PRESENTATION BY OPW TO JOINT OIREACHTAS COMMITTEE ON CULTURE, HERITAGE, AND THE GAELTACHT

THE LOWER LEE (CORK CITY) FLOOD RELIEF SCHEME

The first image shown here is the proposed view at Merchant's Quay from the Scheme, and the second one is Patrick Street during the flood on February 4th 2014.

Introduction

Thank you Chairman, Deputies and Senators for inviting us here today to outline the proposed Lower Lee (Cork City) Flood Relief Scheme.

Cork City has a long history of flooding and this Scheme will provide protection, against Tidal and River flooding, to about 2100 properties, including 900 homes and will extend from Inniscarra dam to the City centre (Figure 1).

While many options were considered in the development of this scheme by the OPW, which has extensive expertise and knowledge in the areas of flood risk management and conservation, in partnership with Cork City and County Councils, the scheme presented here today is the **only** technically viable AND cost beneficial option to provide the required standard of protection to Cork.

The current estimated whole life cost is €140m and the project represents the largest flood relief project proposed in Ireland.

It has been estimated that the damages caused in the 2009 river flood and 2014 tidal flood amounted to €90m and €40m respectively.

Substantial stakeholder and Public Consultation has taken place on this project.

Work on this project determined that the solution requires optimised use of the existing hydro-electric dams for flood storage and flood defences downstream. In line with international best practice the standard of protection provided by the scheme is the 1 in 100 year flood from the River Lee and the 1 in 200 year flood from the Tide.

Statutory Process

The Scheme is being progressed under the Arterial Drainage Acts and the statutory process is ongoing. The formal public consultation (Public Exhibition) of the scheme commenced last December and is being progressed in close partnership with both Cork City and County Councils.

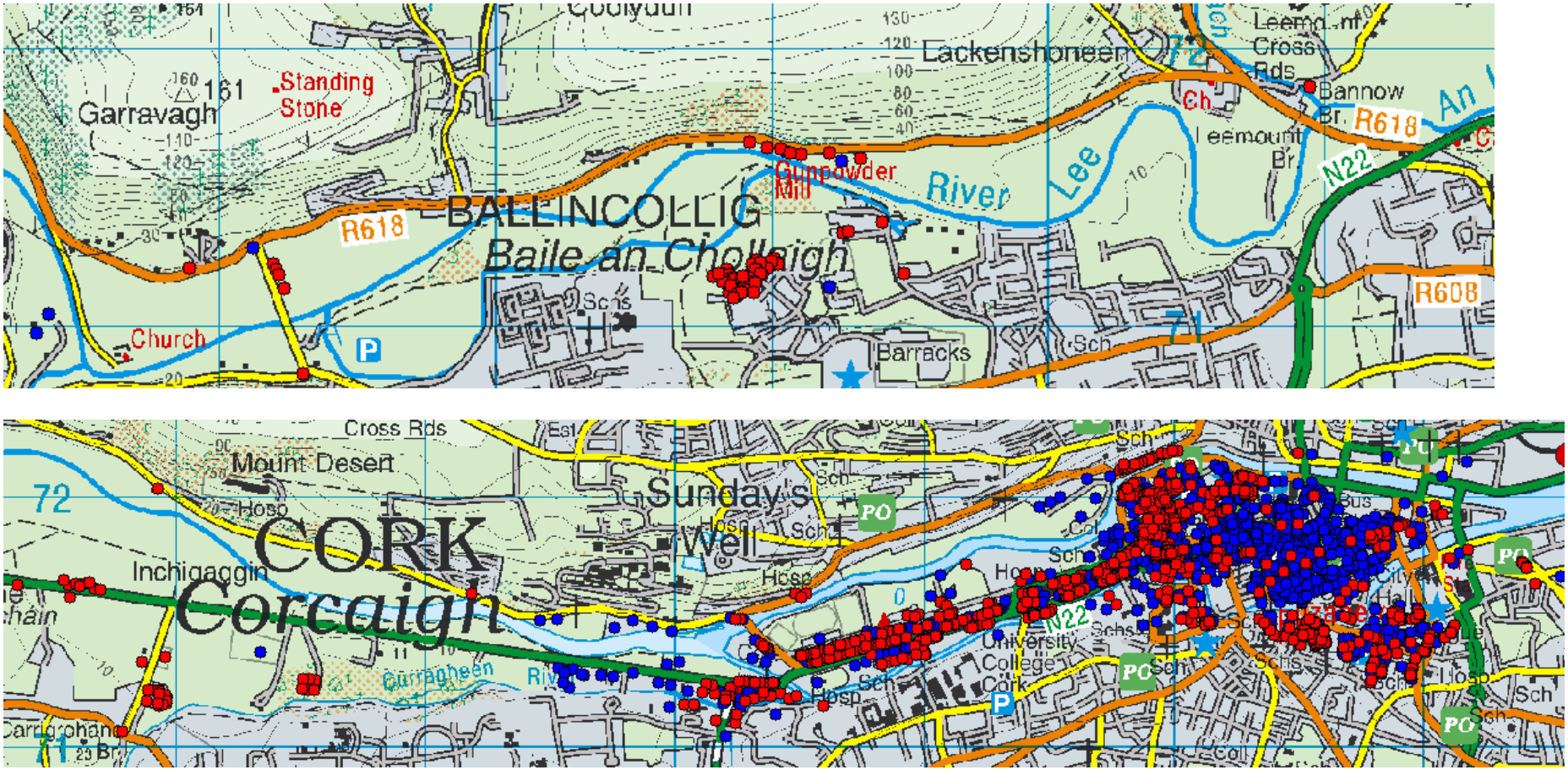


Figure 1: Maps showing locations of properties to be defended by scheme.

Outline of the Scheme

(Images on pages 5, 6, 7 and 8 refer)

The following are key points to note:

- Over €20m is being invested in the repair of the historic quay walls, many of which are at risk of collapse as occurred at Grenville Place in the 2009 flood.
- Over 400 heritage structures will be protected
- The detailed design team includes a Grade 1 Conservation Architect to ensure that the protection of cultural heritage will be considered appropriately.
- The proposed defence height along the majority of the quays is 2 feet or less (Figure 2) with the highest quay wall height of 4 feet above finished ground level (Figure 3). This cannot reasonably be described as high and will not limit views or enjoyment of the river
- Over three-quarters of the quay walls will have an element of open railing below guarding height. (Figure 2)
- Over 1km of **new** river side walkways will be provided which will enhance connectivity with the River (Figures 3 & 4)
- An experienced urban public realm landscape architect is part of the detailed design team, whose remit is to ensure that the defences are integrated unobtrusively into enhanced public spaces.
- Existing unattractive concrete upstands and railings will be replaced with new architecturally designed railings. (Figure 2)
- Taking account of feedback received at Exhibition stage, the proposed scheme is being changed on quays which have original historic railings. At Sullivan's Quay and North Mall, demountable barriers are proposed so that the existing railings can be retained in their current form thus ensuring that there is no heritage impact. (Figure 5)

The mail elements of the scheme are:

- A Flood Forecasting System, using forecast rainfall
- Enhanced Operation of Hydroelectric Dams during Flood Events
- Washlands Upstream of the City
- Flow Control on the South Channel
- Flood Defences
- Ancillary works

The scheme is adaptable to provide greater protection in the future in response to Climate Change.

Support for the Scheme

The scheme has the support of

- the vast majority of the elected representatives of both local authorities,
- key stakeholders like Cork Chamber of Commerce and the Cork Business Association who together represent over nine hundred members in Cork City, and
- The Irish National Flood Forum.

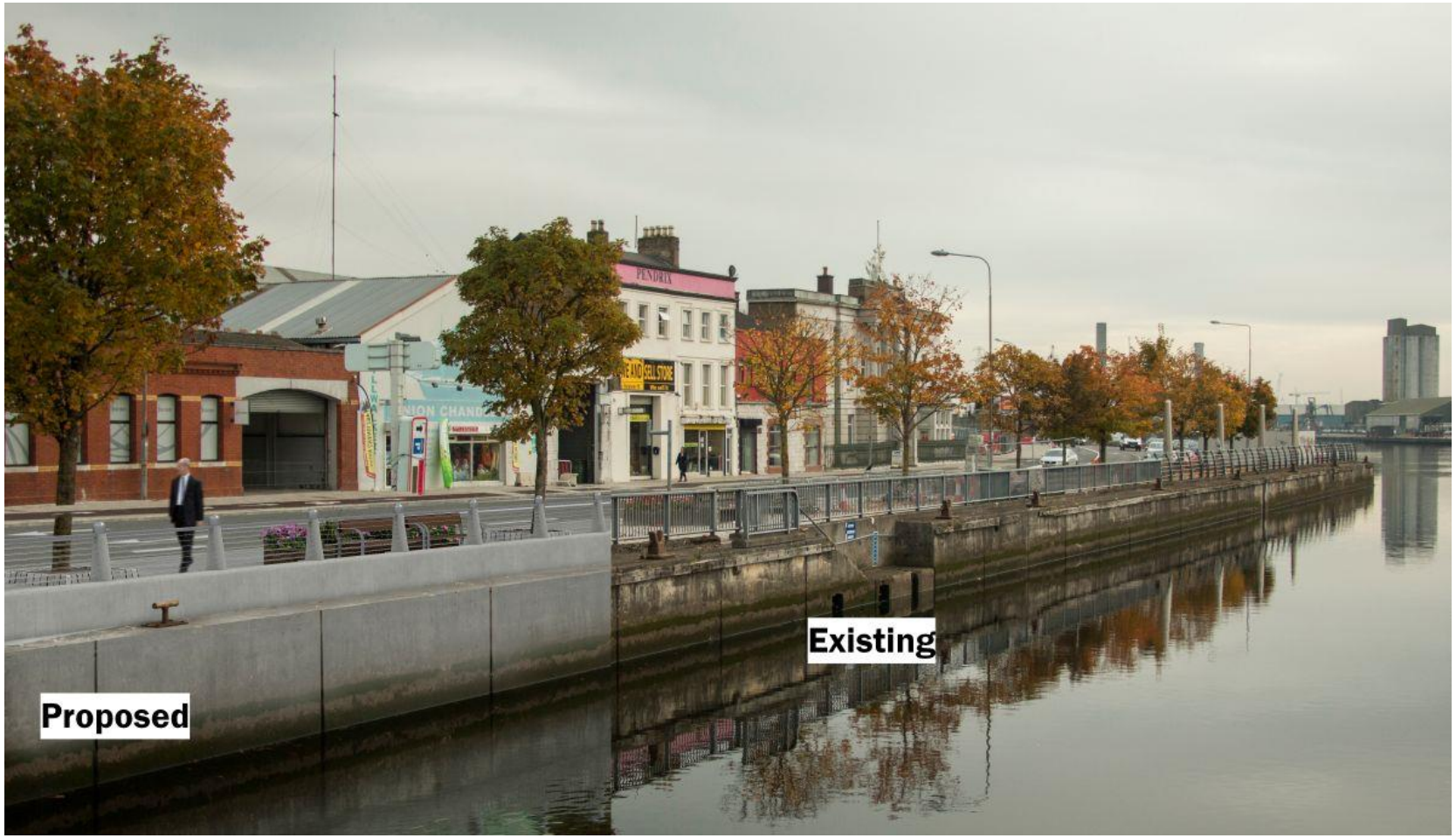


Figure 2: Existing and Proposed view at Penrose's Quay
(Note: the design of the Posts in the railing will evolve in the Detailed design phase, but the essential features of the proposed railing, (visually open or transparent, and low defence height) remain)

Bachelors Quay Existing

Bachelors Quay Proposed

Figure 3: Existing and Proposed views at Bachelors Quay

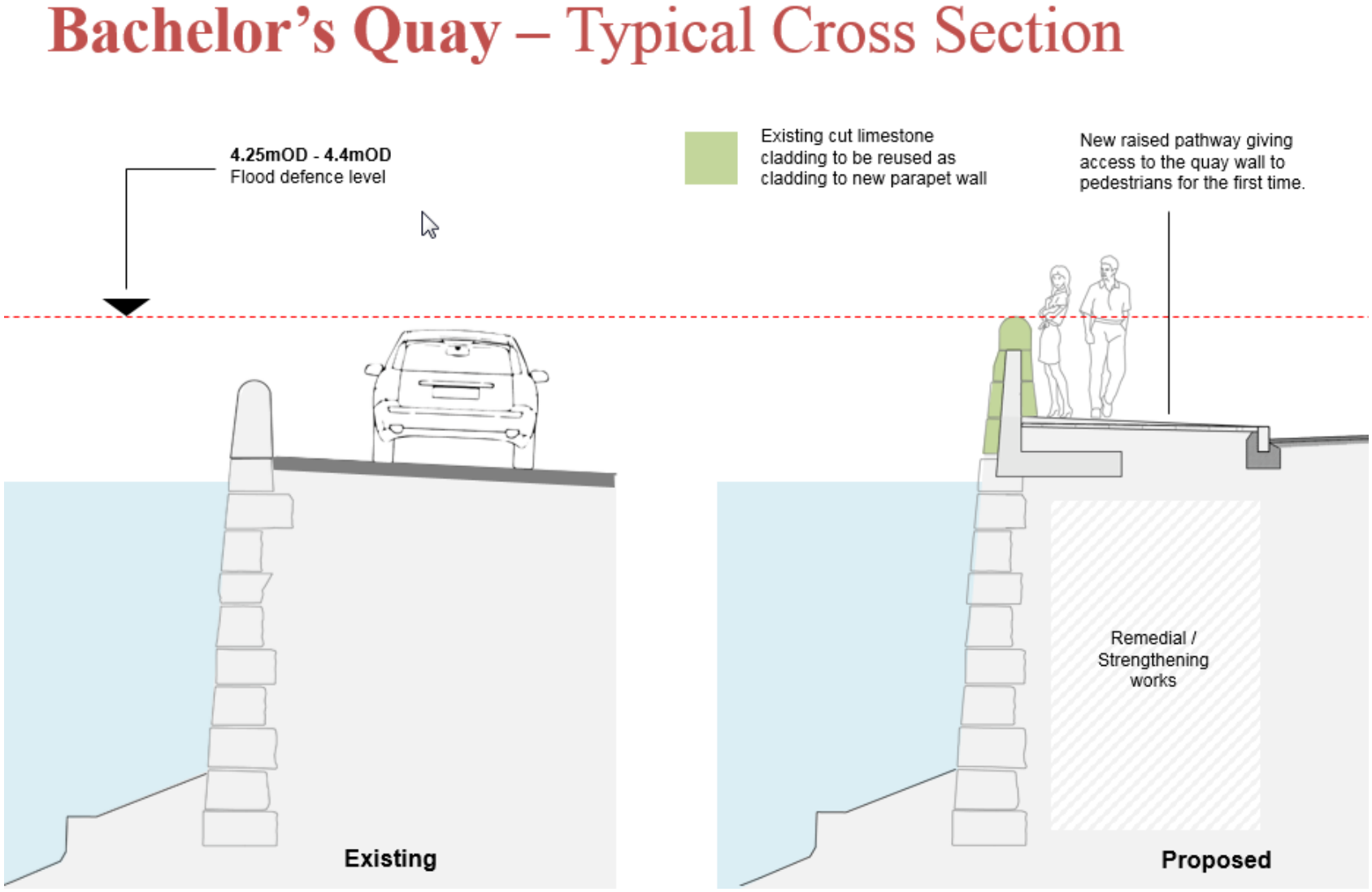


Figure 4: Existing and Proposed cross sectional views at Bachelors Quay

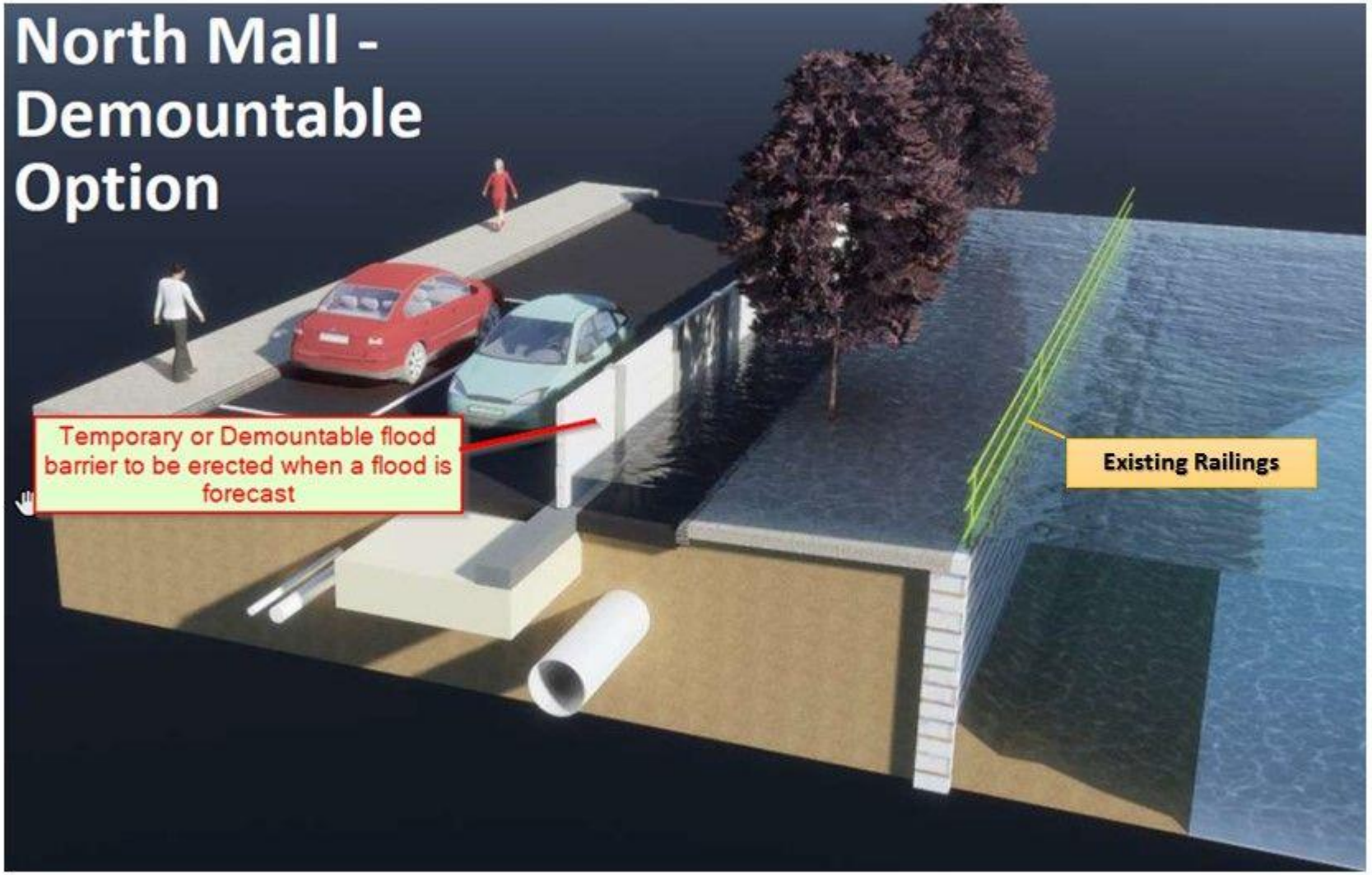


Figure 5: Proposed offset Demountable flood defence at North Mall.

"Save Cork City" (SCC) alternative proposals

SCC has proposed an alternative solution which tries to solve Cork's flooding problem by dealing independently with the fluvial (river) and tidal problems. SCC has proposed a tidal barrier at Little Island, which would **only** address the tidal flooding problem.

This barrier is not considered viable for a variety of reasons including impacting negatively on highly sensitive EU designated environmental sites in Cork Harbour. The location proposed by SCC has limited ability to cope with the likely future impacts of climate change. SCC recently commissioned HR Wallingford to prepare a Cost Estimate Report of its proposal. The report is therefore only a high level cost estimate of the SCC proposal and it notes that *'further study will be needed to develop the design for a barrier and refine the cost estimate"*.

In response to public interest at Exhibition stage, OPW instructed its consultants to examine further the costs and issues around the provision of a tidal barrier at a number of locations around Cork Harbour including that proposed by SCC. In preparing this study, Arup has drawn on the expertise of its relevant international experts, undertaken detailed harbour modelling and liaised with key stakeholders such as the Port of Cork Company. This study includes a detailed analysis of barrier costs for the scale of barrier likely to be required as well as analysing the cost estimate for the SCC proposal. It is currently being finalised. We believe that the HR Wallingford cost estimate is an underestimate of the true cost of a tidal barrier.

In terms of upstream measures to address river floods, SCC has advocated Natural Flood Management (NFM) and/or improved use of the dams. However, all scientific evidence confirms that NFM measures cannot significantly reduce peak flows in large flood events in large catchments. Work undertaken by OPW's consultants has confirmed this is the case in Cork. It is noteworthy that the HR Wallingford report arrived at a similar conclusion.

The OPW scheme incorporates optimised use of the dams to reduce peak flows. In developing the scheme, new operational rules have been developed in close collaboration with ESB (owners of the dams), making use of state of the art modelling techniques which account for the real world constraints and ensure that the rules are robust and provide a reliable solution. The storage capacity benefits of the dams are optimised in the scheme, in line with the operational rules, but some low level defences are still required.

Integrated Approach

Cork City Council will shortly be launching a planning application for the Morrison's Island Public Realm and Flood Defence Scheme, the flood defence element of which is the first phase of the Cork City flood relief project. The Morrison's Island project is representative of the approach and standard which the wider scheme will deliver. With high quality visual aids supporting this application, the public will be able to clearly see the unobtrusive and enhanced quaysides that will be created. (Figure 6)

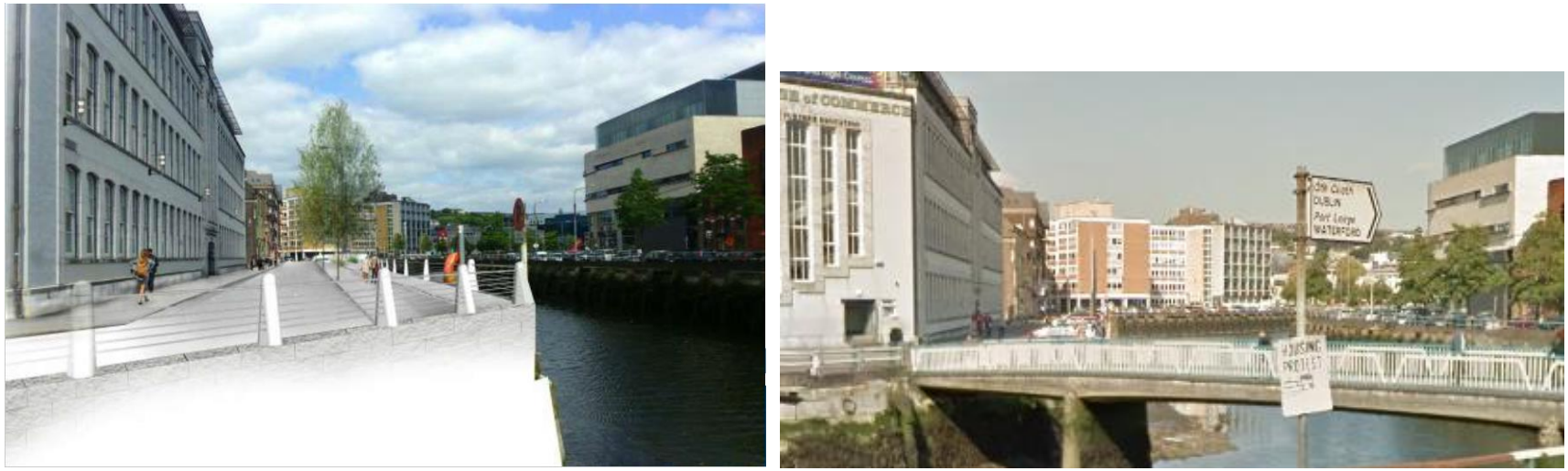


Figure 6: Morrison's Island – Public Realm improvement incorporating Flood Defences
(Note: proposals for this area are evolving and being finalised prior to submission for Planning Permission in November. Possible proposed view on left, existing view, from Google Maps, on right)

Conclusion

In conclusion, , the OPW is fully satisfied that the planning, development and design process for the proposed Cork City flood relief scheme has been rigorous and of the highest professional standard, we have considered all of the potential alternatives, and have determined that the **only** technically viable and cost beneficial solution is the Scheme as exhibited.

This integrated and holistic scheme will substantially free the people of Cork from the worry and stress of living with flood risk and it will remove barriers to future private investment and help to reinvigorate the city centre.

The OPW and Cork City Council would be concerned about further delays to this project amid continued exposure of Cork City residents and businesses to flood risk and so the Commissioners of Public Works intend to submit the Scheme to the Minister for Public Expenditure and Reform for approval in the shortest possible timeframe.

Appendix:

Further information is included or referred to on the following pages as follows.

OPW as Lead agency in Flood Risk Management in Ireland

In 2004, the Government, following a wide-ranging Inter-Departmental review of national flood risk management policy, approved the Report of the Flood Policy Review Group. The recommendations of the Report included:

- Appointment of the OPW as lead agency for delivery of flood risk management policy. This includes close liaison with a range of local authorities, organisations and stakeholders that also have responsibilities for managing flood risk

We would note also:

- OPW has a long track record in successfully implementing arterial drainage scheme and flood relief schemes.
- OPW have appointed highly experienced and competent consultants to prepare and deliver this project.

Exhibition of Proposed Lower Lee Flood Relief Scheme

Information about the Scheme is available on the project website, http://www.lowerleefrs.ie/ .

Among other information, the website includes all information which was part of the recent Exhibition of the scheme under the Arterial Drainage Acts, which stared in December 2016.

The information relating to the exhibition of the Scheme which is available on the website is as follows.

Information	**Website Address**
Drawings and Photomontages	http://www.lowerleefrs.ie/index.php/site/map (This is an interactive map where people can look at their own area and click on a box to open up documents relating to their own area)
Environmental Impact Statement (EIS)	http://www.lowerleefrs.ie/index.php/site/environmental On this page the EIS is available to download as three components, the Non Technical Summary, the Main Report, and the Appendices. All individual Chapters are also available to download individually.
Other Exhibition Documents (Included here are documents that were available at the Exhibition, including the posters that were on display, a brochure about the Scheme, and Project Reports and Presentations. The other documents mentioned above are also available to download from this web page.	http://www.lowerleefrs.ie/index.php/site/otherexhibitiondocs

Public Information Day no. 1 17th July 2013

A first Public information day for the Lower Lee Project was held in July 2013. At this event the public were invited to attend and make their views and comments on the flooding and related issues and possible solutions known to the project's design and environmental teams. Information that was available to the public at this event is available on the project website at the address, http://www.lowerleefrs.ie/index.php/site/news, under the heading "**Lower Lee Public Information Day No. 1**".

Public Information Day no. 2, 29th July 2014

The second Public Information day for the Lower Lee Project was held in July 2014. The purpose of this event was to provide an update on the identification of engineering measures for the Lower Lee from Innsicarra Dam downstream to and through Cork City, and to seek the views of the Public on the engineering measures that were being identified as the 'emerging preferred option'. Members of the design teams were in attendance to respond to queries from the public. Information that was available to the Public on that day is available on the project website at the address, http://www.lowerleefrs.ie/index.php/site/news, under the heading "**Lower Lee Public Information Day No. 2**"

Further illustrations from the Lower Lee Project.

Illustration used by OPW in previous presentations dealing with the following issues are shown on the following pages.

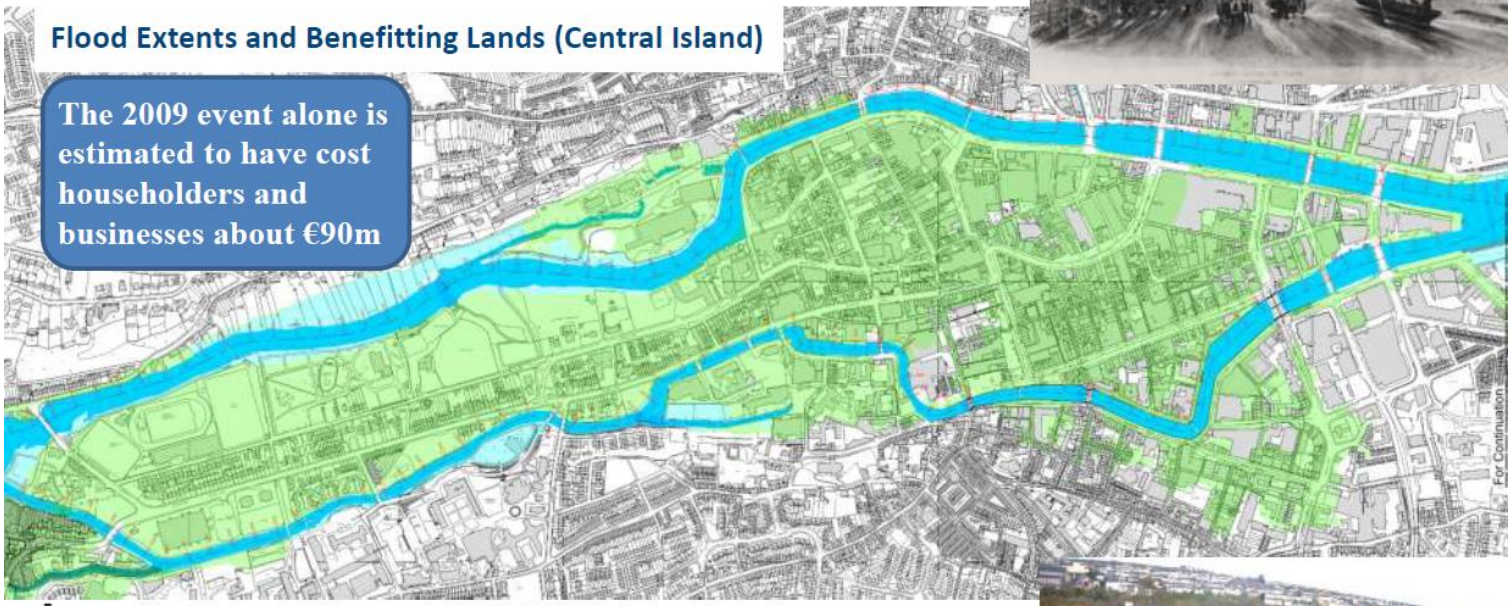
- The area in the city to benefit from the protection to be provided by the scheme
- An indication of the distribution of railings and parapet walls to be used in the scheme, as well as the existing situation.
- Illustration of the Concept design for the new Railing to be used throughout the city
- An indication of the Phased approach to be taken to the Construction of the Scheme

The Need for the Scheme

Long History of both fluvial and tidal flooding

Flood Extents and Benefitting Lands (Central Island)

The 2009 event alone is estimated to have cost householders and businesses about €90m

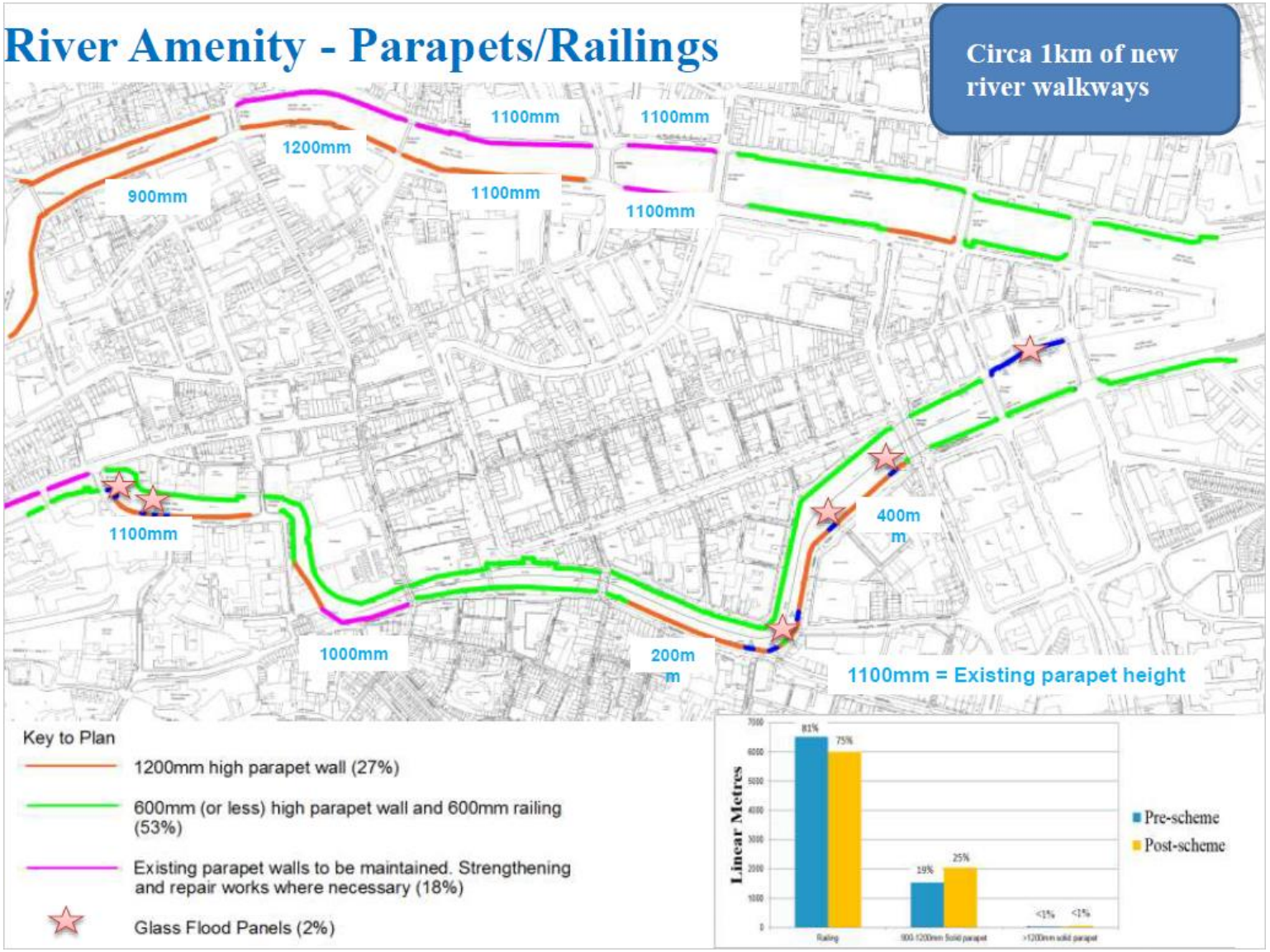


1% AEP Fluvial (River Lee) / 0.5% AEP Tidal Flood Extent
(1 in 100 year fluvial / 1 in 200 year tidal flood extent)

Benefitting Lands
(Defended against River Lee events up to the 1% AEP Fluvial / 0.5% AEP Tidal)

Watercourse

Lower Lee (Cork City) Drainage Scheme
(Flood Relief Scheme)


River Amenity - Parapets/Railings
Circa 1km of new river walkways
1100mm
1100mm
1200mm
900mm
1100mm
1100mm
1100mm
400m m
1000mm
200m m
1100mm = Existing parapet height
Key to Plan
1200mm high parapet wall (27%)
600mm (or less) high parapet wall and 600mm railing (53%)
Existing parapet walls to be maintained. Strengthening and repair works where necessary (18%)
Glass Flood Panels (2%)
Linear Metres
81%
75%
19%
25%
<1%
<1%
Pre-scheme
Post-scheme

600 mm Wall/ Plinth. High Profile

400 mm Wall/ Plinth. Low Profile

Full Pillar

Pillar Proposal
Morrison's Island

Pillar: Reconstituted Stone With Limestone Finish

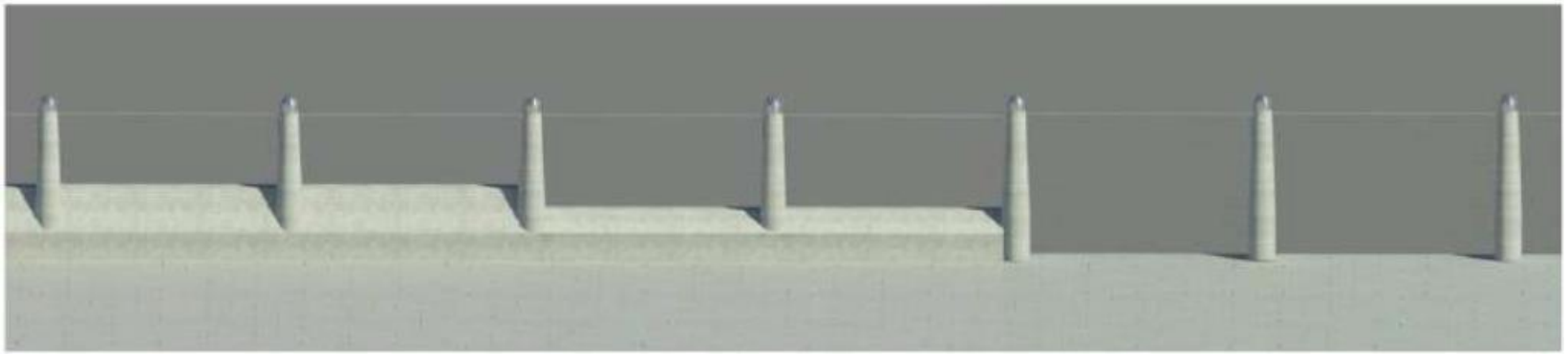
S/S Cap And Handrail

Stainless Steel Cable Spanning 2m. No Intermediate Supports

75mm spacing Between Tension Wires

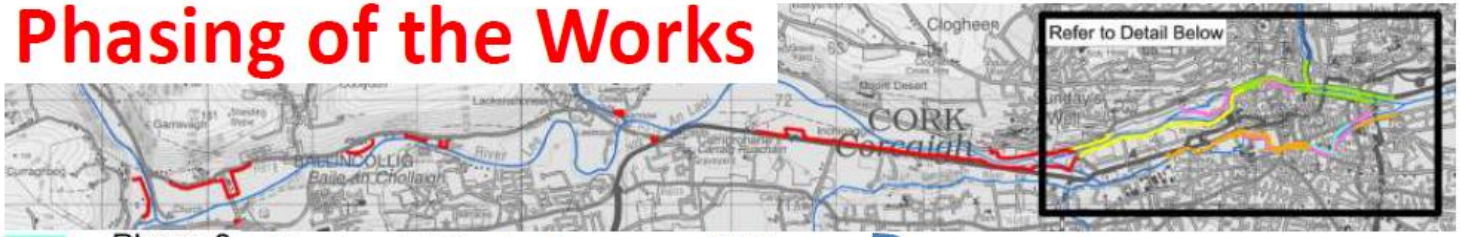
Pilars @ 2m Centers

Recessed Cable Ties



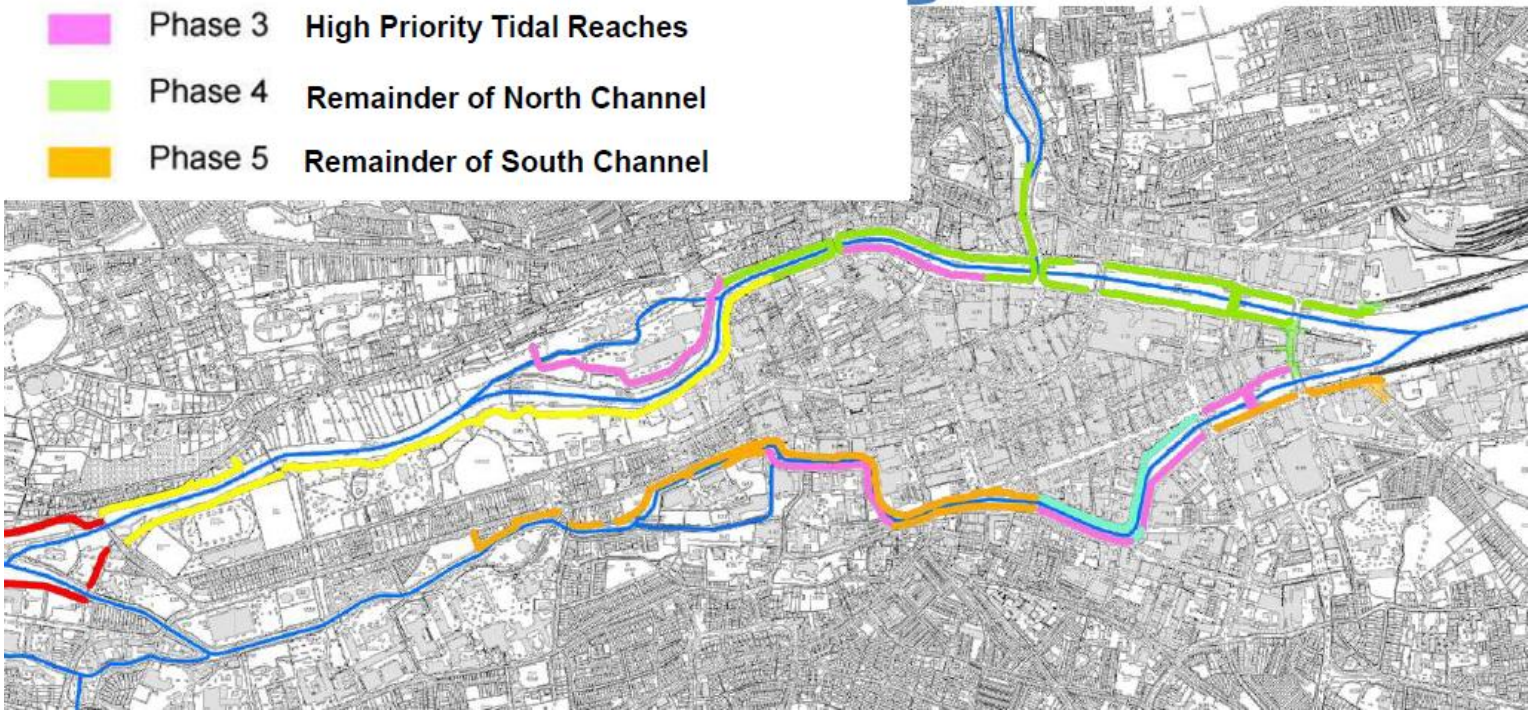
This design will evolve during the detailed design of the project, but the open nature of the railing will be preserved.

Phasing of the Works



Phase 0	Morrison's Island – Commence 2018
Phase 1	West of City Element– Commence 2018
Phase 2	Wellington Bridge to Grenville Place
Phase 3	High Priority Tidal Reaches
Phase 4	Remainder of North Channel
Phase 5	Remainder of South Channel

Projected that Phases 0 – 2 likely to be completed by circa 2021 providing majority of protection



OPW Flood Relief Schemes **WORK**

- All flood relief schemes are composed of components and principles which are well established and have been successfully implemented in various places around the country
- OPW has a track record of implementing schemes that perform as intended
- As the Lead Authority in Flood Risk Management in Ireland, OPW is also prepared to consider and implement, as appropriate, new technologies, such as in Fermoy, and in the Lower Lee Scheme with the planned use of Forecast Rainfall in the flood forecasting system
- Examples of completed schemes are in Fermoy, Mallow, Kilkenny, Clonmel and Waterford – all of which have performed to design standard in the serious flood events of recent years

FERMOY December 2015

CLONMEL Flood event February 2014 (showing the flood well outside the normal bank)