

2 Need for the Proposed Scheme and Alternatives Considered

2.1 Introduction

This chapter demonstrates the specific need for the proposed scheme. This chapter also addresses the main alternatives considered.

2.2 Need for the Proposed Scheme

The Office of Public Works (OPW) in partnership with both Cork City and Cork County Councils carried out a Catchment Flood Risk Assessment and Management (CFRAM) Study for the Lee Catchment which includes the Tramore River Catchment. The CFRAM, which was published in February 2010, recommended flood relief measures for the Togher area. However, the Douglas area was badly affected by flooding in June 2012. As a result of the particularly destructive and disruptive flooding events of recent years, the need to increase flood defences has been identified. A history of flooding in the Douglas and Togher areas is provided in Table 2.1 below.

Table 2.1: History of Flooding Events in the Douglas and Togher areas

Date of Flood Event	Mechanism	Areas Affected
December 2015	Fluvial	Togher
28 June 2012	Fluvial	Togher, Douglas village
27 November 2002	Fluvial	Togher
21 November 2002	Fluvial	Togher, Douglas village
3 December 2001	Fluvial	Togher
30 November 2000	Fluvial	Togher
5 November 2000	Fluvial	Togher, Douglas
1998	Fluvial	Togher
17 March 1947	Fluvial	Douglas
24 December 1895	Fluvial	Douglas
19 November 1892	Fluvial	Douglas
Historic recurring	Fluvial/Tidal	Tramore River downstream of current Cork landfill site, Douglas

The flood event in June 2012 was particularly significant, extending throughout Douglas and Togher. There was significant damage caused to residences in the Ravensdale area, as well as at Douglas village centre (including the Douglas Village Shopping Centre), the St Patricks Mills centre, Donnybrook Commercial centre and commercial properties in Togher. There was also significant damage to community and amenity facilities the above areas.

The maximum flood extent for the 2012 flood event in the Douglas area is presented in **Figure 2.1**, while a comparison of the maximum flood extent for this flood event with the maximum modelled flood event is presented in **Figure 2.2**.



Figure 2.1: Maximum flood extent for the June 2012 flood event. Area 2 (Tramore River through St Patrick's Mills, Douglas) and Area 1 (Ballybrack Stream through Douglas) are located to the north west and the south of this figure, respectively. The N40 (South Ring Road) runs along the northern boundary of the figure. Source: South Western CFRAM consultants.



Figure 2.2: June 2012 flood extent calibration plot (maximum flood extent vs maximum modelled flood event). Area 2 (Tramore River through St Patrick's Mills, Douglas) and Area 1 (Ballybrack Stream through Douglas) are located to the north west and the south of this figure, respectively. The N40 (South Ring Road) runs along the northern boundary of the figure. Source: Cork County Council.

The flooding extended throughout Douglas village. The location of the culvert trash screen at Church Road and photographs of this trash screen under normal conditions prior to the 2012 flood event and following this flood event are presented in **Figures 2.3, 2.4** and **2.5**, respectively. Post flood photographs outside the Irish Countrywomen's Association (ICA) Hall and at a commercial premises in Douglas East are also presented in **Figures 2.6** and **2.7**. **Figure 2.7** illustrates the high water mark from the 2012 flood event.

The residents of Ravensdale were heavily impacted by the 2012 flood event, with a number of properties in this area severely flooded. **Figure 2.8** presents the likely flood routes of the Ballybrack Stream in the vicinity of Ravensdale during this event.

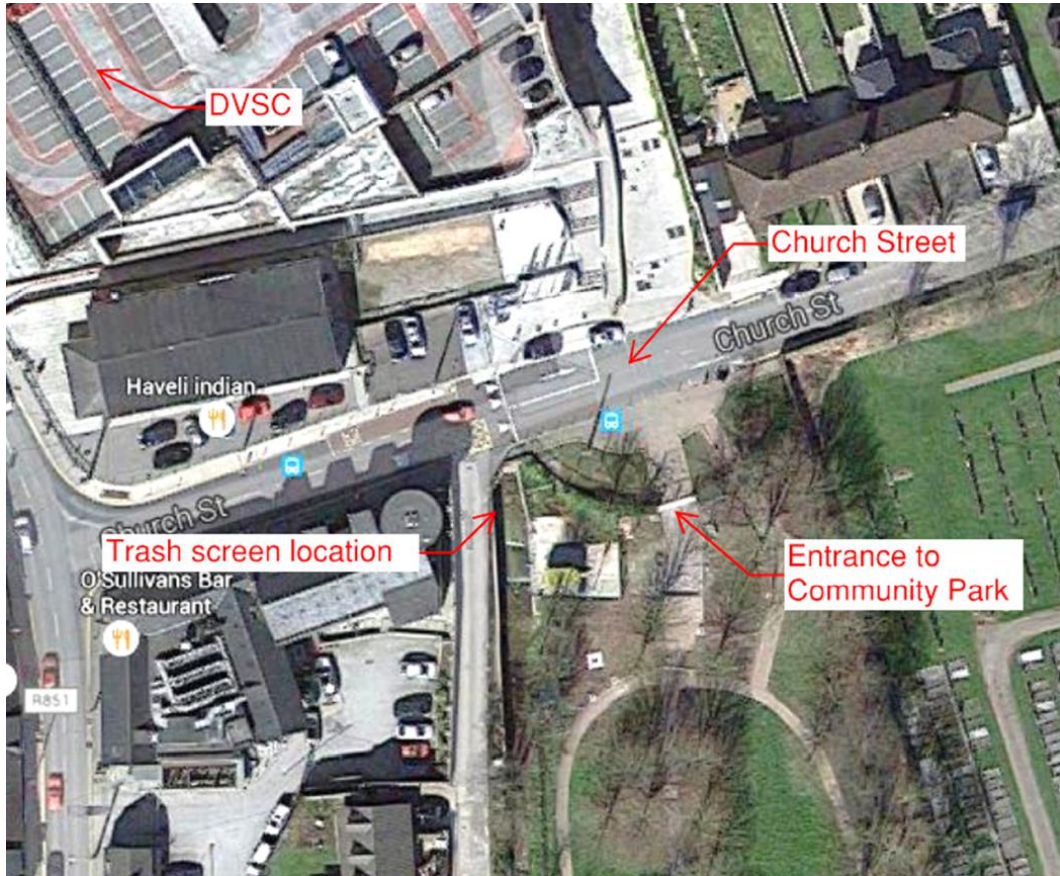


Figure 2.3: Location of culvert trash screen at Church Road



Figure 2.4: Church Road culvert trash screen – normal conditions. Source: OPW



Figure 2.5: Church Road culvert trash screen – post 2012 flood event. Source: OPW



Figure 2.6: Post 2012 flood event – wall knocked down outside ICA Hall



Figure 2.7: Post 2012 flood event high water mark from outside commercial property in Douglas East. Source: OPW

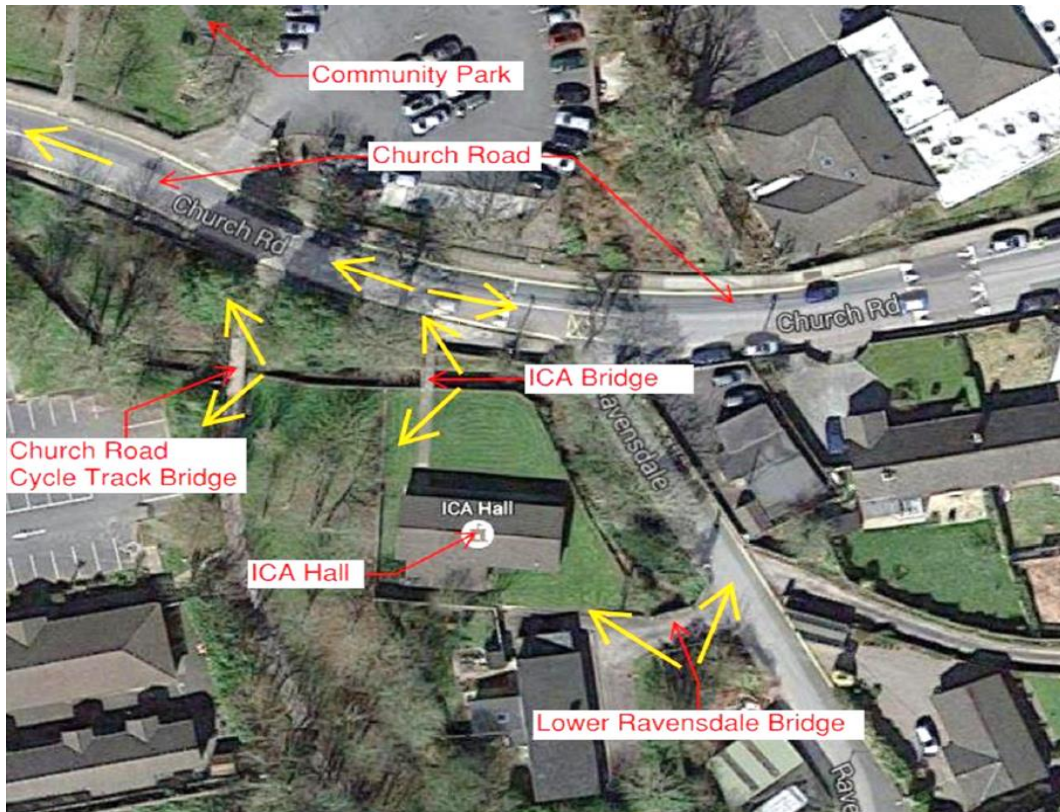


Figure 2.8: 2012 flood event – likely flood routes of the Ballybrack Stream in the vicinity of Ravensdale. The yellow arrows indicate the likely flood routes.

The area nearby St. Patrick's Mills as well as Douglas village centre and Douglas Village Shopping Centre were also severely affected by flooding during the 2012 flood event. Refer to **Figures 2.9, 2.10 and 2.11**. These areas were not accessible during the height of the flood.



Figure 2.9: Post 2012 flood event outside Douglas Village Shopping Centre. Source: Cork County Council



Figure 2.10: Post 2012 flood event inside Douglas Village Shopping Centre. Source: Cork County Council



Figure 2.11: Post 2012 flood event in Douglas Village Centre. Source: Cork County Council

Donnybrook Commercial Centre was also flooded in June 2012. Constrictions within the Grange Stream culvert in the Commercial Centre and blockages due to debris resulted in the culvert becoming surcharged, causing large volumes of water to discharge through a manhole in the centre. Photographs of the aftermath of the 2012 flood event in this area are presented in **Figures 2.12, 2.13 and 2.14.**



Figure 2.12: Post 2012 flood event at Donnybrook Commercial Centre showing debris at manhole. Source: Donnybrook Commercial Centre



Figure 2.13: Post 2012 flood event at Donnybrook Commercial Centre. Source: Donnybrook Commercial Centre



Figure 2.14: Post 2012 flood event at Donnybrook Commercial Centre. Source: Donnybrook Commercial Centre

The Togher area also suffered from extensive flooding following a period of extremely heavy rainfall in 2012. Greenwood Estate was one of the locations in Togher that was worst affected by this event, with significant flooding occurring in this area. Photographs of the aftermath of the 2012 flood event in the Togher area are presented in **Figures 2.15, 2.16 and 2.17**.



Figure 2.15: Post 2012 flood event in Togher Area. Source: Cork County Council



Figure 2.16: Post 2012 flood event in Togher Area – outside Togher Community Centre. Source: Cork County Council



Figure 2.17: Post 2012 flood event in Togher Area – inside Spar Express shop.
Source: Cork County Council

In the future, the risk of flooding may increase. Future changes which have the potential to affect the risk of flooding include:

- Climate change resulting in higher rainfall and higher tide levels.
- Geomorphological processes, such as sedimentation transport, which affects the area of conveyance of the river channel, and erosion.
- Development within the catchment of the Tramore River and its tributaries, which does not conform to the principles of sustainable drainage, and which adversely affects the response of the catchment to rainfall.
- Changes in land use, including afforestation and land drainage.

There is an evident need to implement measures to reduce the current frequency and risk of flooding, which is compounded by the potential for increased flood risk in the future. This is therefore considered an essential development that would provide much-needed flood alleviation for the Douglas and Togher areas.

As a result of the findings of the CFRAM study and the recent flood events in the area, Cork County Council, in association with the OPW, commissioned Arup to develop a Flood Relief Scheme for Douglas and Togher. The purpose of the scheme was to assess and develop a viable, cost effective and sustainable drainage scheme to alleviate flooding in the Douglas and Togher areas. The flood relief scheme design presented in this EIS is as a result of this detailed analysis.

The scheme will be designed to provide protection to properties in the study area from the 1 in 100 year fluvial / 1 in 200 year tidal flood events. The overall scheme will consist of:

- Flood alleviation measures in the form of hard defences along the Ballybrack Stream;
- Upgrade of a section of the Grange Stream culvert in Donnybrook Commercial Centre;
- Upgrade of Togher Culvert
- Other measures to improve conveyance through the Tramore River in Togher and through the Ballybrack and Grange Streams.

2.3 Scheme Design Process

The development of the proposed scheme was a process requiring an extensive assessment of different options for flood relief scheme design. The process included the assessment of the validity of all potential flood alleviation measures for each of the segments of the study area. In order to arrive at the final scheme design, a number of stages were followed. These required co-ordinated collaboration from the engineering and environmental teams. The design process required the following studies:

- Constraints Study
- Hydrology Study
- Hydraulic Modelling Study
- Site Investigations
- Flood Risk Assessment Study
- Options Assessment Study
- Information required for Appropriate Assessment Screening
- Environmental Impact Statement

Input was required from each preliminary assessment in order to finalise the design for the scheme that is being considered as part of this EIS.

2.4 Constraints Study

A constraints study was carried out during 2014 and 2015 in order to identify the main constraints that could either be affected by possible flood alleviation measures or issues that could constrain the viability or design of these measures. Constraints were documented under the following headings:

- Human Beings;
- Ecology (Aquatic and Terrestrial);
- Water;

- Soils and Geology;
- Archaeology, Architectural and Cultural Heritage;
- Landscape;
- Noise, Air Quality and Climate; and
- Material Assets.

Information for the constraints study was gathered with regard to the likely environmental impacts of the proposed scheme and statutory requirements for EIA. In addition, consultation was carried out with statutory and non-statutory consultees. A public information day was carried out during this period in order to gather information from the public about their experiences of flooding in the study area along with their thoughts on possible solutions to the flooding problem and their preferences in this regard.

The constraints study can be downloaded at www.douglasfrs.ie.

2.5 Consideration of Alternatives

2.5.1 Options Assessment

As part of the assessment of the options, an options report was produced, indicating the criteria on which the final design for the scheme would be selected. The assessment was undertaken in conjunction with the Multi-Criteria Analysis (MCA) methodology guidelines published by the OPW in relation to scheme design and options reporting for flood relief schemes (OPW, 2013). The report considered all valid alternatives, and determined the preferred design for the scheme.

2.5.2 Options Assessment Process

The process for the selection of the preferred flood relief options is outlined below:

- An initial screening of a long list of possible flood risk management measures against a predetermined set of criteria, was carried out to determine their potential viability;
- A technical assessment of potentially viable flood risk management measures was undertaken;
- Potential flood relief options were developed using combinations of flood risk management measures which were determined to be technically viable.

These flood relief options were then subjected to multi-criteria assessments (MCA), allowing a preferred flood relief option to be selected.

A summary of the options assessment report is provided below. The initial screening of measures was assessed in terms of:

- Applicability to the study area (including technical feasibility, constructability, and Health and Safety);

- Economic viability;
- Environmental;
- Social; and
- Cultural.

2.5.2.1 Non-viable flood risk management measures

Further to the initial screening, a number of flood risk management measures were identified as being non-viable and were not carried forward for further technical assessment. This included:

- Do nothing;
- Do minimum
- Non-structural Measures:
 - Flood forecasting/flood warning system
 - Sustainable urban drainage systems (SUDS)
 - Planning control/land use management

The ‘**Do Nothing**’ scenario is defined as the option involving no future expenditure on flood defences or maintenance of existing defences/channels etc. The implication is that the existing risk of flooding persists in the study area. This is not considered to be a sustainable option as it fails to meet the needs of the residents and business owners in Douglas/Togher and has therefore been ruled out at the initial screening stage.

The ‘**Do Minimum**’ scenario is not suitable for this scheme where flooding occurs frequently after rainfall events.

Non-structural measures, such as land use management within a catchment, affect the way in which rainfall is directed to watercourses. Hard surfaces reduce the amount of rainfall that can infiltrate to ground water, and intensive drainage schemes will increase the speed of runoff, giving rise to earlier and higher flood peaks. Flood forecasting or flood warning systems are more suitable for larger catchments that have less flash-flood type flood events.

Sustainable urban drainage systems (SUDS) play a role in the management of flood risk through attenuation of surface runoff from impermeable surfaces. Douglas is a heavily urbanised area with little space for the construction of attenuation or other SUDS features into the landscape. This option has therefore not been carried forward.

2.5.2.2 Potentially viable flood risk management measures

The constraints identified in the initial Constraints Report informed the selection of the flood relief measures. The range of engineering measures considered for this FRS included the following:

- Public awareness

- Structural measures (e.g. defence walls, culverts)
- Flow diversion (e.g. river diversion or flood flow bypass channel)
- Flood containment through construction of flood defences
- Increase conveyance of channel (upstream and/or through and/or downstream of the town)
- Combination of direct defences and conveyance improvements
- Sediment/debris control

A detailed description of the works involved in the scheme is described in **Chapter 3 Scheme Description**.

2.5.2.3 Development of Shortlisted options

2.5.2.4 Area 1 Ballybrack Stream through Douglas

Option 1 – Direct defences only with the construction of direct defences along both sides of the Ballybrack Stream including new reinforced concrete defence walls and bridge parapets and regrading of the river bank at Douglas Community Park;

Option 2 – Conveyance improvements only with the widening and deepening of the Ballybrack Stream channel through Douglas as well as removal of constrictions at several hydraulic structures (bridges, culverts, etc.);

Option 3 – Combination of direct defences (flood defence walls, culvert replacement, trash screen replacement) and conveyance improvements (river widening and deepening, bridge removal, bridge replacement, regrading).

2.5.2.5 Area 2 Tramore River through Saint Patrick's Mills

Option 1 – Direct defences only are proposed. A new 1.2m high flood defence wall along the right bank of the Tramore River with stone cladding on the dry side only. New reinforced concrete bridge parapets at 1.2m high.

2.5.2.6 Area 3 Grange Stream (tributary of Ballybrack Stream) through Donnybrook Commercial Centre

Conveyance improvements and replacement of a section of the existing culvert are the only viable option in this area. This option includes the regrading of the existing channel bed in the Commercial Centre to remove two existing trash screen structures that, due to a build-up of material, act as weirs.

2.5.2.7 Area 4 Tramore River through Togher

Option 1 - Replacement of existing culvert with a new culvert along Togher Road;

Option 2 - Replacement of existing culvert with a new culvert parallel to Togher Road (to the west);

Option 3 - Replacement of existing culvert with an Open Channel with engineered banks parallel with Togher Road. This option incorporates five separate culvert crossings along the route of the open channel in order to maintain vehicular and pedestrian access to existing properties and roads from Togher Road.

2.5.2.8 Multi-criteria Assessment of the Shortlisted Options

The effectiveness of each of the viable options can be measured in terms of how it achieves a set of flood risk management objectives. A detailed multi-criteria analysis (MCA) of the shortlisted options was carried out to evaluate the performance of each option in terms of predefined objectives. As part of this process, each objective was given a global and local weighting. Each option was then scored relative to the present day situation (baseline condition), based on how well they met the objectives. The output from this stage was a total weighted score for each option. The option with the highest score is deemed to be most desirable, subject to professional judgement exercised by the project's designers/steering group, as appropriate.

The determination of suitable local weightings and scorings for each of the criteria were determined through a workshop forum held with key representatives of OPW, Cork County Council and Arup.

This ensured that the combined expertise and experience of all relevant specialists and disciplines were brought to bear in a transparent fashion in the scoring of each option.

The flood risk management objectives were categorised as follows:

- Technical;
- Economic;
- Social; and
- Environmental.

The categories were sub-divided into objectives. Each objective was weighted to reflect their importance and/or sensitivity, and to ensure that the objectives most relevant to the location under consideration were given priority in the decision-making process.

Following the MCA assessment, the preferred options were brought forward for further development.

2.5.2.9 Public Consultation

Public consultation was carried out throughout each stage of the development of the scheme. Two public information days were held during the early stages of the project (26th February 2014 and 8th October 2014). These consultations were held at the early Constraints Stage and at the Emerging Preferred Options Stage. On both occasions consultees and members of the public were invited to submit their views on the emerging options of the proposed scheme.

Cork County Council and members of the design team have also engaged in direct consultation with relevant stakeholders, residents and affected landowners. The feedback from this consultation process was carefully considered in the development of the preferred scheme.

Cork County Council intend to acquire the land in private ownership necessary for the construction of the scheme by agreement with landowners wherever feasible, and have commenced the liaison and negotiation process with all affected landowners. Feedback received from affected landowners and residents to date concerning their properties generally relates to the extent of the flood defences, landscaping and screening, wall finishes, access and egress, construction impacts and timeframes, easements and land take. Cork County Council and the design team will continue to actively engage with all affected residents throughout the land-take negotiations, development of the detailed design and construction phases to adequately address the concerns outlined above.

A further public information day was held on the 4th of April 2017 to present and explain the developed scheme and the statutory approval process to the public and affected residents. Cork County Council have taken on board comments from Ravensdale residents regarding the finishes to the flood defence walls in the area which now include for stone cladding on both sides of the flood defence walls.

2.6 References

Office of Public Works (2013) *National CFRAM Programme Guidance Note 28 – Options Appraisal and Multi-Criteria Analysis Framework*.