Bure modelling by Kelvin Allen
Based on 2021-2022 actuals

This presentation is a desktop study into the causes and potential solution for providing some flood and salinity incursion relief on the River Bure in the Norfolk Broads.

Deltares

It takes one of the recommendations from Dutch experts, a Company called Deltares in a study undertaken in 2016 and explores this further.

It looks at tidal locking and how this could potentially be normalised through the use of natural flood management relief. This subject has been studied and discussed many times in the past two decades, without outcomes however.

This is purely a desktop model exploring the potential scope and examines the volumes of tidal water involved to aid further investigation and discussion in ways to adapt the Broads landscape to cope with rising sea levels and increasing levels of saline incursion.

Plans for how the Broads can adapt and manage the landscape in the future reside within the remit of the Broads Futures Initiative.

It is hoped that this can become part of their wider initiative going forwards.

Saline induced fish kill Sep-22

Source: https://riverlevels.uk/levels/norfolk

BASG

Broadland Futures Initiative

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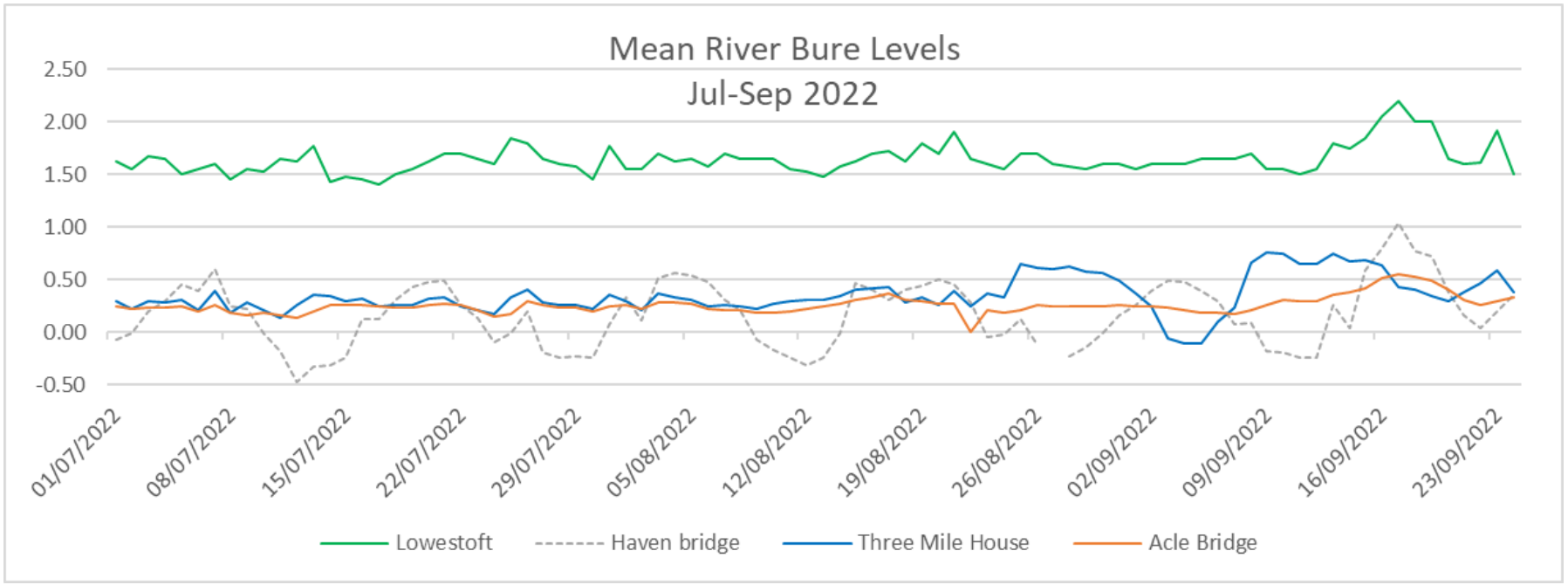
Quantifying the issue.
This desk top model builds on work undertaken in the Fens, looking at actual river flows and availability of water to abstract based on historic flows over 30 years to supply the proposed new Fens Reservoir.

The same approach has been adopted and applied to actual River Bure gauging station data, although it appears that some base data prior to 2021 is corrupt, so is excluded from this initial analysis.
The graph below looks at mean river levels from Great Yarmouth to Acle and shows tidal locking when the blue line sits above the orange.



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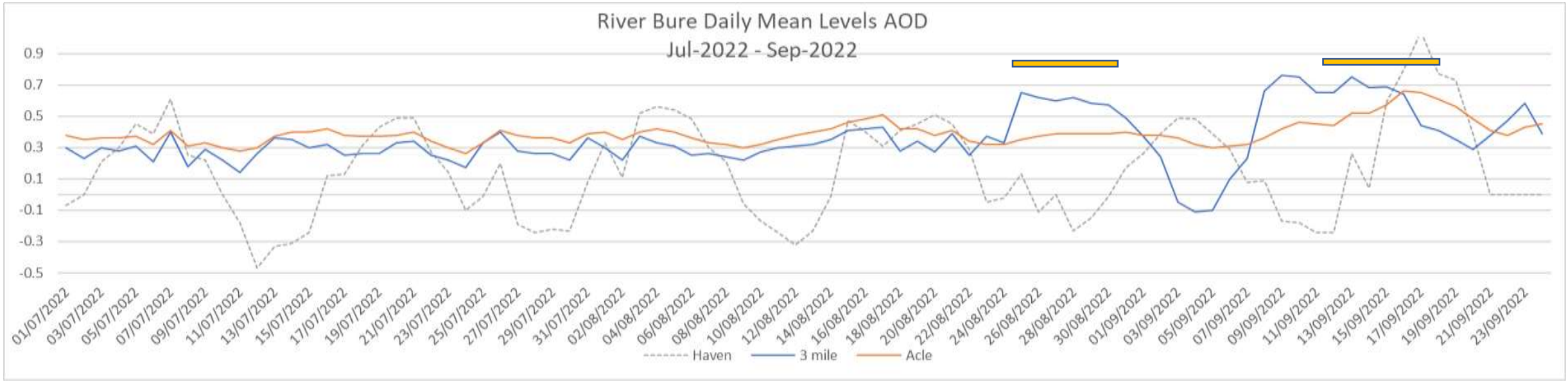

The model uses actual river level data from EA gauging stations at 3 Mile House and Acle Bridge on the River Bure. It also uses the same data from Haven Bridge and Buoy Data from offshore in the North Sea to obtain sea levels.

When the southern north sea becomes under pressure from cyclones the mean level can rise by over 1 metre. This has a dramatic impact on topology within the river Bure causing upstream water to become tidal locked.
The graph above shows this occurring in the recent events when the mean levels along the river don't enable a downward flow to sea. (The blue line is above the orange line)
The model looks at this variance and quantifies the volume of water effectively trapped and examines possible solutions in natural flood management to avoid upstream salinity damage and possible flood relief above Acle to Potter Heigham.

Source: https://riverlevels.uk/levels/norfolk

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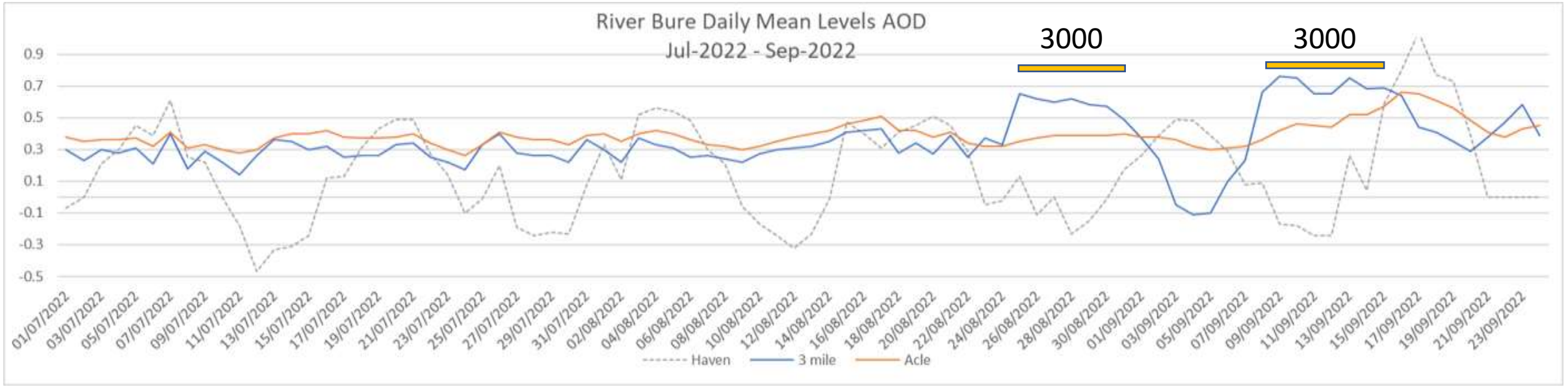

The recent events demonstrate a potential scalable solution may be possible to implement, as the variance in mean water levels are relatively small around 300mm and therefore the quantity of water involved is estimated at less than 3million m^3 litres during the recent surge events
The model includes a variance to allow for future climatic change in sea levels, further impounding the issue.

So what would you do with the water.
The model assumes that Halvergate marshes would return to their former flood plain, but with a much more managed control and automation.
Flood water would need to be pumped back into the river at times when the levels are below a giving Q value.
This could be achieved by using natural sources and again the model sets these values.

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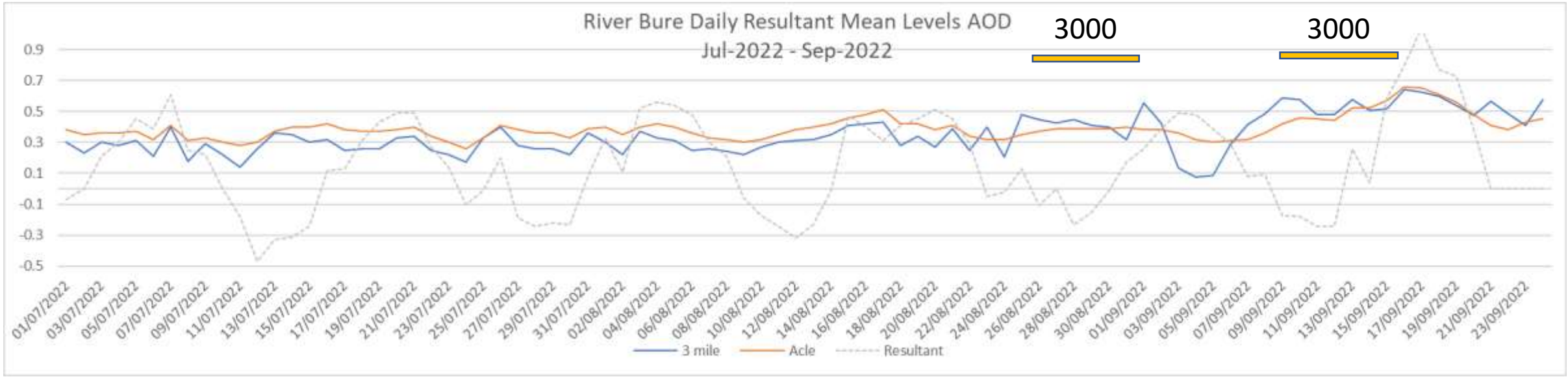

The model looks at maintaining levels in the Bure at 3 Mile House in West Caister below those at Acle, by using natural flood management of circa 240 hectares of the Halvergate Marshes SAC would become salt marsh, as it once did.

It could also potentially be used as flood relief in times of surface water flood relief during high tides above Acle.

The model enables a number of parameters to be set and modelled against, including climate change and the size of storage and return volumes and at what level.

It is not intended to be any form of final proposal, but a desktop concept to aid further investigation and discussion.

https://riverlevels.uk/levels/norfolk

Scenario 7 No intervention

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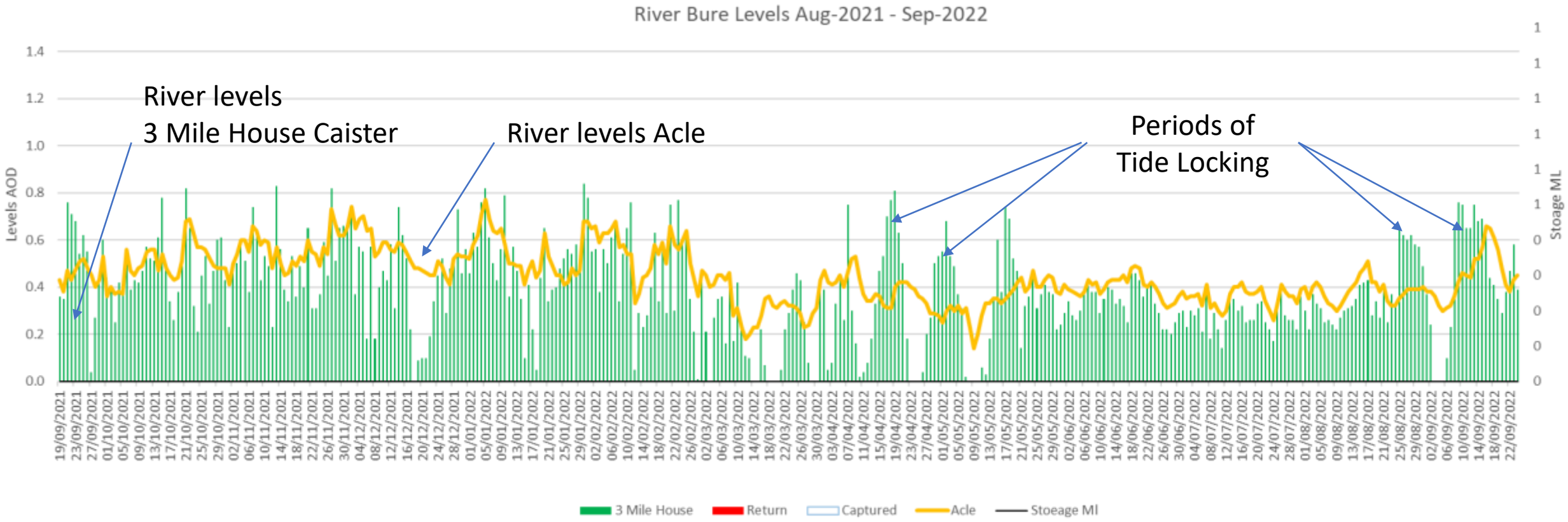

Abstraction +0.0m CC 0% Reservoir 0 MCM Return Rate 0m3/sec @ Q0 Levels

The years 2021 – 2022

https://riverlevels.uk/levels/norfolk

Scenario 1

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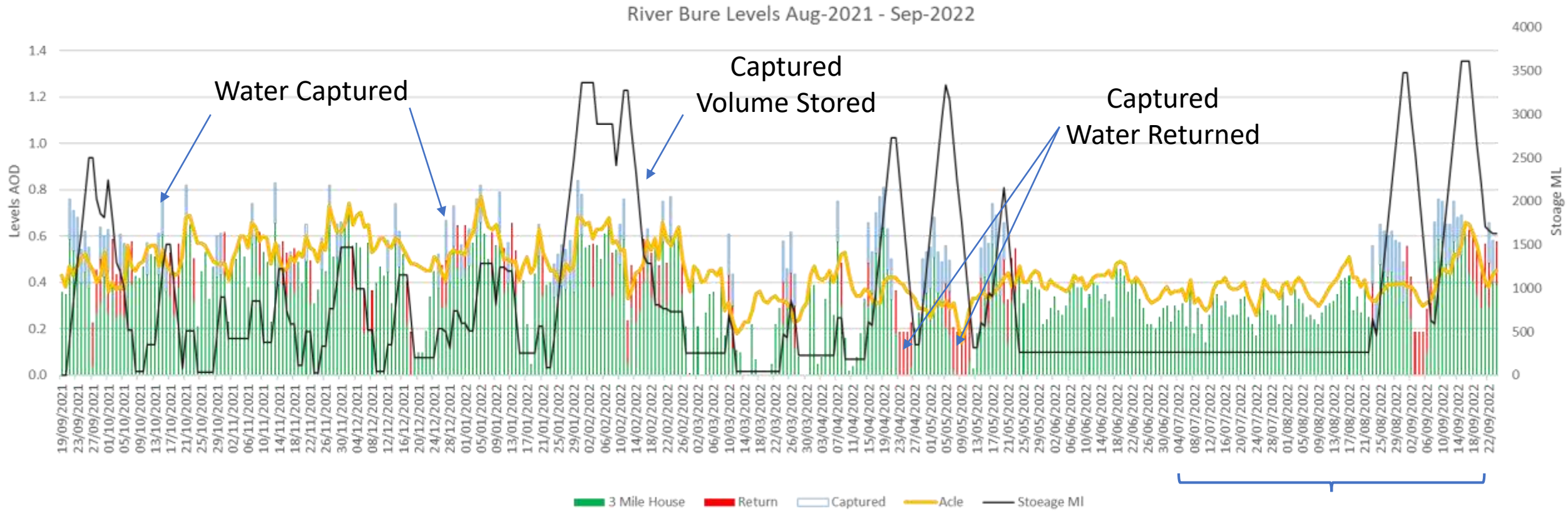
Based on 2021-2022 actuals



Next Slide
Zoom View

Abstraction +0.1m CC 0% Reservoir 4 MCM Return Rate 5.5m3/sec @ Q50 Levels

The years 2021 – 2022

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Scenario 7 No intervention

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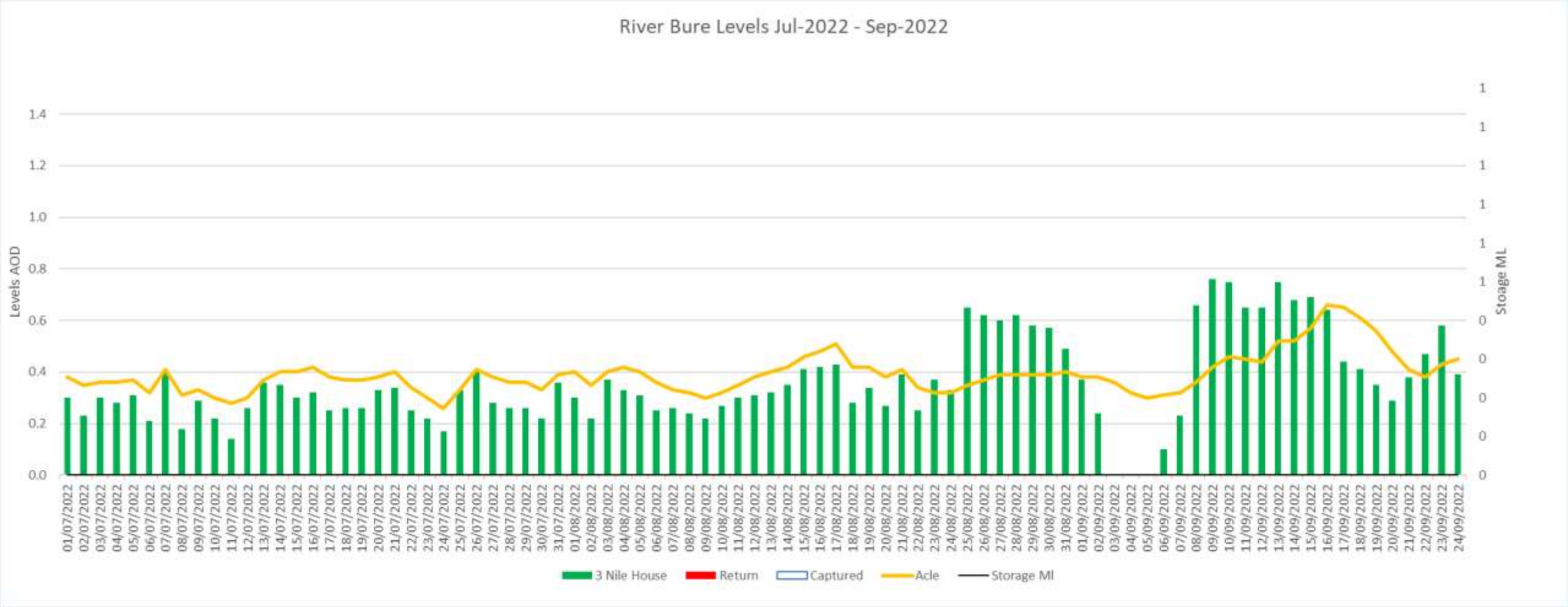

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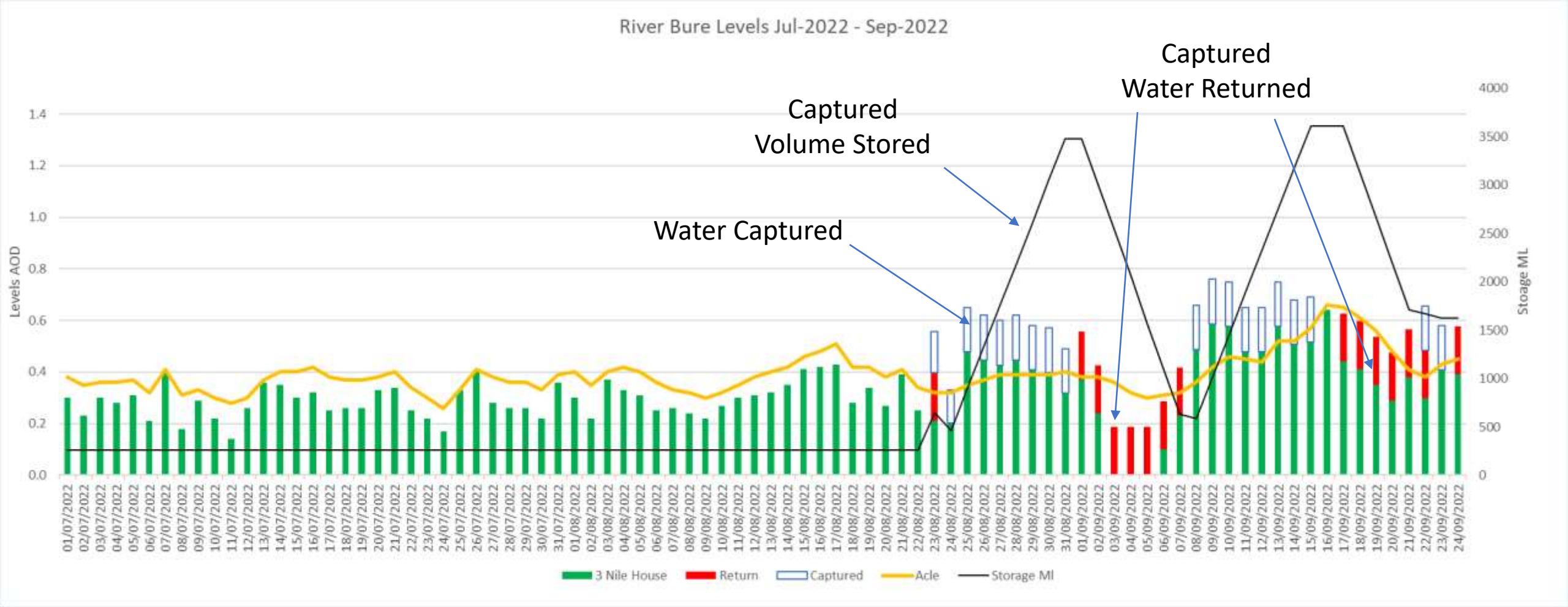

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River Bure Modelling Specifics

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