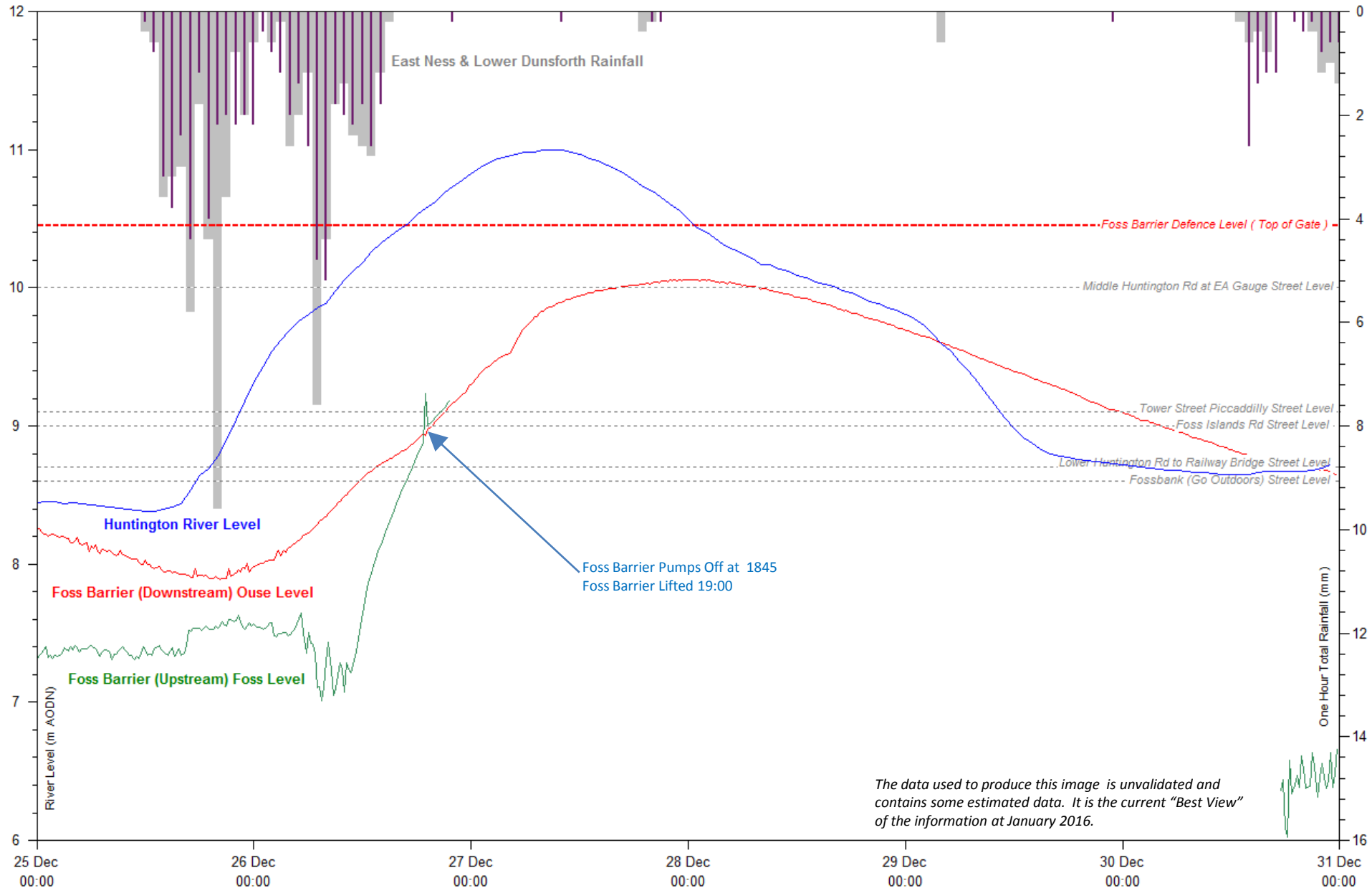


# Environment Agency Hydrograph of River Foss Rainfall and River Level 25 to 31 Dec 2015



*The data used to produce this image is unvalidated and contains some estimated data. It is the current "Best View" of the information at January 2016.*

## Key

The continuous red line (Foss Barrier Downstream Ouse level) is the measurement of the river level at the Foss Barrier on the River Ouse side. Up until 19:00 GMT, the time when the green line stops, this measurement is taken from the sensor at the Foss Barrier. After this, the red line is derived from the Ouse at York Viking; which is about 400-500 yards upstream on the Ouse.

The green line (Foss Barrier Upstream Foss level) is the measurement of the river level at the Foss barrier on the River Foss side – it is a measure of the level in the Foss Basin.

The blue line (Huntington River Foss level) is the measurement of the river level of the River Foss at Huntington, 2km further upstream of the Barrier. This is the only site that records the level of the River Foss independently of the barrier. It shows what is happening to the river level in response to rainfall rather than in response to the barrier.

The red dashed line (Foss Barrier defence level) shows the top level of the barrier gate when it is the closed ( in the down position). Should the Foss level exceed this height it would overtop the barrier gate and flow into the River Ouse.

The purple and grey bars at the top axis show the total rainfall per hour in mm at two raingauges. This is measure of the rain north of York around Easingwold and surrounding area and shows very heavy rainfall.

The horizontal grey dotted lines show the indicative level of the named streets ( the road level in these streets does vary along their length). These streets flood from the River Foss when the level exceeds the height of the grey dotted line. For the purposes of this graph the key relationship is between the level in the Foss upstream of the barrier ( the green line ) and these street levels ( dotted grey lines ).

## **What do the hydrographs tell us about flooding on the River Foss on 26 December 2015?**

### **25 December**

The blue line shows the level of the River Foss upstream of the barrier at Huntingdon. The line rising shows that there is an increasing flow of water. Levels in the River Foss are rising rapidly in response to the overnight and morning rainfall (where rainfall totals per hour in mm at the two gauges are shown by the grey and purple bars at the top axis), through from the afternoon of 25 December. The increase eases off half way up the blue line where there is a kink, as the river is responding to the first period rainfall having stopped.

On 25 December through the early morning of 26 December, the inflow to the River Foss behind the barrier is matched by the ability of the pumps to discharge it into the River Ouse. The Foss river level at the barrier ( shown in the green line ) is holding more or less constant.

### **26 December morning**

The very heavy rainfall in the upper part of the catchment is easing. Levels in the River Ouse (red line) are rising. From mid-morning on 26 December the blue line becomes steeper again showing that the River Foss upstream is now rising more rapidly in response to the early morning rainfall.

However, the Green line shows how levels behind the barrier are rising as the inflow from the Foss upstream ( the blue line ) is exceeding the capacity of the pumps to hold the basin ( the green line ) at a constant level.

The level on the River Foss behind the barrier (the green line ) is still lower than the River Ouse level ( the red line ) at the other side of the barrier. This shows that the barrier is defending the Foss from inflow from the Ouse.

## **What do the hydrographs tell us about flooding on the River Foss on 26 December 2015?**

### **26 December afternoon**

The rainfall in the upper part of the catchment has stopped. The River Foss upstream (blue line) is continuing to rise in response to the morning rainfall. Sections of Huntington Road are under water because of the volume of water coming down the Foss.

The green line shows a steep increase in the River Foss level near the barrier, from around midday on 26 December. The Foss barrier is down and the pumps are on. The steep increase shows that although all eight pumps were operating, they were not keeping up with the inflow from the Foss and the river level behind the barrier was rising quickly. Levels in front of and behind the Foss Barrier are very close.

The level of the Foss River behind the barrier (green line) has now risen far enough that it has exceeded the road levels (dotted grey line) at both Foss Bank and Lower Huntington Road. At 16:30 there are reports of houses flooding in Huntington Road area as a result of these levels in the Foss.

The red line shows the level of the River Ouse rising through 26 December, whilst the Foss Barrier is down and the pumps are on. But it is rising less quickly than the River Foss at Huntingdon and significantly less quickly than the Foss at the barrier.

### **26 December evening around 7pm**

The Foss Barrier pumps were turned off at 18:45 on 26 December and we then started to open the barrier. The barrier takes 10 to 15 minutes to open fully. At this time the Ouse level in front of the barrier was approximately 0.06m higher than the level in the Foss immediately upstream of the barrier. At around the time of these actions, there is a jump or spike in the green line. This is due to a combination of both shutting down the pumps and the time it takes to raise the barrier enough to allow the Foss to flow out into the Ouse.

After the spike, the green line then follows a curve which is less steep, meaning that the water level is rising less quickly in the Foss than it was when the barrier was down and all eight pumps were running. The green line then follows approximately the same line as the red line, meaning that the river levels at the barrier on both sides are the same. The Green line stops at this point because the sensors at the barriers were no longer working.

### **27 December**

The River Foss (blue line) reaches peak levels in late morning on 27 December. It then declines as the levels are reducing.