



## Bridge of the Month No80, August 2017 Charlestown Viaduct Crack



Another month gone already. I have been travelling for the past two weeks. Home last night, washing done and on the line. Many new bridges recorded but really, this will have to be short shift and a bit technical.

While I was away I visited the Scottish Lime Centre at Charlestown on the north shore of the Forth. Many years ago (possibly 30) I came across a little viaduct there with a serious crack and I went back to look for it. If you want to go and look it is [here](#). We didn't get a general view, the terrain was too difficult.

This pic (showing the engineer as an old man looking slightly vacant) shows the piles of discarded product filling the valley and much of the viaduct.



I think that all that weight has caused the damage shown here.

This is a massive spandrel crack but does not seem to start in the usual place at the arch crown.



This is the “good” end of the crack.



Here is the damage at the crown.



And here we get to see the real cause of the trouble. A jacking or chock stone coupled with a strange vertical movement.

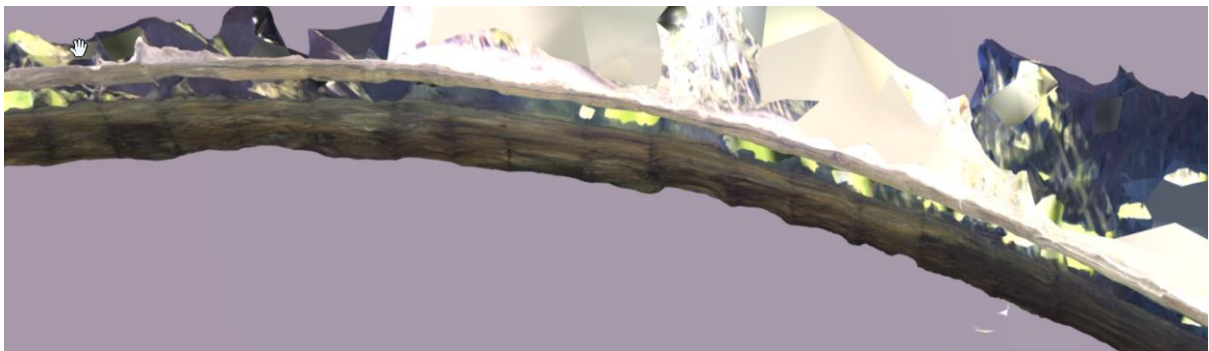
Hamish made a model of just the edge from about 10 minutes worth of photos. That allows a square view of the jacking stone. [You can view the model in full 3D here.](#)

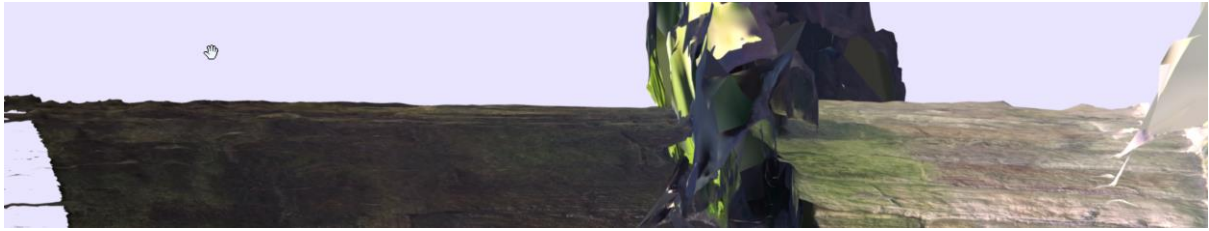


What is particularly strange is that the main pier to the left is obviously going down, leaving the edge behind.

Because the stone bridges the gap it resists that vertical movement, but in the process, generates a lateral force and, once the crack has formed, a substantial lateral displacement.

The settlement at the crown is quite substantial, as can be seen from this edge view.





Taking a section across the crack shows the step. And that can be emphasised by putting lines on the picture.



To properly diagnose the cause of this problem would require much longer on site and a deal of soil investigation.

But that will have to do for August.

Archie seminars coming up in Bristol on 29<sup>th</sup> Sept and London on 3<sup>rd</sup> October. Dates being fixed for Derby, Newcastle and possibly Belfast. A venue is still needed for one in the Manchester area and offers are gratefully received. Contact [philip@obvis.com](mailto:philip@obvis.com) for more details.