Formal Review of Drought Event Level (DEL)

08/09/2022

The water resource situation has been formally assessed following the Drought Plan methodology[1], using data in the most recent Water Situation Report, 8th September 2022. This assessment will be reviewed monthly in line with the releases of the Water Situation Report and amended as necessary.

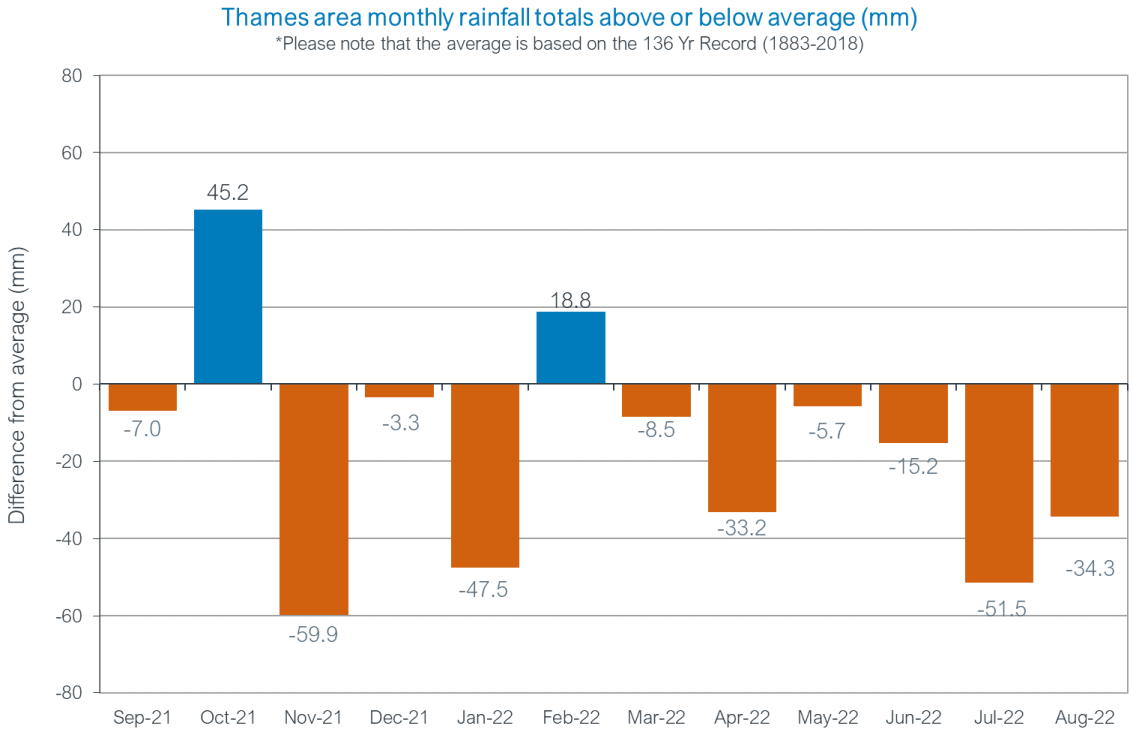
The Overall Risk Indicator (ORI) uses groundwater levels, river flows and reservoir storage. Reservoir storage projections have been modelled assuming normal operation using demand consistent with current levels of demand. The ORI over the next 6 months has been assessed as follows:

WRZ	ORI prevailing			ORI projected (60% LTA rainfall for 6 months)		
	Previous	Update	Movement	Previous	Update	Movement
London	2	2	↔	2	2	↔
SWOX	1	2	↑	3	3	↔

In London, the prevailing ORI remains at 2 due to continued decline in river flows and rapidly declining reservoir storage. The ORI in 3 and 6 month projections remain consistent, reflecting the continued risk of limited winter recovery of groundwater levels in the Chilterns and flows in the Thames. As a result, the ORI for London remains at 2/2. In SWOX, the prevailing risk increased to 2 due to Notably Low groundwater levels in the Cotswolds, low river flow in the Upper Thames and declining reservoir storage in Farmoor. The longer-term, 6-month risk to summer river flows, groundwater levels and reservoir storage remains at 3 in the 60% scenario. Overall, the prevailing risk has increased in SWOX and remains consistent in London, while the risk to winter recovery remains consistent in both London and SWOX.

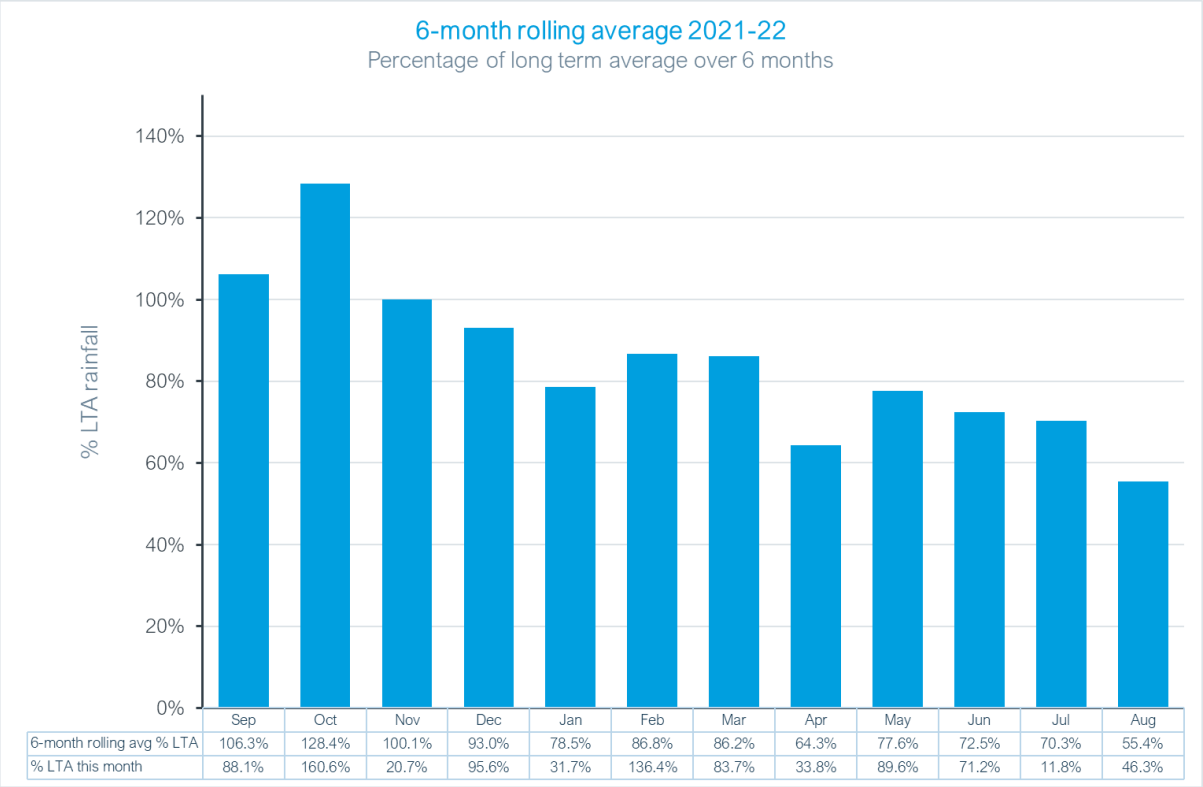
Following review of the ORI, the Drought Plan requires a Drought Event Level (DEL) to be set. To recommend a DEL, consideration has been given to recent and forecast rainfall, operational aspects such as current raw water storage levels, and hydrological conditions such as groundwater levels and soil moisture deficit. A summary of some of the key considerations is outlined below.

Rainfall: For context the recent rainfall over previous months is illustrated in Fig 1 and Fig 2:



[1] Thames Water Drought Plan, Final April 2017 (with June 2020 Addendum), Section 4
https://www.thameswater.co.uk/media-library/home/about-us/regulation/drought-plan/drought-plan-2017/thames-water-draft-drought-plan.pdf

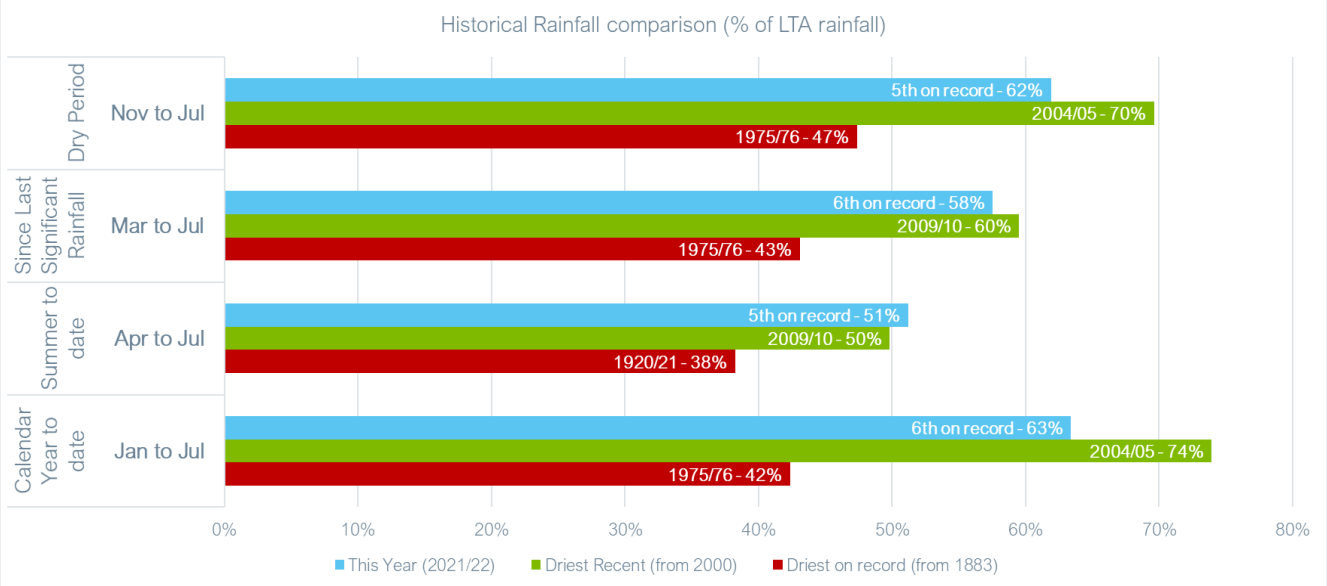
Figure 1. Thames Area monthly rainfall totals



	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
6-month rolling avg % LTA	106.3%	128.4%	100.1%	93.0%	78.5%	86.8%	86.2%	64.3%	77.6%	72.5%	70.3%	55.4%
% LTA this month	88.1%	160.6%	20.7%	95.6%	31.7%	136.4%	83.7%	33.8%	89.6%	71.2%	11.8%	46.3%

Figure 2. Thames Area rolling 6-month rainfall totals

For the period September 2021 to August 2022, rainfall was 73% LTA. This reflects a prolonged dry period from late autumn through winter and early summer. September was slightly drier than average, while October was very wet receiving 161% average rainfall. November was the 2nd driest on record with 21% LTA, followed by a near average December (96% LTA). January 2022 was the 12th driest on record with 32% LTA rainfall, while February received heavy rainfall with 134% of LTA. This was followed by a reasonably dry March (84% LTA), and a very dry April with 34% LTA rainfall. June received 71% LTA rainfall, while July was the 2nd driest on record with 12% LTA rainfall. August received 46% LTA rainfall, the driest since 2003. The catchment has received 6 consecutive months of below average rainfall (March to August) and as a result the 6-month rolling average has now reduced to 55%. Figure 4 sets recent rainfall in a historical context, showing that recent periods are around 60% LTA but with the last 4 months (April to July 2022) being around 50% LTA, with July only receiving 12% LTA.



Reservoir Storage: Figure 4 shows the current storage in the London reservoirs on the Lower Thames Control Diagram. Storage projections from 1st September 2022 in various rainfall scenarios (60%, 70%, 80% and 100% LTA) are shown together with the long-term average storage. Additional dry scenarios (60%, 50%, 40% and 25%) are shown with abstractions constraints applied to reflect the reduced abstraction ability following the dry weather.

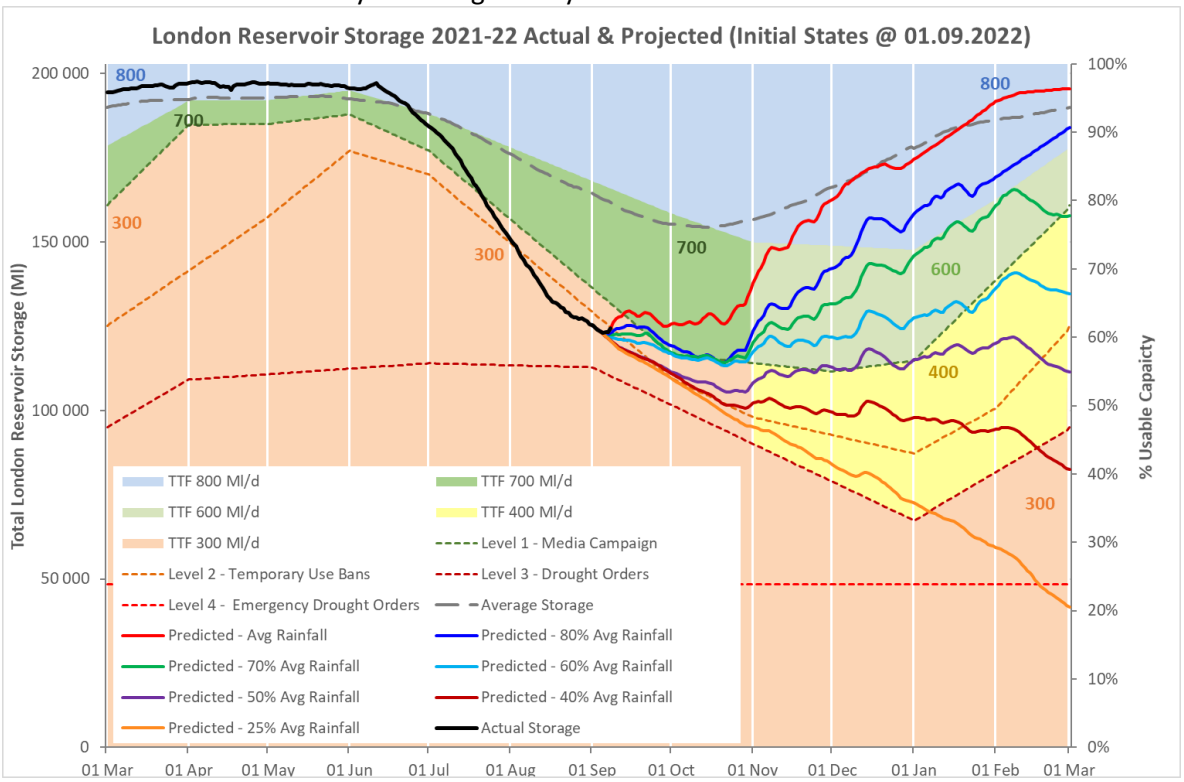
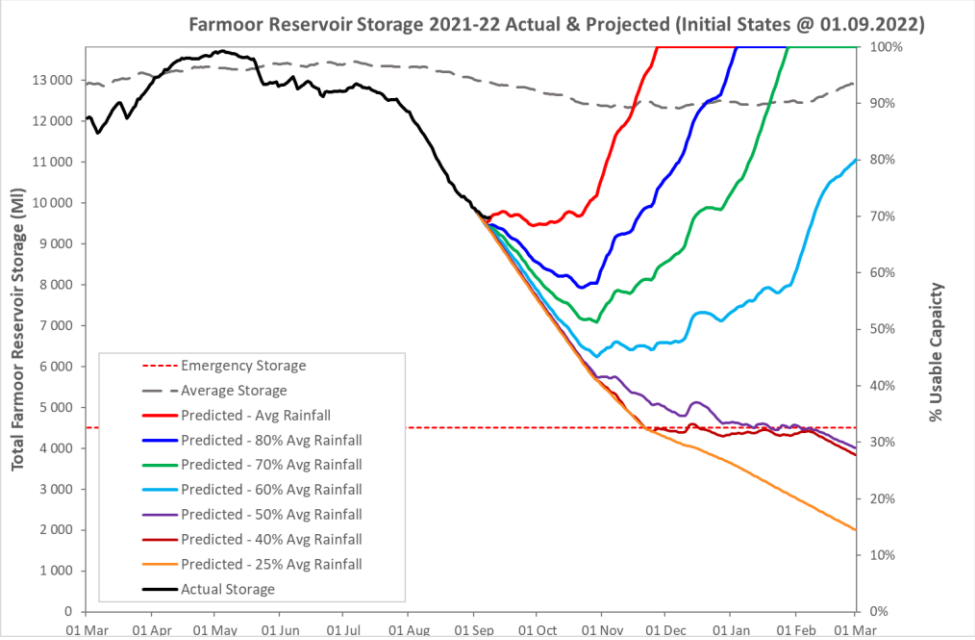


Figure 4. London storage projections, with assumed normal reservoir operation. Projections from 1st September 2022. Observed storage updated to 8th September 2022.

The observed storage in Figure 4 shows storage remained above average through spring but a rapid decline through July following exceptionally hot and dry conditions and reductions in Lower Thames abstraction. On the 21st July, London storage crossed Level 1 into the 300 Ml/d TTF band. Subsequently, the revised Teddington Target flow was agreed with the EA and reduced to 300 Ml/d. Reservoir storage continued to decline rapidly, crossing Level 2 on the 4th August, until periods of rainfall in late August allowed for higher abstractions and the slowing of storage decline. In early September further heavy rainfall allowed for significantly increased abstraction and subsequently storage levels in London have increased. London storage was at 61% on 8th September, with the possibility of crossing out of the Level 2 demand savings trigger within a day. The projections from 1st September have improved compared to last month and delayed the timing of crossing demand saving triggers with level 3 now not crossed until January in the 25% scenario and February in the 40% scenario. However, the risk of poor recovery in late winter remains in all scenarios below average.

Storage in Farmoor reservoir (SWOX WRZ) on 8th August was around 84%. This reflects a decline in storage in July following limited recovery of storage after experiencing Crypto challenges in May. Modelling of the 100% LTA rainfall scenario (Figure 5) shows there is sufficient water for abstraction to recover storage in autumn, but in 60%, 70% and 80% rainfall scenarios, storage is projected to decline significantly later in the summer. In significantly dry scenarios (50%, 40% and 25% of LTA rainfall), Farmoor storage is projected to continue declining through early autumn with limited winter recovery.

Figure 5. Farmoor storage projections from 1st August 2022. Observed storage updated to 8th August 2022.



Groundwater: Following two winter/spring periods with groundwater levels ranging from Above Normal to Exceptionally High, the below average but variable rainfall during the 2021/22 recharge period resulted in slower and less groundwater level recovery across much of the catchment. In the Cotswolds, groundwater levels over the winter/spring of 2021/22 were typically responsive to variable rainfall and continued to decline following dry conditions from April through to August, with Notably and Exceptionally Low levels being reached. In the Chalk of the middle of the catchment levels have also continued to decline and are Below Normal at many sites. Projections are slightly deteriorated compared with last month, showing Below Normal levels through autumn in all scenarios and with limited recovery, remaining Below Normal into winter in drier scenarios. In the Cotswolds, projections have deteriorated further, showing a slightly later recovery, particularly in the 60% scenario with levels reaching Exceptionally Low in November. Projections in the 120% rainfall scenario show normal being reached later in the winter than in previous projections, whilst in the 100% & 80% scenario levels are Below Normal and Notably Low through autumn and early winter.

River Flow: During August, flows responded to periods of rainfall but remain below average. Flows in the Thames at Teddington are still the lowest experienced since 2005, and now the 2nd lowest since 1995 in the Thames at Farmoor. Flows are projected to decline through summer as normal, with flows remaining below average in average rainfall scenarios and well below average in drier scenarios through autumn and early winter.

The current below normal groundwater levels and low river flows and projected limited recovery in winter explain the continued risk, particularly in the late autumn and winter for both London and SWOX with prospects for winter recovery worsening.

Demand: The average customer demand during August was near average overall with Above average demands in Thames Valley and Below Average demands in London. Over the course of the month, demands decreased such that they were slightly Below Average by the end of the month. This reflects a combination of factors such as milder weather and some rainfall, school holidays and the Temporary Use Ban commencing 24th August.

Recommendation: The current hydrological projections are for low river flows and below normal groundwater levels, particularly in a 60% or lower LTA rainfall scenario over the next 6 months. This

builds on the continued prevailing risk due to below normal groundwater levels in parts of London and SWOX. Account also needs to be taken of the recent rainfall being lower than the 60% LTA considered in our drought plan and in setting our DEL position. In mid-August, the risk position was re-assessed to account for this by considering the ORI in a 25% scenario. Alongside the standard rainfall scenarios (60% and above), the ORI was recalculated using updated projections. As a result, the Drought Event Level was recommended to increase to DEL3, this was agreed and took effect on 25th August.
The sub-seasonal and seasonal weather forecasts are now suggesting average rainfall for the remainder of September, along with warmer temperatures, with "a risk of dry conditions continuing in the south and east of the UK, with little sign of the levels of rainfall needed to end current drought conditions ", so the projected risk to groundwater level and river flow recovery over winter 2022/23 could be realised. As a result, the current recommendation from the water resources team is for the Drought Event Level to remain at DEL3.

Implications of recommendation: In line with our Drought Plan, we have reviewed the actions recommended for the Drought Event Level being set. To reflect the continued drought risk projected in prolonged low rainfall periods, the Drought Event Level is recommended to remain at DEL3. With the extended period of dry weather in summer, a TV campaign encouraging customers to use water efficiently was rolled out across the Thames Water area, followed by a radio campaign, supplemented with targeted advertising in supply demand hotspots when temperatures exceeded 20°C. This aided in reducing demand and in managing the risk to customer supply. A Temporary Use Ban was commenced on 24th August, and preparations for Drought Permits and Orders are underway. Enhanced monitoring of the risk to water resources from dry weather has been implemented in order to track the need for further drought mitigation.

Action	Comments
1. Define and implement appropriate water production strategy	West London reservoir storage has declined to below average (currently 62%), Lee Valley reservoir storage is currently stable at 89%. Liaising with the EA to maximise abstraction appropriately to slow reservoir storage decline. Careful tracking is required of groundwater levels in the Chilterns; although projected Below Normal levels are not especially concerning for groundwater source yields, they influence the consequences for river flows and prevailing drought risk in London.
2. Ensure drought sources are ready to be brought online based on appropriate triggers (Thames Gateway WTW, ELRED, Stratford Box, CHARS, NLARS.	Availability and preparation of Strategic Drought Sources for potential use to be confirmed should drought risk increase. Thames Gateway WTW continues being refurbished after demonstrating a peak output of 100 Ml/d in summer 2021. With a potential long-term outage being planned, other options such as the use of NLARS have been commenced and output has been gradually increased to close to 100 Ml/d in early September. ELRED/East Ham WTW has been successfully recommissioned into supply and is operational. Stratford Box/Old Ford remain as requiring water quality testing ahead of a return to service. The WBGWS has been agreed to commence supply with the EA on 19th September, starting at 92 Ml/d.
3. Prepare a media campaign, if needed, appropriate for the time of year.	Media strategy reviewed and actions prepared for customer surveys and subsequent messaging in

	late May/early June with increased through the summer leading to the TUB an beyond. This aligns with C-MeX "Experience Improvement" that aims to promote why we should all save water region-wide. A TV campaign has been implemented across the Thames Water supply area. There has also been targeted messaging to parts of Thames Valley that are higher demand hotspots. Need to ensure actions can be implemented promptly should drought risk increase.
4. Dry Weather event team	Regular Dry Weather event team meetings have been convened to discuss water resources and supply risk, as well as agree and coordinate actions across the business, with targeting of supply demand hotspots as necessary.

We recommend implementing the following DEL 3 demand management measures at this stage for the following reasons:

Action
Enhanced Media Campaign
Reason
Water resource projections show an ORI of 2/2 for London and 2/3 for SWOX in a 60% rainfall scenario in a 6 month projection, the prevailing risk has deteriorated with the longer term risk increasing.
Reservoir storage in Farmoor is below average, with fewer strategic supply options available, SWOX WRZ would benefit from demand saving options.

Action
Temporary Use Ban
Reason
Reservoir storage in London has crossed Level 2 on the control diagram.
We need to take account of the regional picture in South East England and align our actions with those of other water companies. Southern Water & South East Water both have implemented TUBs.
We need to inform our regulators in advance of implementation of measures.
We need to escalate measures in the order prescribed in the Drought Plan, with certain measures required as prerequisites before others can be implemented. Strategic supply schemes have begun operation where appropriate.
TUBs have been implemented and the preparation of Drought Permits and Drought Orders have begun.

Mike Jones, Asiya Campbell & Steve Tuck 08/09/2022