Referee 2: Tom Walski

First of all, the authors would like to thank the reviewer for taking valuable time to review and for the critical assessment of the paper.

Comment1: It would have been great to have cut a section out of the pipe and examined it. Were solids only found on the bottom of the pipe or where they uniformly distributed around the circumference? Collecting a few pipe coupons around the circumference would have been useful if a section could not be removed.

C1 Ans: A pre-intervention pipe cut out was taken from the trunk mains low point (Figure 1a in the manuscript) to assess the pipe internal condition and amount of accumulated material present on the asbestos cement pipe wall.

The following information has been added to the paper:

Figure 1 shows images of pre-interventon pipe cut out. Accumulated material can clearly be seen around the full pipe circumference, supporting the PODDS model concepts. The cut out was taken at the longitudinal low point (manuscript Figure 1a), such that all gravitationally driven self-weight settling processes that would have led to invert deposits were explored, with none being found.

Figure 1: Pre-cleaning intervention pipe cut out

Comment 2: The rapid increase in turbidity in the months after the cleaning indicates that there is some source of the solids causing the turbidity. Without knowing the nature of the solids, it is difficult to determine its source. What did the solids look likeåA˘Tiron particles, treatment plant floc carryover, manganese solids, asbestos particles or microbial growth.

C2 Ans: The following has been added to the discussion, it should be noted that conclusion cannot be drawn based on the data collected.

Results of metal samples during trials are shown in figure 2. Figure 2a shows all metal samples during trials where the concentration of manganese (Mn) was high and occasionally exceeding the UK regulatory prescribed concentration value (PCV) value of 50 μg/l. Iron and aluminium concentrations in the bulk water is also shown to be significant, although well below the UK PCV limit. Figure 2b presents the results for calculated metal concentrations for an equivalent 1.0 NTU limit. Manganese PCV is likely to be exceeded during all trials at this threshold suggesting high Mn content in the bulk water. From this it could be suggested that the accumulation or fouling effects are driven by manganese and other metal (e.g. iron and aluminium) precipitation from the bulk water which is consistent with previous research findings (Boxall et al., 2003; Husband and Boxall, 2011; Seth et al., 2004)[1,2,3]. However, a complete conclusion about inorganic particles responsible here for discolouration risks cannot be drawn from this sampling study alone as undisturbed sampling data from trunk main were unavailable. Also the previous work has indicated that biological processes impact on material accumulation and hence it's influence discolouration risks as well (Gauthier et al., 1999; Husband et al., 2016)[4,5].

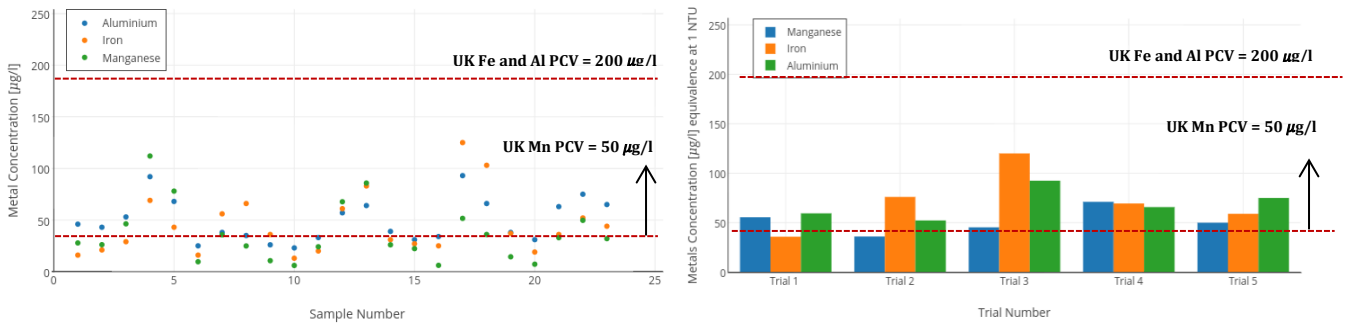

Figure 2: a) Metal concentration in bulk water during trial durations, b) metal concentration equivalence at 1.0 NTU

Comment 3:"High contacts rate worldwide?" What is a contact rate?:

C3 Ans: We think the rate term is correct i.e. number of customer contacts per 1000 population per year. Otherwise, the contact numbers cannot be comparable.

Comment 4: In North America, a 228 mm pipe would not be considered a "trunk main". Depending on the system, that terminology is usually reserved for the pipe on the order of 500 mm or larger.

C4 Ans: A transmission (trunk) main is defined by its operation, not its size. A trunk main is one that is used to transport water between treatment works, service reservoirs, demand zone etc. Typically it does not have customers directly connected to it (with the occasional unavoidable expectations). This definition has been added to the paper.

Comment 5: The title referred to in-service cleaning, but it sounds as if no customers were being provide water along the test section from the test pipe during this work. Were there no customers on the line or where they provided water through bypass piping?

C5 Ans: As commented above (**C4**) this was a trunk main so did not have any direct customer connections, however the downstream network and associated consumers were connected and operational throughout.

Reference cited in this discussion paper:

[1] J. Boxall, P. J. Skipworth, and A. J. Saul, 'Aggressive flushing for discolouration event mitigation in water distribution networks', *Water Science & Technology: Water Supply*, vol. 3, no. 1–2, pp. 179–186, 2003.

[2] P. S. Husband and J. B. Boxall, 'Asset deterioration and discolouration in water distribution systems', *Water Research*, vol. 45, no. 1, pp. 113–124, Jan. 2011.

[3] A. Seth, R. Bachmann, J. Boxall, A. Saul, and R. Edyvean, 'Characterisation of materials causing discolouration in potable water systems', *Water Sci. Technol.*, vol. 49, no. 2, pp. 27–32, 2004.

[4] S. Husband, K. E. Fish, I. Douterelo, and J. Boxall, 'Linking discolouration modelling and biofilm behaviour within drinking water distribution systems', *Water Science and Technology: Water Supply*, vol. 16, no. 2, p. ws2016045, Apr. 2016.

[5] V. Gauthier, B. Gérard, J.-M. Portal, J.-C. Block, and D. Gatel, 'Organic matter as loose deposits in a drinking water distribution system', *Water Research*, vol. 33, no. 4, pp. 1014–1026, Mar. 1999.