water released in storm conditions, this would have triggered a status change of the bathing water icon. The status changed regardless of whether there would be an impact to bathing water quality. Many Beachbuoy users told us they would like to better understand if the release would actually impact bathing waters or not.

Going forward Beachbuoy will take the location of the outfall, the tidal conditions and release duration into account to determine whether bathing water will be affected. But importantly storm overflow releases will still be indicated on the map (bathing water pop up) and in the history table.

This document provides an outline of how we use coastal modelling. It explains how we calculate the influence of the tide to establish whether a bathing water is impacted by an outfall release for particular tidal conditions. It also illustrates the new user interface enhancements and explains how they work.

Coastal modelling

Tidal models are used to understand how an outfall release is moved with the tide and wind (advection) and how it spreads (dispersion).

The models have been robustly checked against survey data (tidal levels, current speed and direction and dye tracing). This means that we can be confident that the model is performing in the same way as the movement and dispersion of the plume from the release as it would in real time.

We have gathered comprehensive data about historic releases, their volumes and tidal effects. This data has been modelled by independent specialists Atkins who have calculated which outfalls have the potential to impact upon bathing waters.

In order to determine which overflows have the potential to impact each bathing water, we apply the following process:

- Include overflows which release within the tidal influence of the bathing water.
- Include overflows which discharge into rivers that may influence coastal bathing water quality.

The modelling has been undertaken for each of the 84 bathing waters in our area.

Due to the dynamic nature of tides and the varying volumes of releases, a discharge from an overflow may not impact the associated bathing water. Beachbuoy uses the tidal state and release duration, in conjunction with our coastal modelling, to determine whether any given release may be impacting or not.

Dynamic outfall mapping

The duration of a release and the tidal conditions at the time can have a significant influence on whether that release has the potential to impact on a particular bathing water.

When Beachbuoy initially went live, a release from any associated outfall would trigger a status change to the bathing water, regardless of the prevailing tidal conditions. However, this was an extremely cautious approach.

Following feedback from users and other stakeholders, we commissioned independent hydrological specialists Atkins to refine our tidal modelling to reflect the tidal influence on releases from every outfall with the potential to impact bathing water at key tidal states.

For each outfall 1-, 3- and 12-hour duration discharges have been modelled for High Water Neap, High Water Spring, Low Water Neap and Low Water Spring tides. This provides 12 different

tidal conditions per outfall and has resulted in approximately 2,000 tidal models which have been uploaded into Beachbuoy.

An example of how tidal models are used to determine bathing water impact can be seen on pages 4 and 5.

The images on the following pages show the 12 tidal states modelled for 1-, 3- and 12-hour discharges at an outfall.

These images demonstrate that the dispersal pattern and extent vary significantly depending on the tidal conditions and duration.

Dynamic outfall mapping (continued)

The tidal modelling has been carried out in accordance with the Foundation for Water Research's standards for calibration and validation of hydrodynamic models.

Our tidal models are developed using the Mike21 software DHI (**mikepoweredbydhi. com**) which solves the complex 'Navier-Stokes' equations that underpin them.

MIKE21 is a professional software package of high reliability, quality and versatility for 2D modelling of hydrodynamics, water quality and ecology.

Our models have been calibrated and validated against measured data including:
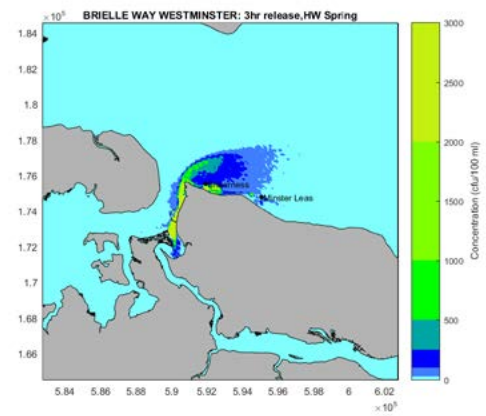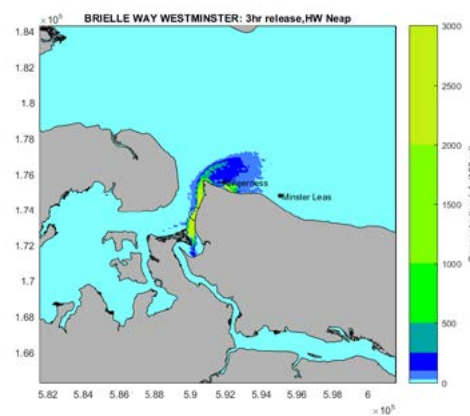
- **Tidal elevation**
- **Current speed**
- **Current direction**
- **Drogue track**
- **Dye tracing**

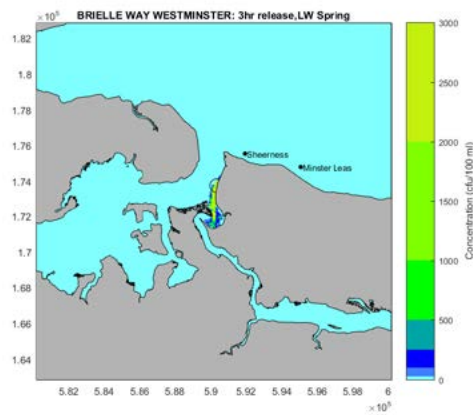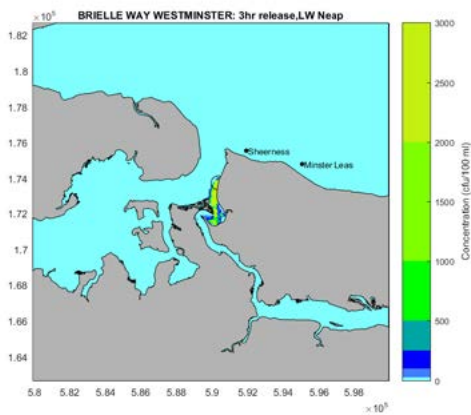An explanation of drogue tracking and dye tracing can be found at **CHETN-VI-37.pdf (dren.mil)**
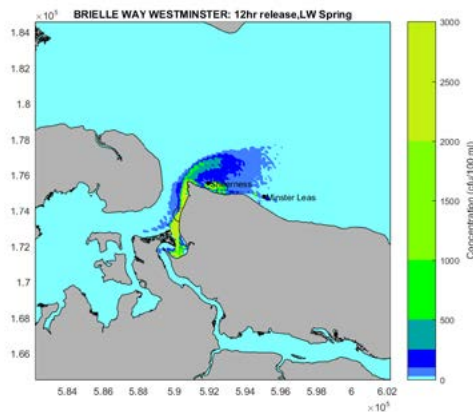
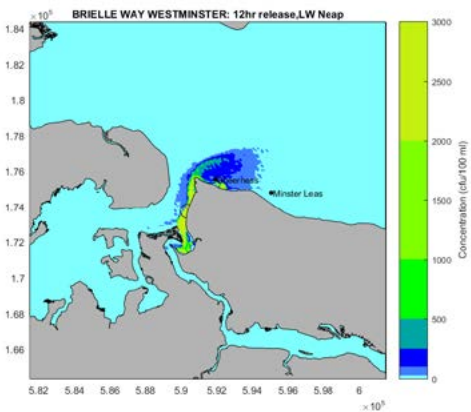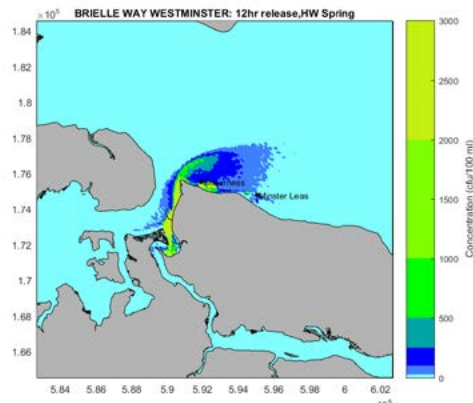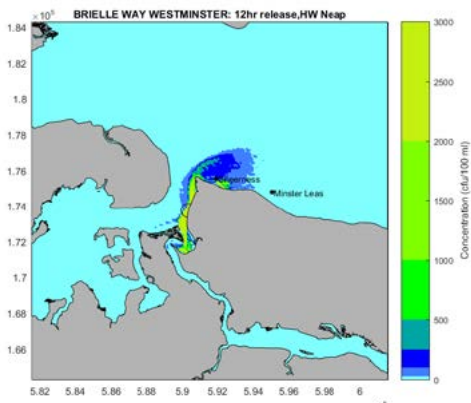## 1-hour discharges at an outfall
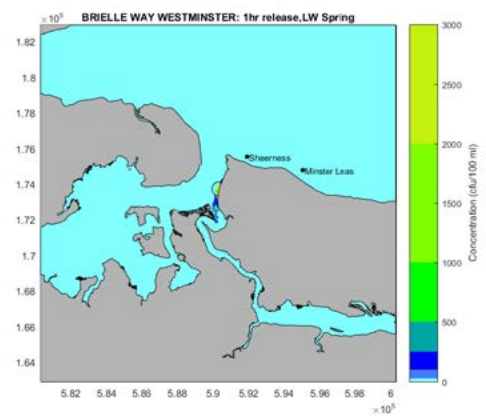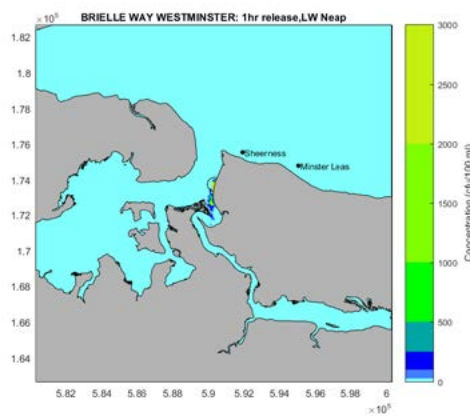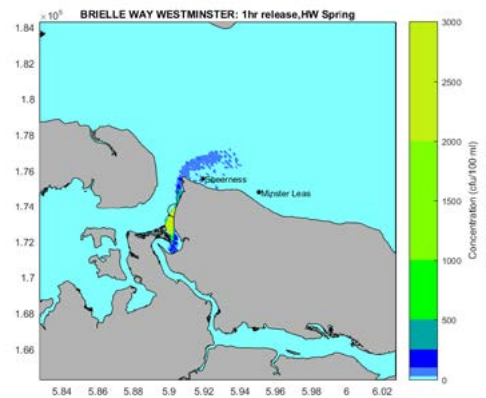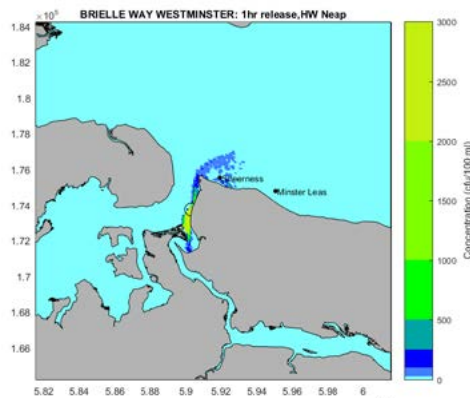
3-hour discharges at an outfall

3-hour discharges at an outfall (continued)

12-hour discharges at an outfall

This in turn influences which if any bathing waters are impacted by the discharge.

The blue/green scale indicates the modelled bacterial impact of the release.

We have taken a conservative approach using a high modelled load resulting in maximum concentrations. We have continued to take this cautious approach to tidal modelling to ensure that bathing water users can have confidence in water quality.

The blue/green boundary is set at 500 ec/100ml. This is the 'good' classification threshold in the Bathing Water Directive.

Excellent – the highest, cleanest water quality.

Good – generally good water quality.

Sufficient – the water meets the minimum standard.

Green shading means a higher modelled bathing water quality impact whereas blue shading means the model predicts good water quality or better.

Further information regarding bathing water classification can be found at:
Bathing Water Quality (data.gov.uk)

Dynamic outfall mapping (continued)

The 12 modelled tidal states are then consolidated into a table which summarises whether or not they will impact upon associated bathing waters. (1 indicates impacting, 0 is non impacting).

Tables for every outfall have been uploaded into Beachbuoy which will use the tidal conditions at the time of a discharge and its duration to determine whether or not there is a bathing water impact. Beachbuoy uses these tables to determine whether a release impacts the bathing water or not.

Case	Minster Leas	Sheerness
12hr HW spring	0	1
12hr LW spring	0	1
12hr HW neap	0	0
12hr LW neap	0	0
3hr HW spring	0	1
3hr LW spring	0	0
3hr HW neap	0	0
3hr LW neap	0	0
1hr HW spring	0	0
1hr LW spring	0	0
1hr HW neap	0	0
1hr LW neap	0	0

User interface improvements

To make Beachbuoy easier to use we have introduced colour coded bathing water 'pop ups' to provide more information, provide links to the release history table and to enable users to sign up for email alerts for the bathing water. We have listened to user feedback, so these pop ups provide information about recent releases and link directly to a table which allows you to understand the release history for the location.

The pop ups will also explain whether or not they are impacting the bathing water.

In this example the pop up explains that there has been an overflow release in the past 72 hours and the date and time it ended, but that because of tidal conditions it will not impact the bathing water.

The outfall locations will still be displayed on the map, colour coded to indicate their status. Releases will also be visible in the release history table.

In the coming weeks there will be further developments that will improve the way you access Beachbuoy.