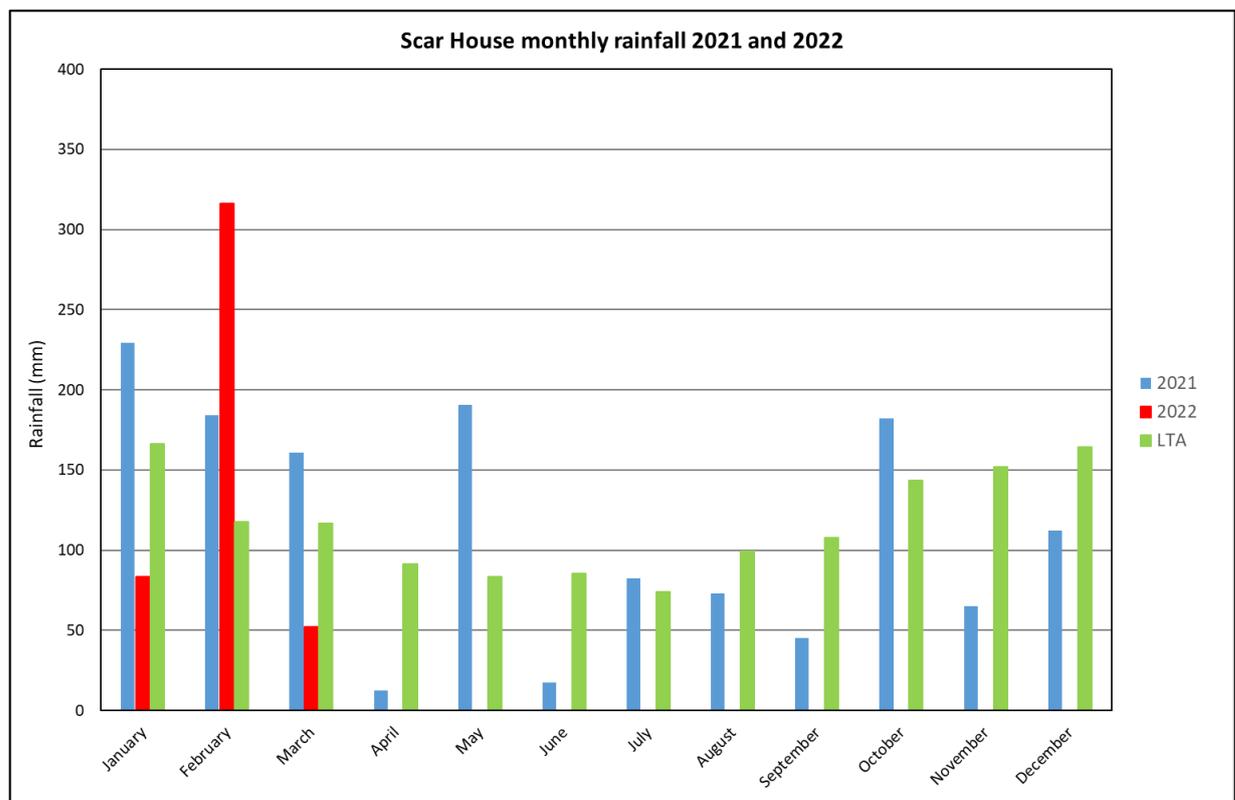


## Report to Gouthwaite Board of Management Hydrological Conditions of the Nidd Catchment – 2021 to March 2022

### Rainfall

Graph 1 below shows the monthly rainfall totals recorded in the Upper Nidd catchment at Scar House Reservoir rain gauge during 2021 and up to March 2022. All recorded rainfall is compared to the calculated Long Term Average (LTA) monthly values. Previous reports have used the 1961-1990 LTA, with annual average rainfall 1387 mm. This and subsequent reports will use the more recent available LTA from 1981-2010. This has only 1% higher annual average rainfall of 1402 mm, but indicates increased winter monthly values from October to February and slightly decreased average rainfall in most spring and summer months.

Total rainfall for 2021 at Scar House was close to the LTA (97%) but there was much variability through the year as described below.



**Graph 1: Monthly rainfall totals at Scar House Reservoir compared to the LTA for 2021 to March 2022**

Rainfall from January to March was above average but not exceptional. For the second year running April was very dry, with only 12.6 mm of rain recorded at Scar House, 14% of the LTA. In contrast, May was wet, with 228% of the LTA recorded. It was the third wettest May on record over the Nidd catchment and for Yorkshire as a whole, using the Met Office Had-UK data set which commences in 1891.

Dry conditions returned in June when only 20% of the LTA rain fell, mostly in the last week of the month. July and August rainfall was typical of the long-term record. September was notably dry however, with 42% of the LTA recorded and most of this concentrated into the last five days.

October was a little wetter than average. A notably dry early to mid-winter period followed. The 3-month cumulative rainfall for November to January was only 54% of the LTA at Scar House, and the driest since 2006 for the Nidd catchment-averaged rainfall.

Although not as exceptional as 2020, February 2022 was extremely wet due to a succession of storms crossing the region. It was the 3<sup>rd</sup> wettest February on record for the Nidd catchment, using the same Met Office Had-UK data set. At least 225% of the monthly LTA rainfall was recorded at Scar House. The tipping bucket rain gauge (TBR) indicated 269% of the LTA but comparison with check gauges suggests that the TBR reading may have been affected by snowfall or the potential for TBRs to over-record during very heavy storms.

March 2022 became much more settled from the second week onwards. At the time of writing on the 29<sup>th</sup>, 45% of the LTA has been recorded.

### River Flow

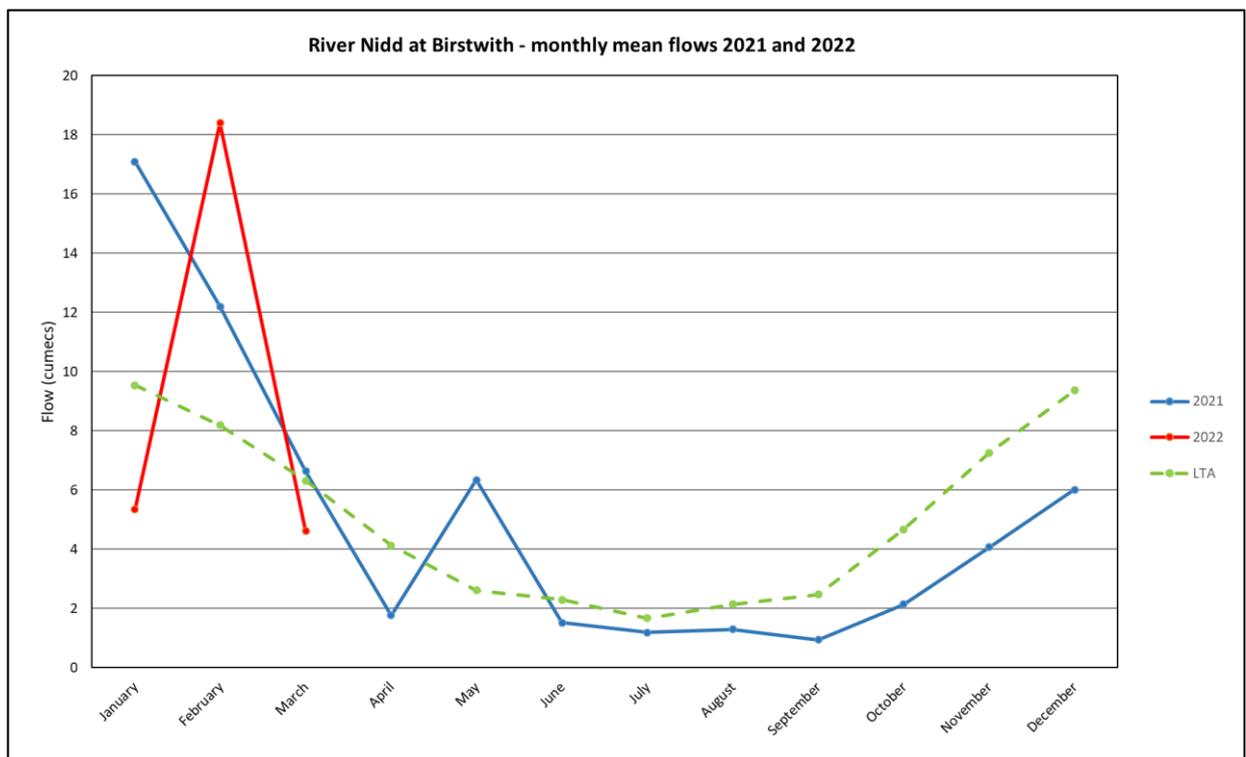
Graph 2 shows the monthly mean flows recorded at Birstwith flow gauge on the River Nidd during 2021 and early 2022. They are compared to the calculated LTA.

In January and February 2021, monthly mean river flows were high but not extreme, at 179% and 149% of the LTA respectively. The highest flow peak of 2021 occurred on the 20<sup>th</sup> January, with smaller peaks following on the 29<sup>th</sup> January and 6<sup>th</sup> February. Flow continued to fluctuate in late February and March but the overall trend was declining and the March monthly mean flow was close to the LTA.

In April flows were well below average, reflecting the low rainfall, and were supported by reservoir releases. A series of small to moderate flow peaks occurred during the wet May, when the monthly mean was 242% of the LTA.

River flows were very subdued from the second week in June to the end of October. There were only a few small spills from Gouthwaite Reservoir, which had been drawn down to facilitate the Phase 2 siphon works. An increased number of flow responses to rainfall were observed from November to mid January, but the peak flows remained moderate, below 30 m<sup>3</sup>/s.

Both base flows and peak flows increased in the wet February 2022. The river level peak generated by Storm Franklin on the 20<sup>th</sup> February was the fourth highest in the 45-year record at Birstwith and the monthly mean flow was 225% of the LTA. Flows receded rapidly during the last few days of February and more gradually during March.



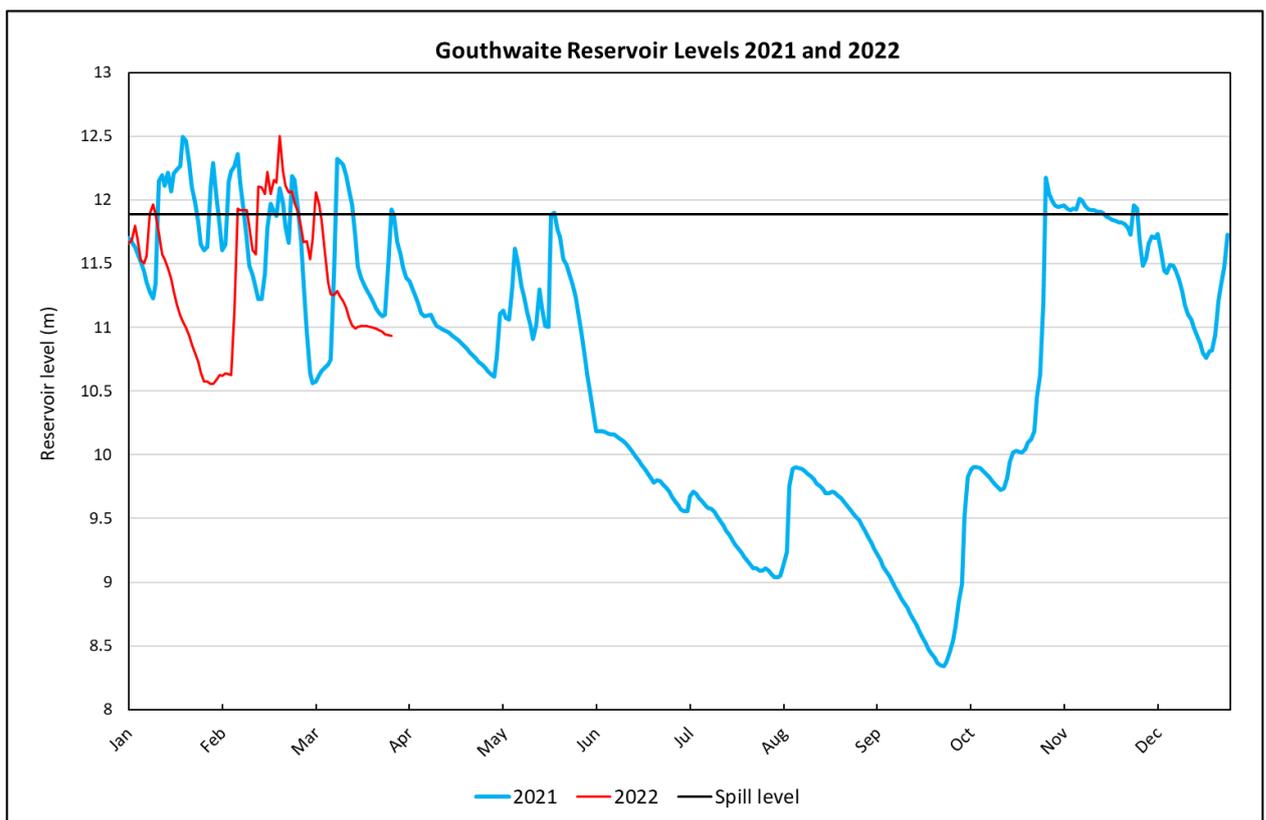
**Graph 2: Monthly mean flow at Birstwith (River Nidd) compared to the LTA for 2021 to March 2022**

### Reservoir Level

Graph 3 below shows the reservoir level at Gouthwaite during 2021 and early 2022 relative to the spill level of 11.89m. During January to March 2021 the reservoir was above the spill level for 40% of the time. The increase in level on the 10<sup>th</sup>-11<sup>th</sup> of March was associated with about 80mm of rainfall recorded at Scar House over three days. The water level fell during the dry April, to 73% full by early May, compared with an LTA of about 85% full for that time of year. The reservoir level recovered during the wet periods in May; the spill level was exceeded for one day only.

The reservoir level was drawn down during late May and early June to facilitate the Phase 2 siphon works. Although work stopped after the silt escape incident on the 4<sup>th</sup> June, reservoir levels continued to decline until the 4<sup>th</sup> of August. After a brief wet spell in early August, the water level decreased again during the dry weeks of September, down to 40% of capacity. (The LTA for late September being 66% full).

Reservoir levels increased sharply during the first few days of October and again at the start of November, the latter following 85mm of rain in four days measured at Scar House. The spill level was exceeded continuously for the first 20 days of November. Water levels then decreased during much of December and January, to 70% full, reflecting the low rainfall. Reservoir levels increased in response to rainfall in early February 2022, and the reservoir was spilling for about two-thirds of the time that month. Levels declined again during March.



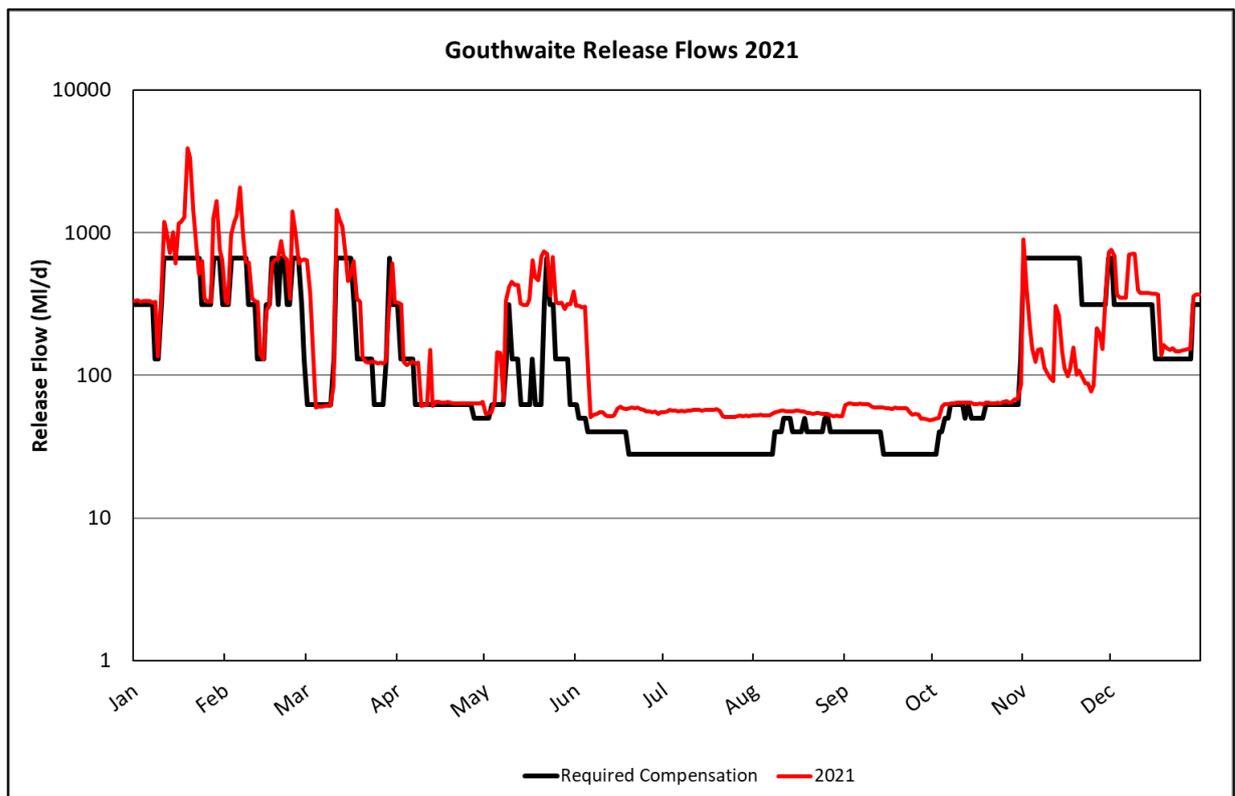
**Graph 3: Gouthwaite Reservoir levels 2021 to March 2022**

### Compensation Releases

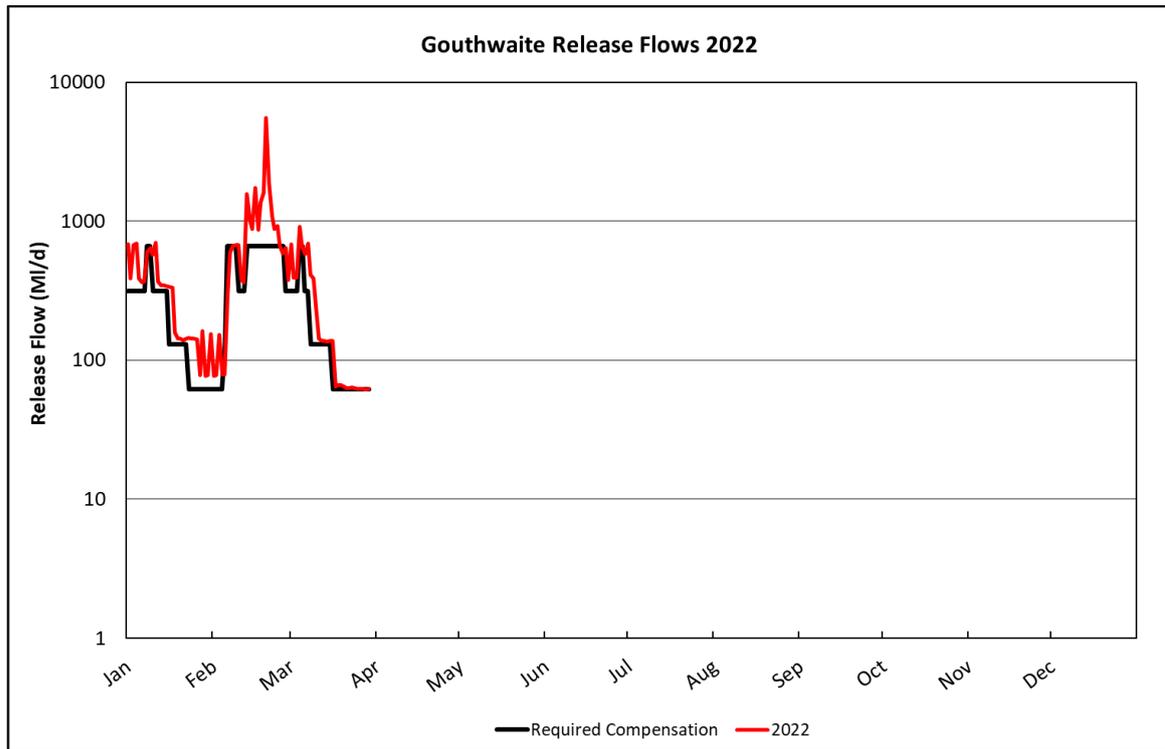
Graphs 4 and 5 overleaf show the reservoir release flows, including any spill, for 2021 and early 2022, together with the compensation releases that would be required under the current control rules. From May to 30<sup>th</sup> November 2021, the reservoir operations varied from the control rules in order to manage the construction works for reservoir safety. The Gouthwaite Board and Environment Agency were kept informed.

Graph 4 shows that reservoir releases from January to mid May 2021 were well controlled according to compensation flow requirements, with occasional spills during heavy rainfall events. During later May and the first few days of June, releases were greater than the usual compensation allowances to achieve drawdown for the construction works. After the silt escape incident in early June the releases were held steady between 51 and 58 MI/d, with consequent decrease in reservoir level as shown in Graph 3. There was a brief spill event on the 1<sup>st</sup> November in response to heavy rainfall. In the following four weeks, releases were lower than would usually be expected for water levels close to or above the spill level. During this period Yorkshire Water undertook trials to test whether sediment had built up behind the valves.

The reservoir returned to normal operation from the end of November. As shown in Graphs 4 and 5 the releases have followed the required compensation flows closely from December through to March 2022. The reservoir was spilling during Storms Dudley, Eunice and Franklin in February.



**Graph 4: Compensation releases 2021**



**Graph 5: Compensation releases 2022**