



OPW Oifig na
nOibreacha Poiblí
Office of Public Works

Flood Map Update

MR021 Avoca



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PROJECT ENGINEER	Kevin Macken / Daniel Walsh
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1 Map Review Programme

The Map Review Programme is the process that the OPW follows to update predictive flood mapping to continue to provide the best available flood risk information to as wide an audience as possible. The Flood Maps have been developed from detailed engineering analysis and modelling. There is always some uncertainty with regard to the accuracy of predictive flood models; however, the detailed models used have been developed using the best available modelling techniques, tools and data at the time of production. Updates and revisions to the Flood Maps will be prepared as appropriate. Updates to the Flood Maps are considered when one of the below criteria are met:

- A change in the physical conditions since the Flood Map was produced. Examples of potential changes include new infrastructure, a new development, a culvert or bridge upgrade, land raising, channel realignment, etc.
- An error has been identified in the survey. Errors in the survey may include a channel missing or a channel misaligned, or an error in the surveyed levels used.
- Completion of an OPW-funded Flood Relief Scheme or Minor Works Scheme.
- Evidence presented by a recent flood event that calls into question the published Flood Map.
- The completion of a Strategic Flood Risk Assessment, supported by hydraulic modelling, which produces flood maps that are materially different to the OPW published Flood Map.

The Flood Map Review Programme covers Flood Maps produced by the National Catchment Flood Risk Assessment and Management Programme (CFRAM) and other projects that produce detailed productive flood mapping as published on www.floodinfo.ie. The CFRAM Programme was the principle vehicle to deliver on Ireland's commitments under the EU Floods Directive (2007/60/EC). The EU Floods Directive also requires that the Member States review and if necessary update the flood maps on a six-yearly cycle; the Map Review Programme is the process that satisfies this requirement.

The review of indicative national mapping datasets such as the outputs of the National Indicative Fluvial Mapping and the National Coastal Flood Hazard Mapping are not considered as part of the Map Review Programme.

2 Request Assessment

2.1 Map Review Request

Flood Maps were produced for Avoca as part of the Eastern CFRAM Study under the National CFRAM Programme. The Flood Maps for this location were finalised in 2016 and were informed by topographical survey data captured in 2012.

A Flood Map Review Request was received by the OPW which indicated a potential anomaly in the flood mapping regarding the alignment of the Avoca Trib3 watercourse. Figure 1 shows the location of the misaligned watercourse. As shown, this tributary of the Avoca River is modelled (red) as passing through the footprint of two houses rather than along the actual alignment of the river (green).

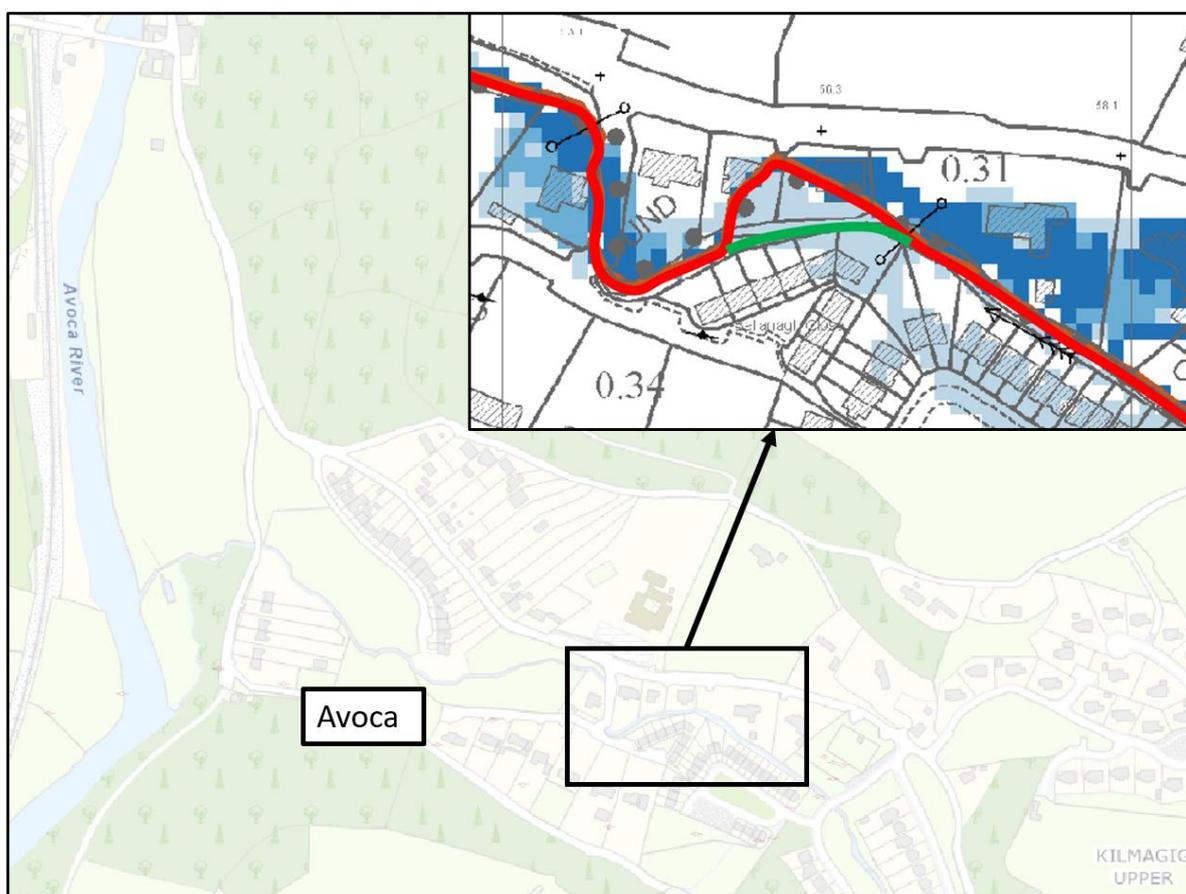


Figure 1: The modelled watercourse alignment (red) and the actual watercourse alignment (green) in Avoca, Co. Wicklow.

The Flood Map Review Request also queried the overland flood route that results in the same houses shown to be at risk, noting it was unlikely to occur in reality given the ground levels and streetscape features present.

2.2 Initial Assessment

An initial assessment was carried out of the items raised in the request. It was determined that the alignment of the Avoca Trib3 was incorrectly represented in the model. The tributary passes through the footprint of two houses rather than along the actual alignment of the

watercourse. The survey data for the CFRAM study contained the misalignment, which in turn was used to inform the hydraulic model.

Regarding the flow path, visually it was considered possible that the overland flow path illustrated in the Flood Maps may not represent the actual flow path, owing to the presence of a raised verge and kerb adjacent to the estate road. It is unlikely that this feature would be accurately represented in the LiDAR that was used for the CFRAM Study due to the resolution.

The OPW will only carry out a Map Update when the information provided supports one of the criteria described in Section 1. The channel misalignment identified satisfies the criteria of a survey error. An update of the flood maps is warranted in this case.

3 Map Update

3.1 Data Collection / Site Visit

To inform the Map Update a review of the survey data, flood maps, and the relevant CFRAM study reports was undertaken. A site visit was also carried out to identify any other issues that may be present and to verify information on the ground. The findings are listed below, and identified by number in **Error! Reference source not found.**:

1. The alignment of the Avoca Trib3 was incorrectly recorded in the survey data and therefore incorrectly modelled in the CFRAM study.
2. The final modelled section of the Avoca Trib4 is culverted in a 450mm pipe from a headwall just upstream of the main road (L2180), to where it discharges into the Avoca Trib3. This culvert was visibly blocked to a significant extent at the upstream face by debris, with limited capacity evident.
3. A new 600mm diameter pipe / culvert (orange) has been installed since completion of the CFRAM study by the Local Authority on Avoca Trib4. This runs from the headwall adjacent to the 450mm inlet, to the Avoca Trib3 at a point upstream of the existing 450mm outlet.
4. After inspection, it was considered possible that the overland flow path illustrated in the Flood Maps (identified by magenta arrows) may not represent the actual flow path, owing to the presence of a raised verge and kerb adjacent to the estate road.

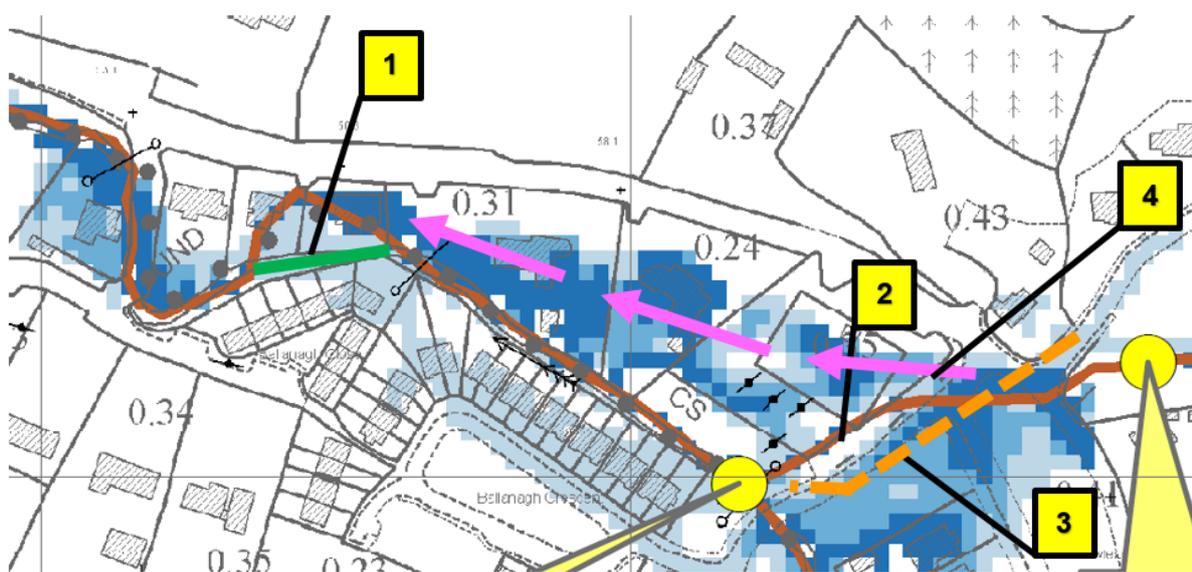


Figure 2: Site visit issues identified

There was no identifiable reason to reconsider the hydrological flows calculated in the original CFRAM study, as there were no additional records (flood extents, gauge records etc.) to consider. The issues identified in this review relate to physical changes on the ground and hence only the hydraulic model structure required updating with alternative survey data.

3.2 Map Update scope

The original purpose for proceeding with the Map Update was the error identified with the modelled river centreline. However, after a review of the relevant data and a site visit, it was determined that additional changes were required and these were included in the scope of the Map Update. This included improving the accuracy of the mapping in relation to the overland flow route as there was a direct impact on several residential properties.

The scope of work for the Map Update was defined as follows:

- Correct the alignment of the Avoca Trib3
- Retain the existing 450mm culvert in the model and apply a 100% blockage
- Survey the new 600mm diameter culvert and include it in the hydraulic model
- Capture additional survey data to better represent the overland flow path identified by the Map Review Request and incorporate it into the model
- Utilise the hydrological flows from the original CFRAM study to undertake the hydraulic model runs
- Produce updated Flood Maps and associated data from the hydraulic modelling results

3.3 Additional survey data

Additional survey data was captured in the areas identified in Figure 3 **Error! Reference source not found.** to improve the accuracy of the mapping. This included:

- A general topographical survey of the area from the upstream end of the new culvert, across the overland flow route (identified by grey cross hatching)
- A detailed topographical survey of the critical area to verify the actual flood path (red outline)
- Invert levels for the upstream and downstream faces of the 450mm Culvert (Culvert 1) and 600mm Culvert (Culvert 2)
- A cross section for the upstream face and headwalls of Culvert 1 and Culvert 2

In addition to the above, LiDAR data for the area with a 2m² resolution was sourced from existing CFRAM data for use in the model, instead of the 5m² resolution originally used.

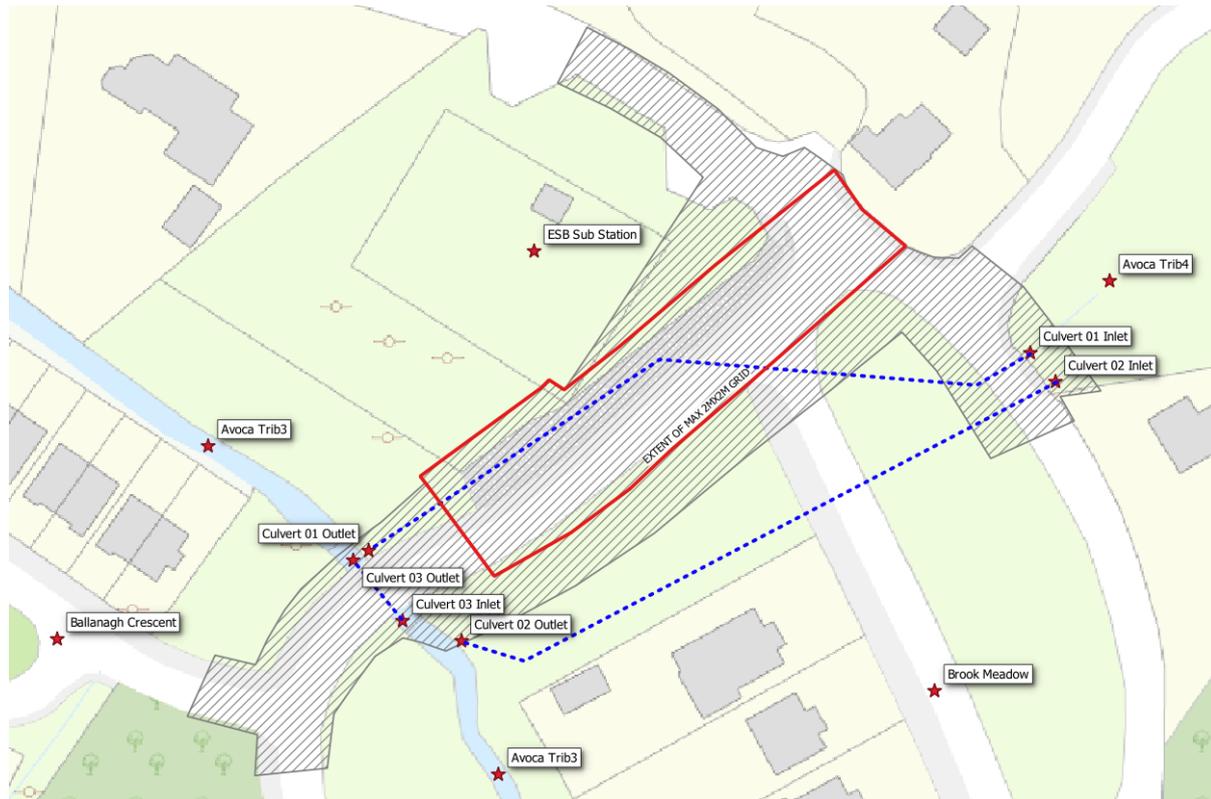


Figure 3: Items surveyed

3.4 Hydraulic Analysis

RPS Consulting Engineers were appointed to update the hydraulic model and generate updated mapping outputs. RPS were the consultants on the Eastern CFRAM Study responsible for developing the original model and therefore familiar with the area, the existing model, and the technical processes involved in developing the model.

As previously mentioned, no updates to the original hydrology were deemed necessary so the model was rerun with the design flows and hydrographs from the CFRAM study. New simulations were undertaken after the following changes were made to the hydraulic model:

- The model was upgraded to run in MIKE 2017
- The model was cropped to the area of interest in Kilmagig
- 2m² resolution LiDAR was used in the model instead of the original 5m² resolution
- The 2D model grid resolution was set to 2m² to reflect the new LiDAR data
- Ground levels were updated to incorporate the new topographical survey data
- The river centreline was amended, with a revised cross section (1039M00072) used on the Avoca Trib3
- Conveyance of the existing 450mm diameter culvert was set to zero flow (i.e. 100% blockage)
- A new 600mm diameter culvert and revised upstream headwall t was added

3.5 Results

The adjustments to the model have resulted in changes to the flood extents locally, particularly the overland flow route from the culvert inlet across the ESB substation site and several properties to the west (i.e. downstream of node 1039M00092J). **Error! Reference source not found.** shows a comparison between the original CFRAM flood extents and the updated flood extent map.

One of the most notable differences is the decrease in the 10% AEP flood extent across the map update area. The increased resolution of the model relative to the CFRAM Study specification appears to have had the biggest impact on the mapping, producing cleaner flood extents when compared to the original flood maps.

While this map update has resulted in significant changes to the flood extents, it incorporates a larger culvert on Trib4 not included in the original model, as well as utilising higher resolution survey data than was required under the CFRAM. It is likely that these changes alone have had a more significant impact on the flood extents than the correction to the Trib3 alignment. Note that mapping produced under the CFRAM Study was at a larger 'Community Scale' than this Map Update and at a particular point in time.

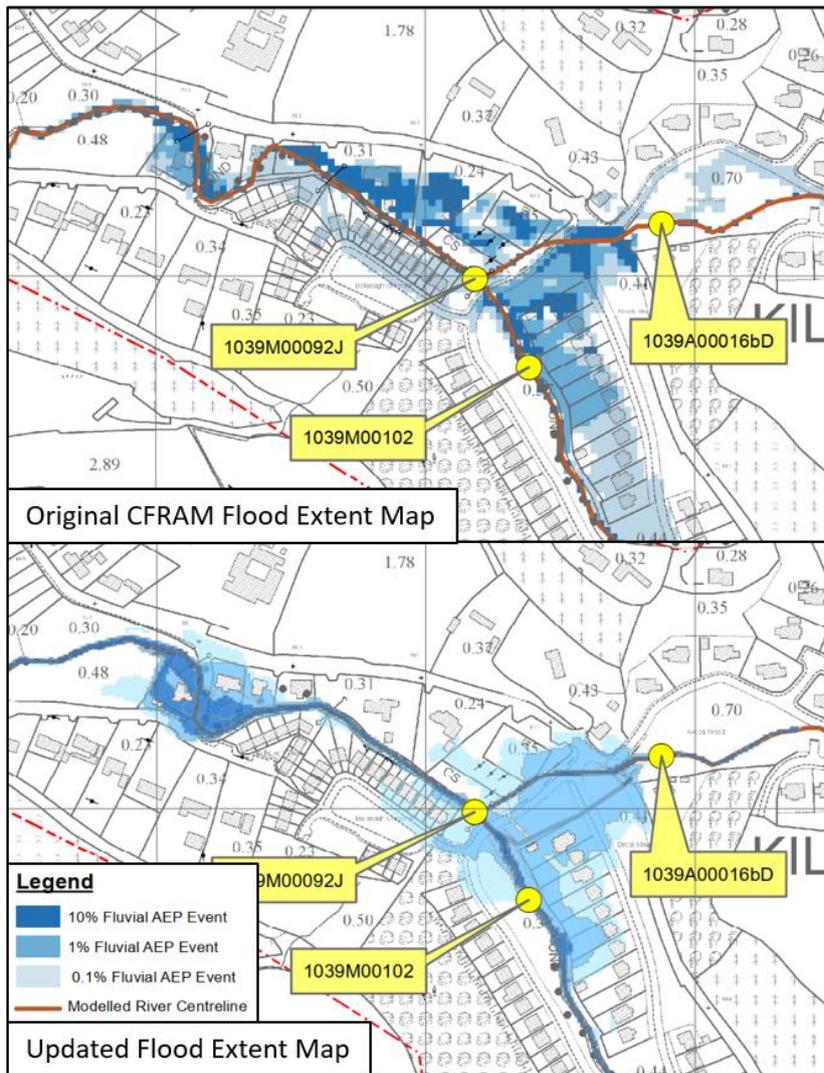


Figure 4: Comparison of original CFRAM extents and the updated flood extents

4 Conclusion

The Flood Maps for Kilmagig, Avoca, Co. Wicklow have been updated in response to a Map Review Request that highlighted required corrections to the alignment of the Trib3 watercourse and an overland flow route modelled in the Eastern CFRAM Study. The original CFRAM hydrology was used for this Map Update, which also included a new culvert arrangement and higher resolution survey data in the updated model.