AMP7 Bathing Water Ambition Investigations Programme

Mothecombe

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South West Water

Executive Summary

Mothecombe is one of 25 Bathing Waters (BW) at which DEFRA (Department for Environment, Food & Rural Affairs) have required South West Water (SWW) to do an investigation into the feasibility of achieving 'Good' and/or 'Excellent' bathing water quality.

This report reviews and builds on the current understanding of water quality issues at Mothecombe. It also quantifies what changes need to be affected on bathing water quality to achieve at least 80% confidence of 'Good' or 'Excellent' compliance. Also, what proportion of FIO (Faecal Indicator Organisms) contamination could be reasonably attributed to SWW assets and potential possible storm overflow discharge frequency criteria or treatment options for significant SWW assets that would markedly improve water quality classification.

Figure 1: Mothecombe Bathing Water at the mouth of the Erme Estuary

Mothecombe Bathing Water is a small sandy beach at the mouth of the Erme Estuary on the south Devon coast. The main freshwater input to the Erme Estuary is the River Erme, while there are nine other streams which flow into the Estuary. Oceanographic studies and salinity analysis demonstrate the importance of freshwater inputs on the bathing water quality at Mothecombe. Local freshwater inputs include the Mothecombe Stream and Wonwell Stream and the other freshwater inputs up the Erme Estuary. It was determined that the River Erme is the most significant freshwater input in terms of flow, followed by the Sheepham Brook. There are four sewage treatment works (STW) in the Mothecombe catchment, these are Ermington STW, Holbeton STW, Ivybridge STW and Modbury STW which all discharge to the Erme or associated tributaries. The final effluent from Holbeton STW, Ivybridge STW received ultraviolet (UV) disinfection. There are several intermittent discharges further upstream to the Erme estuary and its respective streams. These include Storm Overflows (SO) from the STWs (e.g. Modbury STW SSO and Holbeton STW SSO) and combined sewer overflows (CSO) (e.g. Poundwell Meadow CSO).

To understand the required level of change needed to achieve the desired classification, Planning Classification data for Mothecombe was examined.

- **Mothecombe has had a 'Good' Bathing Water classification since 2016.**
- **The Planning Classification has also been 'Good' since 2016, although this decreased to 'Sufficient' in 2021, with a 90% risk of failing to reach Good and 100% risk of failing to reach 'Excellent'.**

At Mothecombe Intestinal enterococci (IE) is the main FIO parameter that determines planning class for the most recent planning data sets. *E. coli* (EC) was the FIO that determined class in earlier data sets. Statistical analysis in Section 3 demonstrated 6 of the 28 EC elevated above the 95 percentile EC limit of 250 cfu/100ml would need to be replaced with 'Excellent' water quality to achieve a robust 'Good' classification 2012 to 2019. For IE 2 of the 30 IE elevated above the 100 cfu/100ml threshold needed to be replaced with 'Excellent' water quality to achieve robust 'Good' classification. For the time frame looked at, it was not seen to be possible to achieve a robust 'Excellent' water quality.

Faecal pollution can come from an abundance of sources, many of which can be unrelated to human waste and its treatment, a prime example is land runoff from livestock. Microbial source tracking (MST) analysis carried out by SWW on 2021 bathing season samples collected by Nijhuis showed that sources at the BW

were predominantly ruminant although human sources were also present. The Erme Estuary samples were also predominantly ruminant with nearly equal presence of human, and one occasion with a signal from canine sources. The only substantial source found in the Mothecombe Stream was human.

Routine Environment Agency (EA) data between 2012 and 2019 was examined to better establish the conditions that lead to elevated FIO events The EA pollution risk forecasting (PRF) model uses Flow 12 hours average as the most important factor for predicting poor water quality. River flow clearly plays a large role in BW quality where the model also selected for 72 hours average flow as well. Analysis suggested that increased flow had a greater relationship with EC levels than IE. The PRF also selected for 24 hours antecedent rainfall for the whole catchment. This was seen to have good relationship with both FIO. Time and day where also selected for. Time was seen to be a possible artifact from the data where samples are largely collected at one of two times of day. Day was seen to have a limited relation with the different FIO appearing to respond differently. The PRF selected 15 hours average Wind onshore component. Elevated samples tended to occur in the presence of positive onshore wind component. The same was seen for alongshore, but this is likely down to it being the predominant wind direction. Finally absolute hours relative to high water was also selected for with elevated events tending to occur around low tide.

- **Freshwater analysis revealed little relationship between the BW and Mothecombe Stream.**
- **The BW water was seen to have a better relationship with the river Erme (at mouth).**
- **This relationship was significantly stronger once the data set was sorted into tide state with the flood tide seen to have the strongest relationship.**

Considering the tendency for elevated counts around low water, it is likely that on the ebb tide the river can discharge past the bay without impacting on quality whereas on the flood tide this gets pushed back into the bay. It was also observed that at low tide the BW transect is no longer sheltered in the bay but almost on the river mouth itself.

Nijhuis data for 2019 and 2021 came to similar conclusions although Mothecombe Stream was seen to have a slightly more significant relationship. Wonwell Stream was also seen to have a degree of correlation with poor quality coinciding with that at the BW. Nijhuis 2021 survey looked at freshwater tributaries on the River Erme. Of these Sheepham Brook and Oldaport Stream were seen to have the strongest relationship with the BW. Flete Stream had the best relationship with water quality at the river mouth.

Asset performance and freshwater loading assessment for 2012 to 2019 were scrutinized to inform options available to improve bathing water (BW) quality. 11 of 33 elevated FIO scenarios coincided with a storm overflow discharge event from either Holbeton STW SO, Holbeton STW SSO, Ivybridge STW SSO, Poundwell Meadow CSO, Modbury STW SSO, Town Hill CSO The most frequent storm overflow discharge was Holbeton STW SO.

Loadings assessment showed the bulk of the pollution is likely sourced on the River Erme upstream of Sequers Bridge. Oldaport Stream was also seen to be a significant cause of loadings for the BW. Based on our assessment, the largest continuous discharges are Modbury STW and Ermington STW. These contribute to the high loads seen in the Oldaport stream and River Erme respectively. Given the importance of the freshwater component in the elevated bathing water samples, as demonstrated throughout this report, contributions from these STW are assessed as being significant.

- **We therefore propose that both Modbury STW and Ermington STW have effective biological treatment with ultraviolet (UV) disinfection.**

A review of EDM data and assessment of loads show that Holbeton STW SSO and SO may be impacting on water quality more frequently than other intermittents discharge and water quality at the bathing water would benefit from a reduction in storm overflow discharges.

- **Due to this we propose that the discharges be improved to a design standard of 2 significant (greater than 50m^3) storm overflow discharges per bathing season (aggregated).**