

Impact of Wastewater Discharges on Coastal Water Quality and Public Health in North Wales

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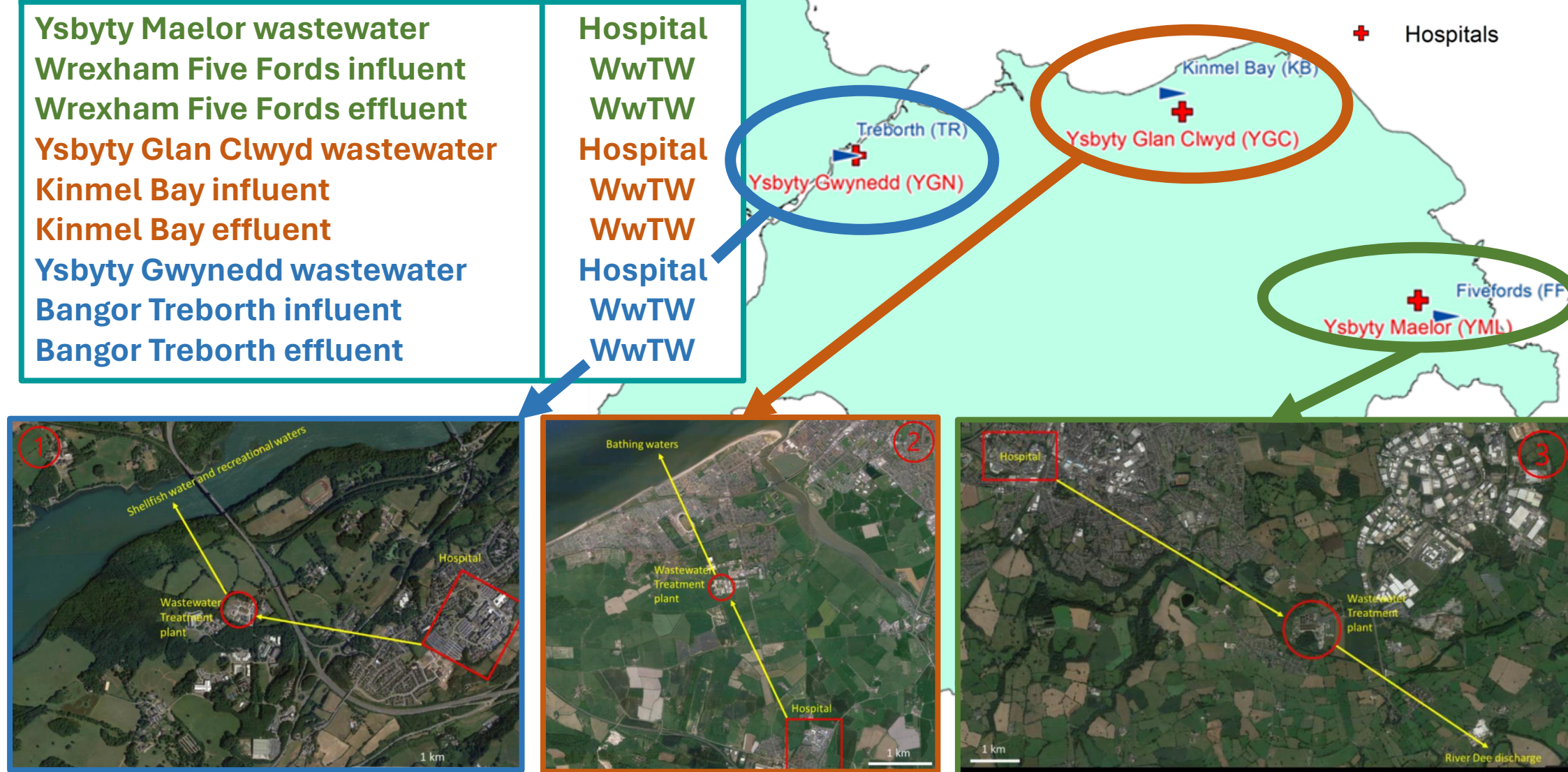
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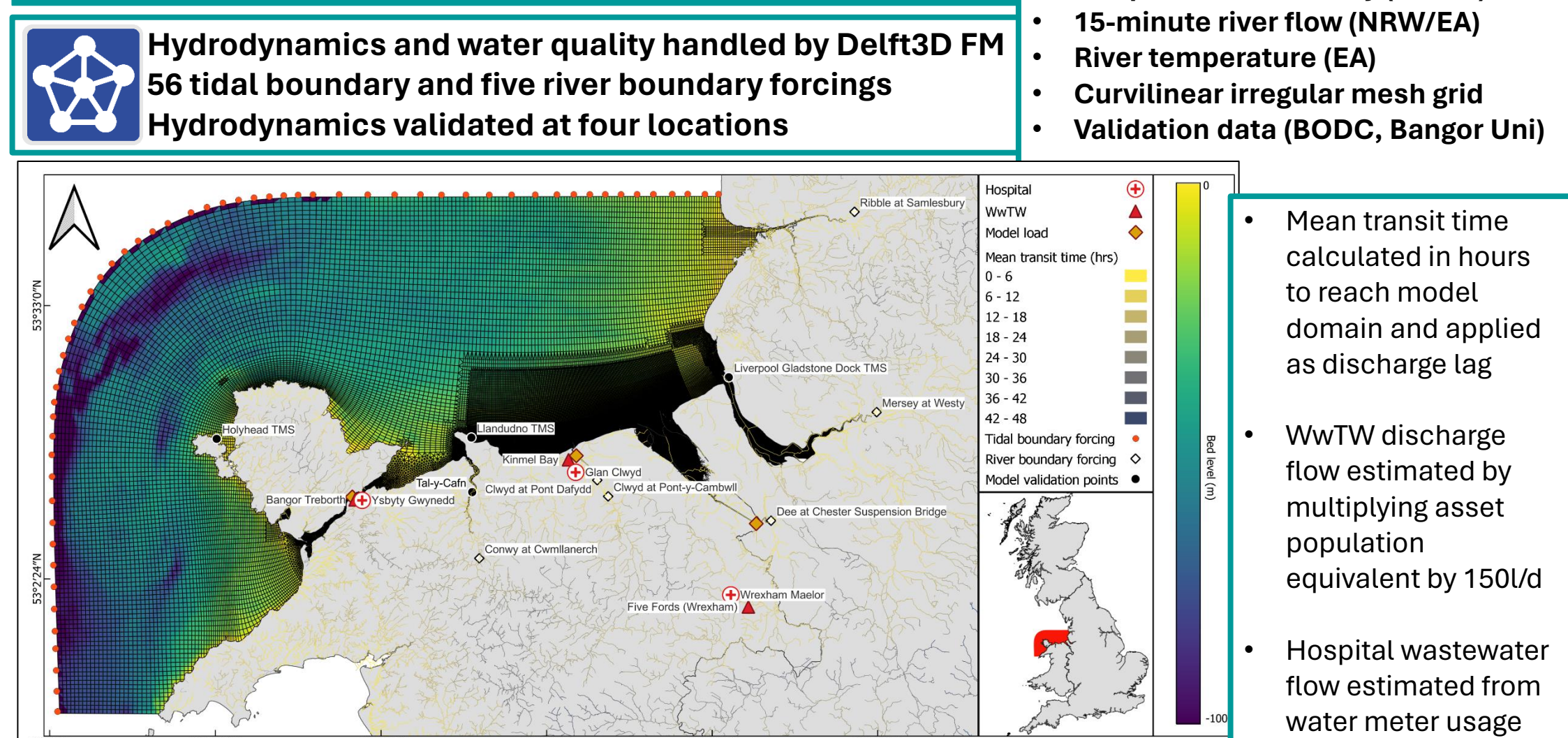
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This study aims to understand the spread and impact of Norovirus (NoV) and antimicrobial resistance (AMR) genes in North Wales' coastal waters, focusing on the impacts of wastewater discharges from municipal and hospital-derived sources. Hospitals are an acute source of NoV and AMR and their potential impacts on coastal water quality are poorly understood

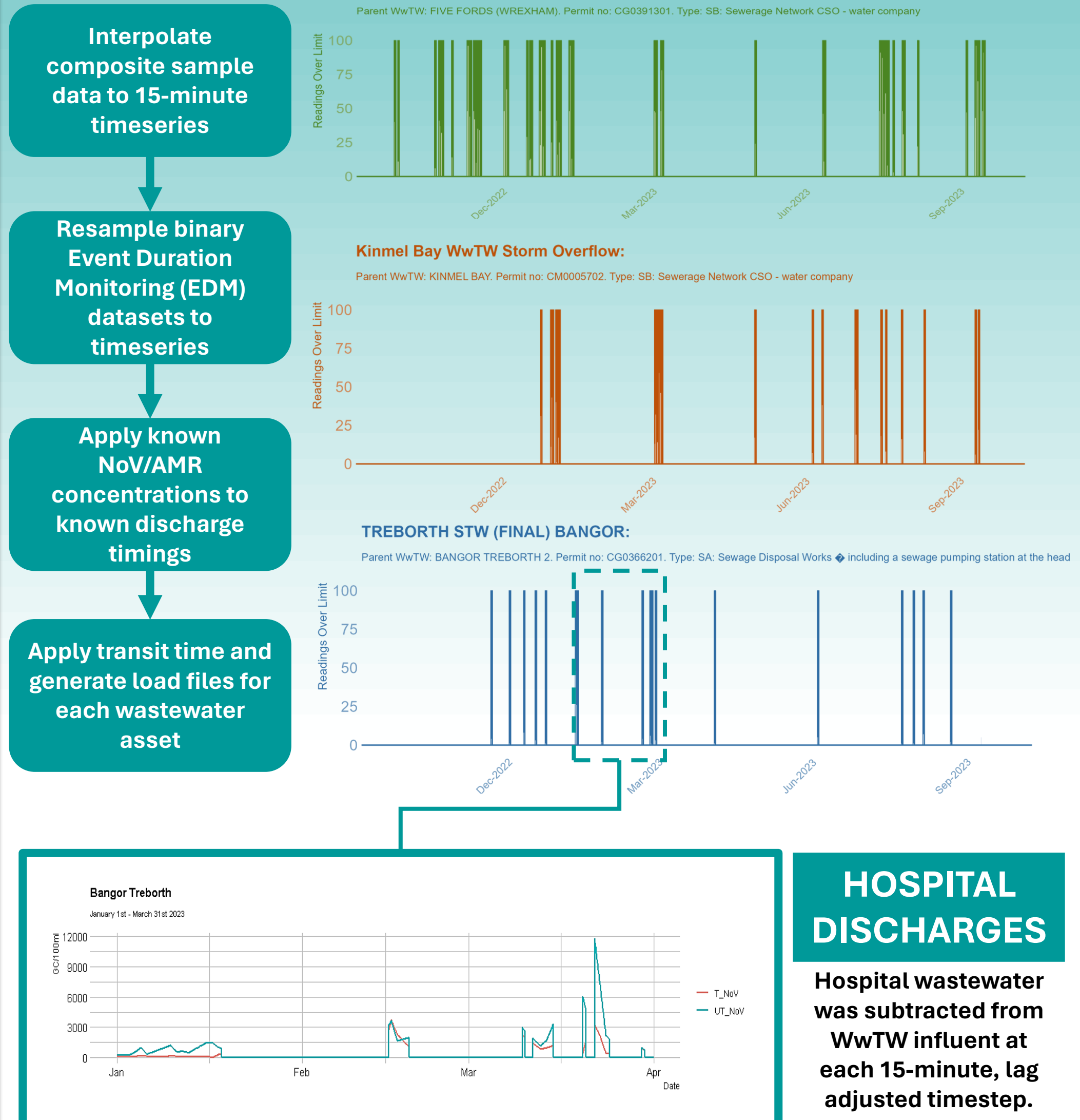
SAMPLING LOCATIONS



MODEL DESIGN



WASTEWATER ASSET DISCHARGES

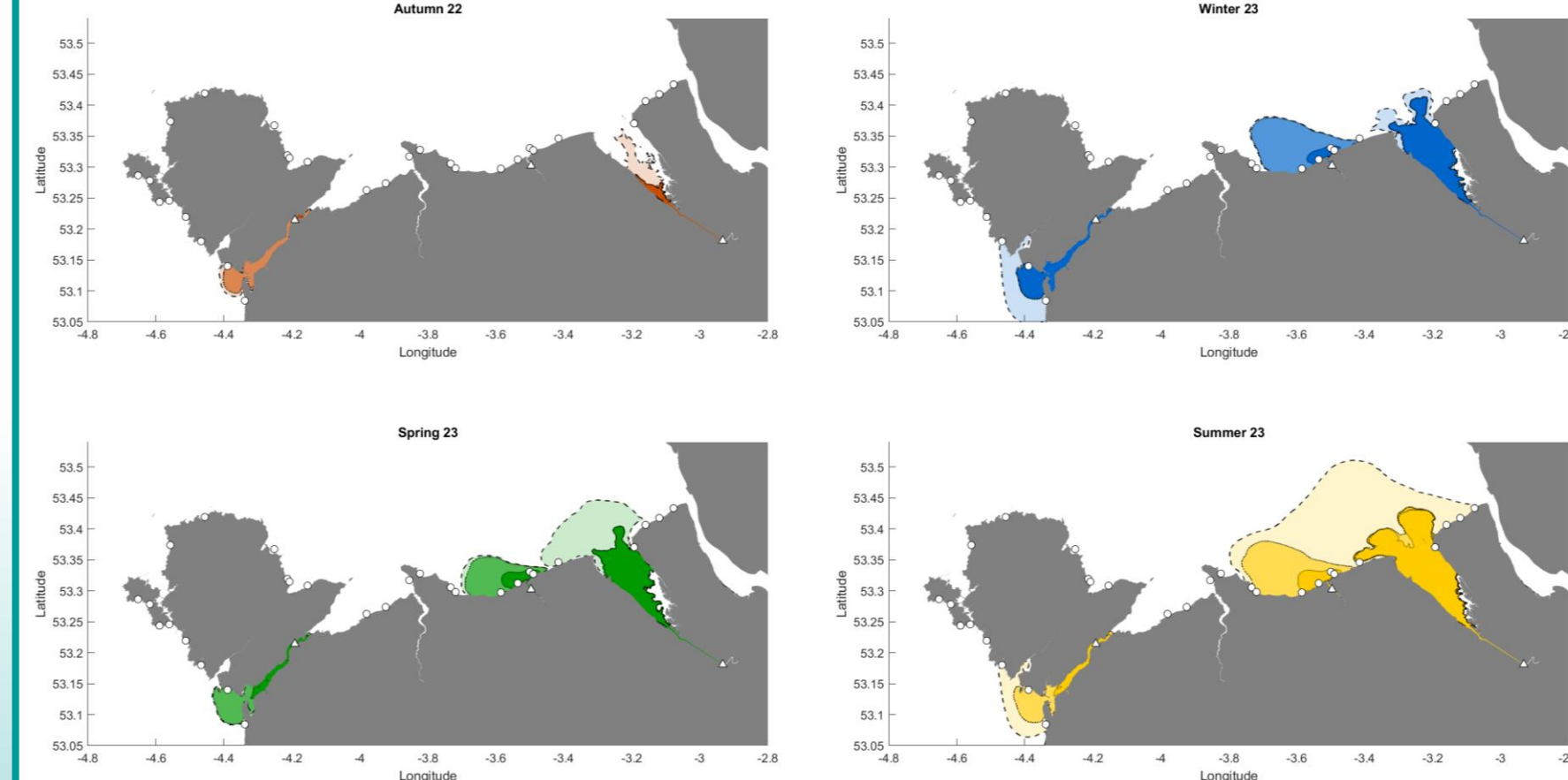


HOSPITAL DISCHARGES

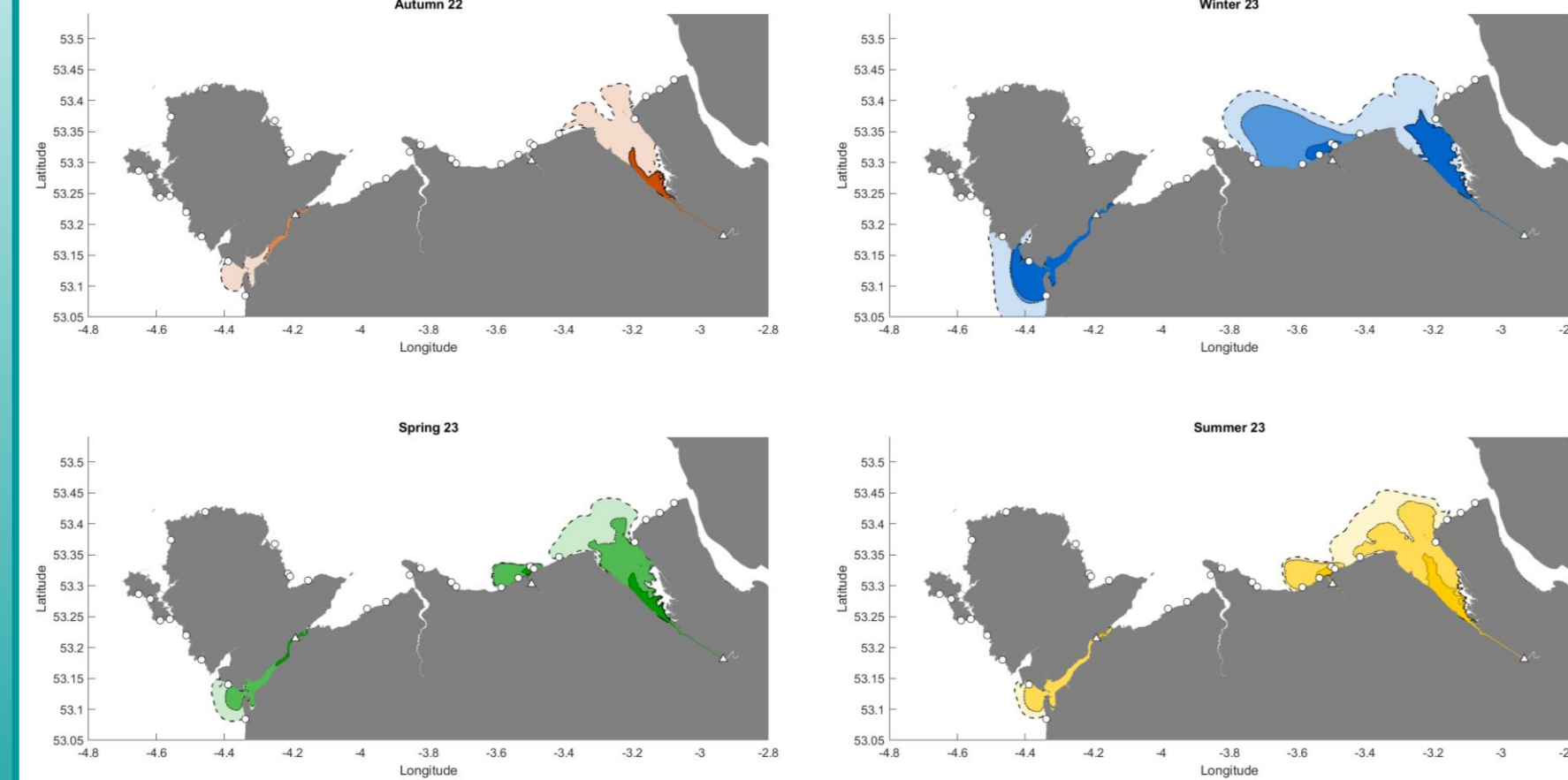
Hospital wastewater was subtracted from WwTW influent at each 15-minute, lag adjusted timestep.

RESULTS

Max NoV GI



Max NoV GII



Greatest maximum plume area of NoV GI from untreated discharges = 1314.729 km² (summer)

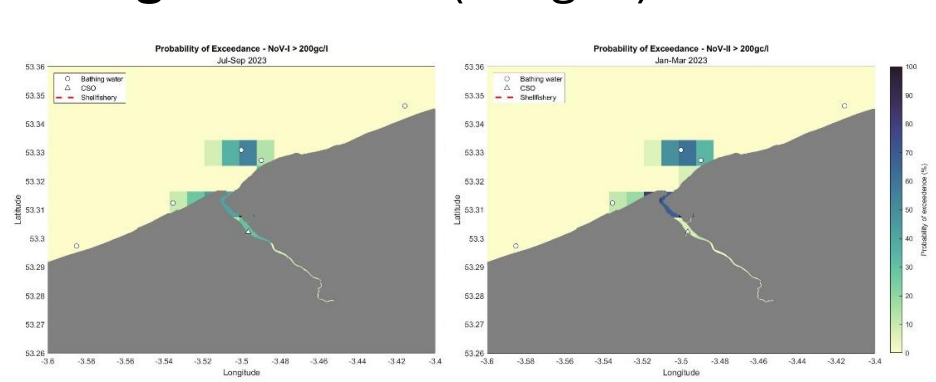
- 55.76% reduction with hospital concentrations removed

Greatest maximum plume area of NoV GII from untreated discharges = 993.562 km² (winter)

- 62.39% reduction with hospital concentrations removed

Mean plume reduction of 41% without hospital influence

Probability of exceeding infectious dosage threshold (200gc/l)¹



59% probability NoV GI at Rhyl (summer)

- 51% probability minus hospital

63% probability NoV GII at Rhyl (winter)

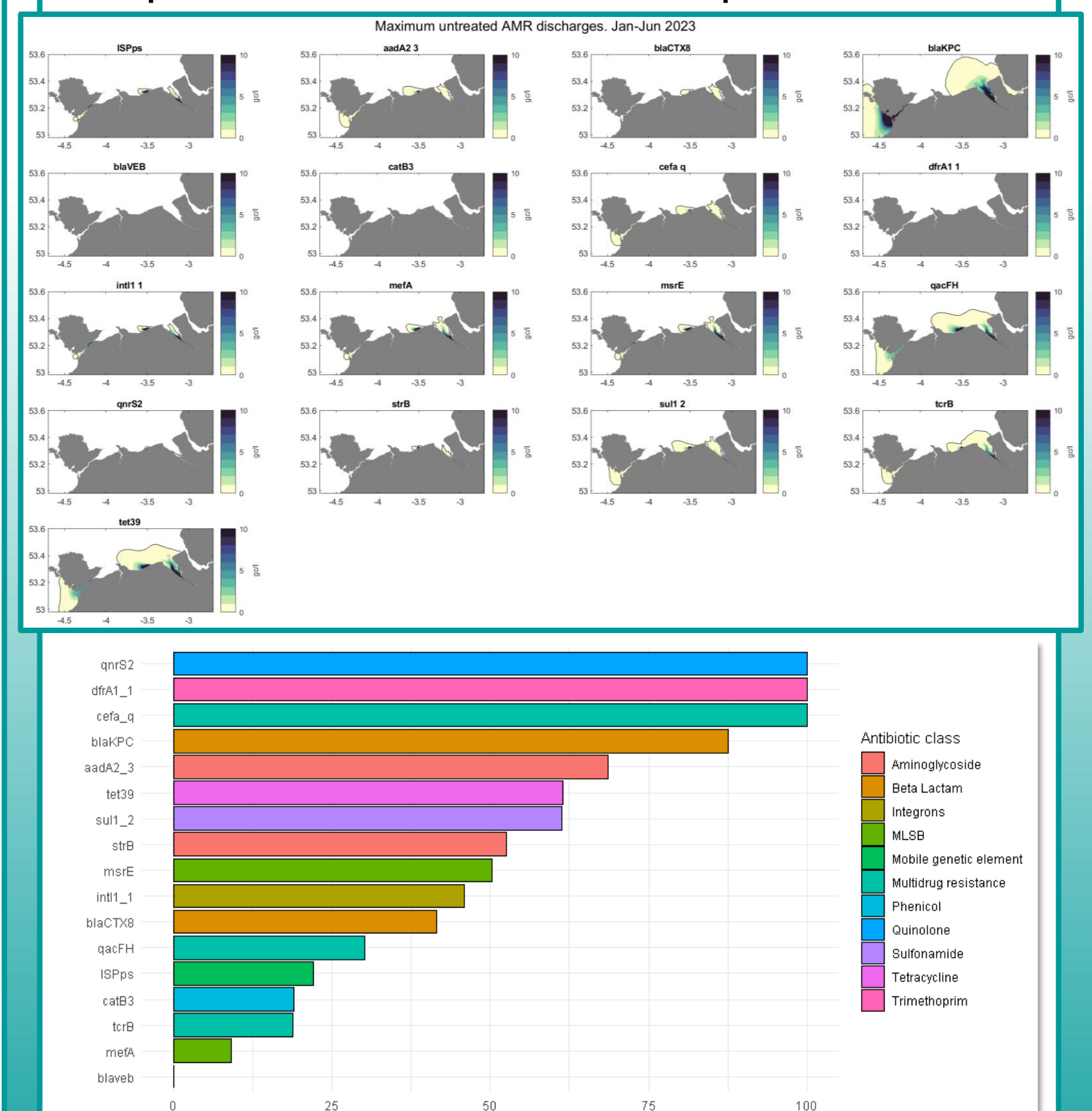
- 29% probability minus hospital

AMR

Greatest maximum plume area of blaKPC from untreated discharges = 923.4 km²

- 30.2% reduction with hospital concentrations removed

Mean plume reduction of 51.06% without hospital influence



[1] Jones, D.L., Baluja, M.Q., Graham, D.W., Corbishley, A., McDonald, J.E., Malham, S.K., Hillary, L.S., Connor, T.R., Gaze, W.H., Moura, I.B., Wilcox, M.H., Farkas, K., (2020). Shedding of SARS-CoV-2 in feces and urine and its potential role in person-to-person transmission and the environment-based spread of COVID-19. *Science of The Total Environment* 749, 141364. doi:10.1016/j.scitotenv.2020.141364