Updated Referee report on Dupuits et al., 2017, Using Graphs to find economically optimal safety targets for multiple lines of flood defences.

General comment:

The authors have thoroughly revised their paper. The paper now clearly discusses previous work on which this paper builds. The scientific value added of this paper is clear from the introduction section (section 1).

Unfortunately, the scientific value added of this paper is not properly described in the abstract. Rewriting this abstract will solve this problem. In addition, I have some technical and presentational remarks to obtain scientific correctness and improve the presentation.

The paper title should also be changed to correctly state the scientific value added. I propose as title: "Revisiting a graph based approach for solving economically optimal safety targets for flood defences to avoid annual expected damage calculations".

I propose to the editor that she handles these matters from now on.

Comments:

1. Abstract: please state that: "This paper ***revisits*** an approach for …". Instead of ""This paper ***presents*** an approach….". As clearly described in the introduction, this paper revisits a solution approach earlier presented in previous papers and reports and implemented in one earlier paper.
2. Abstract: delete the sentence: 'and is, thanks to some beneficial properties of the application able to traverse large problems'. This claim is not at all supported in the paper. As previously assessed and discusses in Zwaneveld and Verweij (2014a) and Eijgenraam et al. (2016 , including proceeding working paper), this shortest path approach is unable to solve present real world problems due to the fat that a shortest path approach requires exponential amount of combinations. This fact is also mentioned in this paper on page 6, line 15-20). Hence, the shortest path approach can be used for small problems only. Other solution approaches are better to handle large problems. That is the reason why previous authors did not use the shortest path based approach although they were fully aware of it. This must also be clearly discussed in the main text. My previous referee report included many references to that.
3. Delete (and rephrase) the sentence: The work presented here make cost-benefit…. both easier and applicable to a broad range of flood defences with multiple lines of defences''. As follows from the detailed and cumbersome discussion of the shortest path implementation, I think this is not easy and broader applicable at all. I do think that the other approaches by Zwaneveld and Verweij (2014a) and Eijgenraam et al 92016) are much easier and more general applicable. See the discussion of pro and cons of several solution approaches (including shortest path) in Zwaneveld and Verweij (2014a) and Eijgenraam et al. (2016) I am sure that some readers prefer these other approaches. I am also sure that some readers prefer the shortest path approach. As discussion in section 1, this differs from once person to another. Hence, rephrase this sentence for example as: "The work presented here provide suggestions to implement the shortest path approach to cost benefit analyses of complex defence systems with interdependent multiple lines of defences."

4. Section 1: As described, the authors revisit the shortest path approach to reduce AED estimates. Other approaches (see page 4 line 4-8) can also be used or adjusted to avoid AED estimates. This should be mentioned. Be clear about the fact that shortest path approach may not be the best approach to avoid AED estimates. Leave the answer to this question for further research. I think that the heuristic approach and the ILP approach by Zwaneveld and Verweij (2014a) are first and second best approaches to find 'good solutions with minimal AED estimates'. Of course, this is an expert guess from me which I did investigate (yet). However, the authors didn't look into this question as well.
5. Section 2.2 and 2.3: the proposed shortest path solution approach is – in my opinion - a standard approach. I advise the editor not to publish these two subsections. I see no scientific value added. Please refer to textbooks and wikipedia internetpages instead. This will make the paper shorter. Furthermore, it avoids several mistakes. The authors seem to be non –experts in shortest path algorithms. E.g.:
    a. Many scientists consider Dykstra algorithm and UCS as logically identical[1].
    b. A greedy shortest path algorithm is – in general - not a greedy algorithm. The first provide a proven optimal solution. The latter provide a quick heuristical (i.e. possibly non-optimal) solution.
    c. The presented shortest path algorithm gives – by its well-known structure- a proven optimal solution. The authors do not seem to be aware of this.
    d. Page 9, line 4. Should *t* not be 200? Other similar mistakes in line 5.
6. I do not see the scientific value added of section 3.1. My advice is to delete this section.
7. Figure 17: please refer that this approach describes the heuristic approach as previously proposed by Zwaneveld and Verweij (2014a). See page 4, line 5 in which this approach is already mentioned by the authors.
8. Section 4.1: new title: "Single flood defence with tiny step sizes".
9. Section 4.1: Eijgenraam 2006 presents an analytical solution which may be non-optimal. Eijgenraam et al. (2016) presents an analytical, proven optimal solution. Please use the latter. If you stick to Eijgenraam (2006): please clearly state that the solution may be non-optimal!
10. Section 4.2: New title : "Single flood defence with regular step sizes"
11. Section 5: The authors should state explicit here that they *revisit* the shortest path approach to avoid AED estimates.
12. Section 6: please rewrite this section as suggested for the abstract.

[1] See for example. Felner, 2011 Position Paper: Dijkstra's Algorithm versus Uniform Cost Search or a Case Against Dijkstra's Algorithm. Proceedings, The 4th SoCS 2011.