



Dodder CFRAMS

Option Development Process Multi Criteria Analysis

DOCUMENT CONTROL SHEET

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1.0 INTRODUCTION

This report details the process whereby the previously screened flood risk management measures for each of the five assessment units are developed into potential flood risk management options for the Dodder Catchment. The five assessment units are the Main Dodder Channel, the Tallaght, the Owendoher/Whitechurch, the Dundrum Slang and the Little Dargle. It will describe and present each of the options for each of the assessment units and then score each of them against five criteria - Technical, Economic, Environmental, Social and Other. The scoring process, known as the Multi Criteria Analysis (MCA), will evaluate each of these potential options with a view to establishing a preferred option. The MCA provides a robust and open process whereby the reasons for eliminating or choosing a potential flood risk management option is clearly evident.

2.0 PRELIMINARY SCREENING OF MEASURES

2.1 REVIEW OF PRELIMINARY SCREENING OF MEASURES PROCESS

Prior to the MCA stage of the option development process, the Dodder catchment was divided into five assessment units. RPS screened a wide range of potential flood risk management measures against 2 initial criteria which determined whether they were practical and/or applicable. This was a straight 'yes' or 'no' assessment whereby each measure was either eliminated or given further consideration. Those given further consideration were screened and scored against 5 further criteria (Technical, Economic, Environmental, Social and Other) to determine their suitability as a flood risk management measure in each of the respective assessment units. The measures which were carried forward for each of the five assessment units are given in Table 2.1

Main Dodder	Tallaght	Owendoher/ Whitechurch	Little Dargle	Dundrum Slang
Do nothing Upstream Storage Tidal Barrage Improvement of Channel Conveyance Hard Defences Diversion of Watercourses Proactive Maintenance regime Reactive Maintenance regime Public Awareness Campaign	Do nothing Improvement of Channel Conveyance Hard Defences Proactive Maintenance regime Reactive Maintenance regime	Do nothing Upstream Storage Improvement of Channel Conveyance Hard Defences Diversion of Watercourse Proactive Maintenance Regime Reactive Maintenance Regime Public Awareness Campaign Rehabilitation of Existing Defences	Do nothing Upstream Storage Improvement of Channel Conveyance Hard Defences Diversion of Watercourses Proactive Maintenance regime Reactive Maintenance regime Public Awareness Campaign Individual Property Protection	Do nothing Improvement of Channel Conveyance Hard Defences Proactive Maintenance Regime Reactive Maintenance Regime Public Awareness Campaign Rehabilitation of Existing Defences Individual Property Protection

Table 2.1 Screened Options for each of the Five Assessment Units.

3.0 DEVELOPMENT OF FLOOD RISK MANAGEMENT OPTIONS

At this previous stage of the option development process, a range of potential flood risk management schemes were formulated for each assessment unit by combining the screened measures in Table 2.1 in different combinations. A total of 37 potential flood risk management options across the 5 assessment units were developed and carried forward to the Multi Criteria Analysis. Each of these 37 options is presented in section 4.0 of this report.

3.1 MULTI CRITERIA ANALYSIS - METHODOLOGY

The Multi Criteria Analysis uses the same five criteria as the screening of measures – Technical, Economic, Environmental, Social and Other, but assesses each in more detail and with various weightings to reflect their importance.

3.2 MCA WEIGHTING AND SCORING

The ethos of the EU Floods Directive aims to reduce the consequences of flooding to “human health, the environment, cultural heritage and economic activity”. It is therefore imperative that equal consideration is given to each of these criteria in developing flood risk management options. Consequently RPS have developed a scoring matrix which gives predominate weighting to the economics of the scheme and the social and environmental impacts but further consideration will also be given to the technical and the “other” criteria which assesses adaptability to climate change. Table 3.1 shows the weighting for each of the five criteria.

Criteria	Overall Marks (%)
Technical	5
Economic	30
Environmental	30
Social	30
Other	5

Table 3.1 Weighting for each of the Five Criteria

Within each of the five criteria there is a further breakdown into sub-criteria and it is these that are specifically scored against to assess the impact of each potential option. Each sub

criteria is scored from a maximum of -6 if it is considered to have a major negative impact to +6 if it is considered to have a major positive impact. The full scoring scale is presented in Table 3.2

Impact	Score
Major negative impact below minimum requirement	-6
Medium negative impact below minimum requirement	-3
Minor negative impact below minimum requirement	-1
Minimum requirement met	0
Minor benefit above minimum requirement	1
Medium benefit above minimum requirement	3
Aspirational target achieved	6

Table 3.2 Scoring Scale for MCA Sub Criteria

Each sub criteria was also assigned an objective as a benchmark against which the impact could be assessed and subsequently scored. A minimum requirement and an aspirational target were also assigned to each sub-criteria which assist in evaluating scoring towards the upper and lower ends of the scale. Once a score has been assigned to one of the sub-criteria it is weighted to reflect its importance. Table 3.3 shows how the weighting is determined. As an example, any of the environmental sub-criteria associated with the EU Water Framework Directive would be considered of International Importance whereas the majority of the social sub-criteria affect predominantly the local community and hence would be considered of Local Importance.

Weighting	Description
5	Major / International Importance
4	Significant / National Importance
3	Medium / Regional importance
2	Minor / Local Importance
1	Negligible importance

Table 3.3 Weighting of Sub Criteria

3.3 TECHNICAL ASSESSMENT METHODOLOGY

This was essentially a qualitative assessment which considered how difficult it would be to initially construct a proposed option, but also to ensure that the flood risk management options are operationally robust and can be managed, constructed safely and are sustainable into the future. Options which involved relatively straightforward construction techniques and required minimum ongoing maintenance scored highest in this category.

3.4 ECONOMIC ASSESSMENT METHODOLOGY

3.4.1 Estimation of Damages

The economic assessment involved mapping the flood outlines respectively for the 50%, 20%, 4%, 2%, and 1% Annual Exceedance Probability (AEP) for each of the five assessment units. Each of the properties in the flood extent maps were then classified according to its type and age and then using the available digital terrain model (DTM) a finished floor level was attributed to each building. Using the ARC GIS software package, each of the flood outlines were then overlaid and a flood level assigned to each. The software could then attribute a flood depth to each of properties affected. This enabled a damage figure to be attributed to each property using the standard methodology in 'The Benefits of Flood and Coastal Defence' referred to as "The Multi Coloured Manual". A total damage figure for each of the five assessment units for all properties affected by particular flood event was then calculated. Then based on the total damage for each of the various return periods, an Annual Average Damage (AAD) was calculated. It was a requirement to discount this figure back to a Net Present Value (NPV) figure based on a 50 year horizon. This figure is in monetary terms and is the total benefit accrued from the avoidance of flood damage for the projected 50 years. The tables showing these damage figures are provided in Appendix A

3.4.2 Estimation of Costs

Each of the proposed options was costed over the design horizon of 50 years and incorporated the initial capital construction cost and also ongoing maintenance costs. Allowances including a 20% contingency, archaeology, detailed design, site supervision, land acquisition and compensation, environmental measures and art were also accounted for. Inclusion of art is a legal requirement under the 1% Art Scheme To ensure consistency and to provide a direct comparison with the damage assessment the total costs were discounted back over a 50 year horizon to get a NPV. A breakdown of the estimated costs for each of the 34 options is provided in Appendix A.

3.4.3 Benefit Cost Ratio

A Benefit Cost Ratio (BCR) for each of the proposed flood risk management options in each of the five assessment units was then calculated by dividing the total NPV of the benefits by the total NPV of the costs. A BCR for a proposed flood risk management option which was greater than 1 would be considered economically viable whereas an option with a BCR less than 1 would be considered uneconomic and would be scored as less than zero accordingly.

3.5 ENVIRONMENTAL ASSESSMENT METHODOLOGY

A Strategic Environmental Assessment (SEA) was carried out in accordance with the EU SEA Directive (2001/42/EC) and this formed the basis of the environmental assessment of the MCA. Each of the proposed options were screened against the environmental sub-criteria which included Biodiversity, Flora and Fauna, Water, Landscape visual Aspect, Material Assets, Cultural Heritage, Population, Human Health and Soil. This was another qualitative assessment where each proposed flood risk management option was determined as having either a positive or negative effect on the environment.

3.6 SOCIAL ASSESSMENT METHODOLOGY

The social impact was qualitatively assessed and considered the impact of a proposed measure on people's everyday lives both in their homes and businesses. It also considered any interaction the community enjoyed with the river from a visual aspect and also as an amenity. Further though was given to any potential increase in health and safety risk from the construction of any of the options. An example of a negative impact may be where hard defences could restrict angling or be detrimental to the visual aspect of the river.

3.7 'OTHER' ASSESSMENT METHODOLOGY

Climate change must be a consideration in the selection of any potential flood risk management option. The Scotland and Northern Ireland Forum For Environmental Research (SNIFFER) are predicting sea level rises by the 2080s of between 23 and 36cm but a wider range of models reviewed by SNIFFER have produced a range between 9cm and 69cm. In addition to this, an increase in river flows of between 20-30% for the same period have been predicted. The 'other' assessment therefore undertakes a qualitative evaluation of how adaptable the proposed flood risk management options to the predicted effects of climate change. The 'other' category also considers whether the proposed flood risk management option will increase or decrease the flood risk elsewhere in the catchment. It sets as an aspirational target that each proposed flood risk management option will reduce the rate of flow to other areas of the catchment and consequently reduce the overall flood risk. Flood risk management options which may have the potential to increase the flood risk, such as increasing channel conveyance, could have a negative scoring under this sub-criteria.

3.8 MULTI CRITERIA ANALYSIS TABLES

The core criteria set out in sections 3.3 to 3.7 have been given objectives and are set out in the Multi Criteria Analysis Summary Table overleaf. Each objective has an explanation as to what is considered when scoring, how it is scored, what the minimum requirement is and what the aspirational target is. If an objective achieves the minimum requirement a score of zero is given. If an objective achieves the aspirational target a maximum score of 6 is given.

3.9 INCIDENTAL DEFENCES

There are areas in the study area where existing walls act as a flood defence. These walls are referred to as incidental defences. Any wall designated as an incidental defence has sufficient height to defend against the design flood and as such is included in the option analysis. Although a visual inspection of the existing walls has been carried out a structural assessment has not. Without such an assessment it is unclear as to whether an incidental defence is suitable to be incorporated into an option. If an option includes incidental defences and is carried forward as a viable option a structural assessment of the incidental defences should be carried out.

4.0 PROPOSED FLOOD RISK MANAGEMENT OPTIONS AND MCA

RPS have devised 35 potential flood risk management option for the Dodder Catchemtn and its five assessment units. 13 of these were for the main Dodder Channel, 8 for the Owendoher/Whitechurch, 6 for the Little Dargle, 5 for the Dundrum Slang and 2 for the Tallaght Stream. Further measures were also considered for flood cells or APSRs within assessment units where no preferred option could be found. This chapter presents each of these options and the corresponding MCA table.

4.1 OPTIONS FOR DODDER CATCHMENT

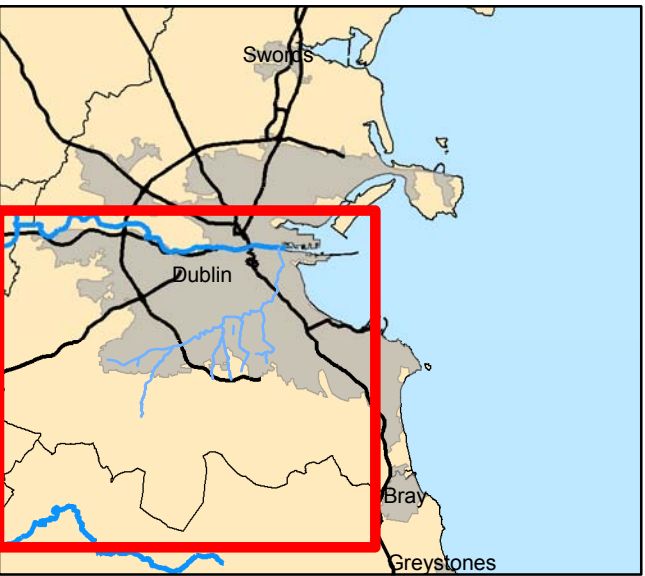
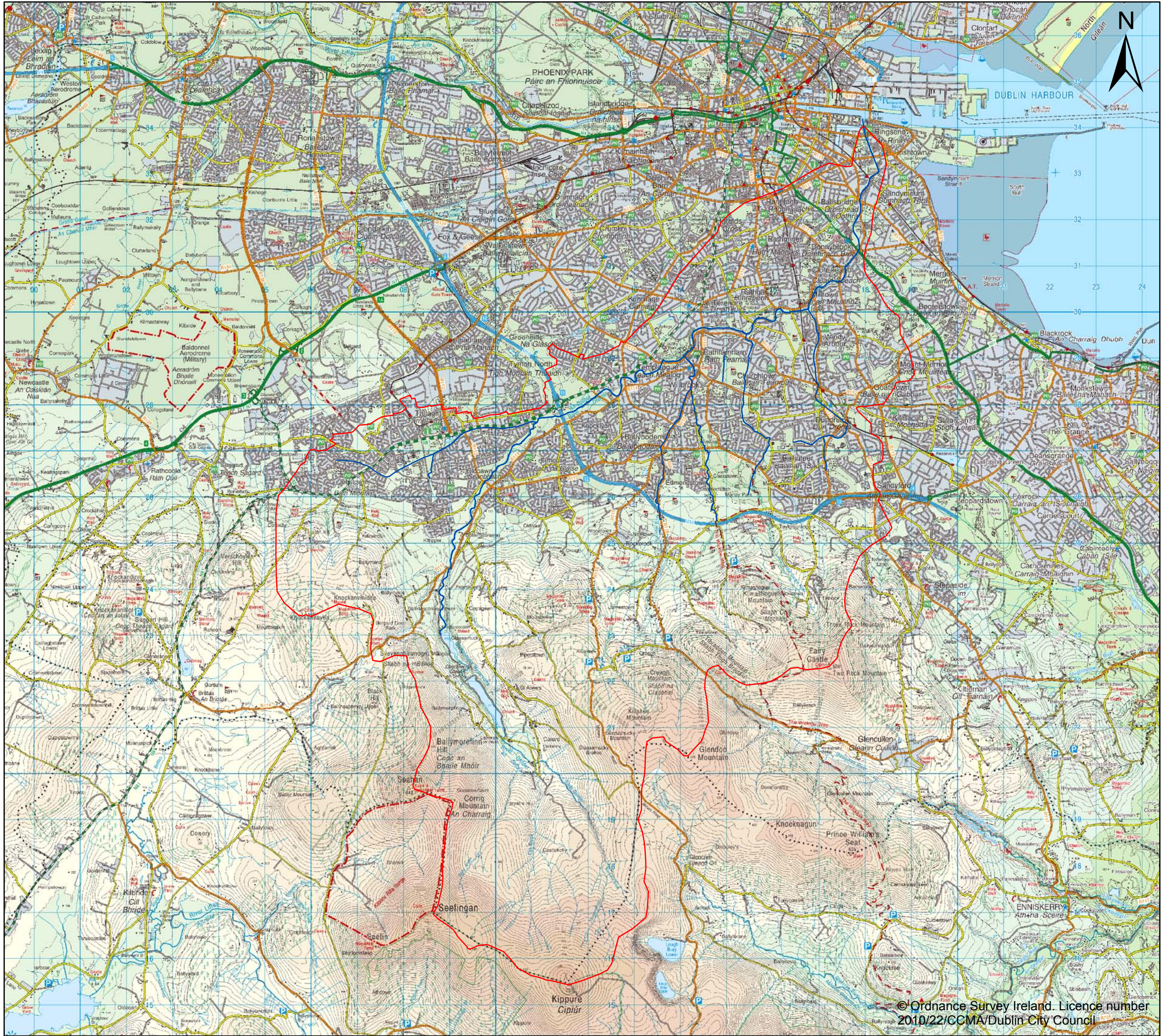
The following option has been considered for the Dodder Catchment.

Option 1 Flood forecasting systems with public awareness & flood warning programmes along with maintenance, monitoring and policy measures.

Table 4.1

Dodder Catchment

Dodder Catchment					Option 1 - Flood forecasting systems with public awareness & flood warning programmes along with maintenance, monitoring and policy measures (Drawing 401_001)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Reactive maintenance measures will be reduced due to increased proactive measures before flood events.	2 (2)	6 (-60 to +60)	0.50 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Maintenance will require coordinated response from multiple local authorities. The impact is of regional importance.	option relies on reaction to flood forecasting information. The reliability of the forecast, the proactive maintenance and the pblic reaction is difficulty to ensure.	-1 (3)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	Additional properties to be protected in future scenarios can be easily adapted into the plan.	1 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €1,065,000 Benefit = €1,722,259 BCR = 1.62	1 (5)	5 (-30 to +30)	5 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Health and safety will be reduced as increased prior warning of flood event will allow suitable evacuation and protection measures to be put in place.	1 (4)	4 (-66 to +66)	1.82 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	All roads currently at risk will not be protected by option 1.	0 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	0 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Fishing access will not be affected by this option	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No impact	0 (4)	0 (-144 to +144)	0.00 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	No impact on the ecological status	0 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	No impact on flora and fauna	0 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon , Sea Trout and Brown Trout.	Fisheries will not be affected by this option	0 (5)		
						0 (2)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	No impact on landscape and visual amenity	0 (2)		
f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	No additional protection or increased risk will arise from option 1	0 (4)				
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								7.32 (-100 to +100)
*Weighting mechanism		*Scoring mechanism						



Legend

River Channel

Dodder catchment boundary

CLIENT

Dublin City Council

PROJECT

Dodder Catchment Flood Risk Management Study

TITLE

Option Development Stage 4
Dodder Catchment
Option 1 - Flood Forecasting with Public Awareness& Flood Warning Programmes with Maintenance,Monitoring and Policy Measures

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Kilometers

SCALE : 1:78,125

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Date : 04/08/09

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4.2 OPTIONS FOR MAIN DODDER CHANNEL

The following options have been considered for the Main Dodder Channel.

- Option 1 Hard Defences
- Option 2 Hard Defences and Improvement of Channel Conveyance
- Option 3 Hard Defences and Upstream Storage
- Option 4 Hard Defences and Diversion of Watercourses
- Option 5 Hard Defences and Tidal Barrage
- Option 6 Hard Defences, Improvement of Channel Conveyance and Upstream Storage
- Option 7 Hard Defences, Improvement of Channel Conveyance, Upstream Storage and Tidal Barrage
- Option 8 Hard Defences, Improvement of Channel Conveyance and Diversion of Watercourses
- Option 9 Hard Defences, Improvement of Channel Conveyance and Diversion of Watercourses and Tidal Barrage
- Option 10 Hard Defences, Upstream Storage and Diversion of Watercourses
- Option 11 Hard Defences, Upstream Storage, Diversion of Watercourses and Tidal Barrage
- Option 12 Hard Defences, Improvement of Channel Conveyance, Upstream Storage and Diversion of Watercourses
- Option 13 Hard Defences, Improvement of Channel Conveyance, Upstream Storage Diversion of Watercourses and Tidal Barrage.

Secondary options which are considered with all of the above include;

- Option 1 Proactive and Reactive Maintenance Regime
- Option 2 Public Awareness Campaign

The following options have been considered for the APSR Downstream of Donnybrook.

- Option 1 Hard Defences

The following options have been considered for the APSR Orwell Gardens.

- Option 1 Hard Defences

The following options have been considered for the APSR Shanagarry Apartments & Smurfit Site.

Option 1 Hard Defences

Table 4.2.1

Assessment Unit - Dodder

Assessment Unit - Dodder					Option 1 - Hard Defences (Drawing 402_001)				Option 2 - Hard Defences with improvement of channel conveyance (Drawing 402_002)				Option 3 - Hard Defences with upstream storage (Drawing 402_003)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance. Current dredging will become technically more difficult to carry out with added access restrictions.	-1 (2)	-7 (-72 to +72)	-0.48 (-5 to +5)	No additional maintenance activities expected than with option 1. Access problems remain for dredging.	-1 (2)	-42 (-72 to +72)	-2.90 (-5 to +5)	No additional maintenance activities expected than with option 1. Access problems remain for dredging.	-1 (2)	-12 (-72 to +72)	-0.83 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments with sheet piles are not technically difficult however construction within the city will be logistically difficult.	3 (5)			Technically and logistically difficult to manage upgrading of bridges and weirs as well as the logistics of constructing hard defences. Technically difficult to upgrade the DART Bridge while keeping it operational.	-4 (5)			Same level of technical and logistical difficulty for hard defences as in option 1. Upstream storage should be relatively straightforward.	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-4 (5)			The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-4 (5)			The difference in wall height and length required between option 1 and option 3 is small. There will not be much scope to increase upstream storage.	-5 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €20,055,973 Benefit = €14,490,682 BCR = 0.72	-1 (5)	-5 (-30 to +30)	-5 (-30 to +30)	Cost = €23,514,366 Benefit = €14,490,682 BCR = 0.62	-1 (5)	-5 (-30 to +30)	-5 (-30 to +30)	Cost = €22,508,675 Benefit = €14,490,682 BCR = 0.64	-1 (5)	-5 (-30 to +30)	-5 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	3 (4)	18 (-66 to +66)	8.18 (-30 to +30)	Same frequency and level of risk and maintenance required as in option 1	3 (4)	18 (-66 to +66)	8.18 (-30 to +30)	Same frequency and level of risk and maintenance required as in option 1	3 (4)	26 (-66 to +66)	11.82 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option 1 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 2 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 3 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible No new green space or recreational facilities will be created.	-2 (2)			Upstream storage in proposed location has the potential to open up an inaccessible area to new walkways and amenity space. However the hard defences will reduce access to the waterside.	1 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments will effect access.	-1 (2)			The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments will effect access.	-1 (2)			Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments may effect access. The creation of storage may also create more access to amenity areas and fishing areas	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	There are a number of abandoned mills in the Assessment unit which are flooding. These areas may potentially have contamination issues due to the type of industry process they used such as paper production.	-1 (4)	-43 (-144 to +144)	-8.94 (-30 to +30)	There are a number of abandoned mills in the Assessment unit which are flooding. These areas may potentially have contamination issues due to the type of industry process they used such as paper production.	-1 (4)	-43 (-144 to +144)	-8.94 (-30 to +30)	There are a number of abandoned mills in the Assessment unit which are flooding. These areas may potentially have contamination issues due to the type of industry process they used such as paper production.	-1 (4)	-13 (-144 to +144)	-2.70 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-2 (4)			Construction of walls and embankments will disconnect river from the floodplain and improving channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted.	-2 (4)			Construction of walls and embankments will disconnect river from the floodplain and improving channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted. Upstream storage is not likely to impact on the	-1 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Short term negative impacts on surrounding ecology. Potential impact is possible but unlikely. Otter holts may be present and therefore works would be subject to licence. Further investigations would be needed at project stage/EIA stage.	-4 (5)			Bridge Improvements may affect bat roosts but there is also the potential for habitat creation. Weir alterations may also destroy habitats having significant impacts on flora communities due to changes in water levels, and may impact invertebrate communities	-4 (5)			Could have negative effects on the terrestrial ecology. Certain mitigation techniques such as re-planting would have to be investigated/incorporated into design..	-1 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage.	-1 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also destroy habitats having significant impacts on flora communities due to changes in water levels, also effects invertebrate communities, fish and fish spawn	-1 (5)			Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage. The creation of storage may have positive effects on fisheries.	0 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	Raising defences may obstruct river vistas.	-1 (2)			Raising defences may obstruct river vistas.	-1 (2)			Upstream storage area may enhance landscape character and visual amenity..	2 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	There are a number of protected monuments which could be impacted. There is also the possibility of damage to underwater archaeology	-1 (4)			London Bridge, New Bridge, Balls Bridge, Clonskeagh Road Bridge and Old Bridge are all protected Monuments. There are also a number of protected monuments located in areas where flood walls are proposed which may impact on the design/extent of the defence	-1 (4)			There are a number of protected monuments which could be impacted. There is also the possibility of damage to underwater archaeology. There are no known protected monuments in the area proposed for upstream storage.	-1 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 2 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 3 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-6.25 (-100 to +100)				-8.66 (-100 to +100)				3.29 (-100 to +100)
*Weighting mechanism		*Scoring mechanism														

*Weighting mechanism
5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

*Scoring mechanism
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6
← minimum requirement not met | achieves minimum requirement | aspirational requirement met →

Table 4.2.2

Assessment Unit - Dodder

Assessment Unit - Dodder					Option 4 - Hard Defences with channel diversion (Drawing 402_004)				Option 5 - Hard Defences with tidal barrage (Drawing 402_005)				Option 6 - Hard Defences with Improvement of channel conveyance and upstream storage (Drawing 402_006)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Maintenance of hard defences are as in option 1. Technically difficult to maintain channel diversion culvert due to working in confined spaces and the depth the culvert will be laid.	-3 (2)	-31 (-72 to +72)	-2.14 (-5 to +5)	Maintenance of hard defences are as in option 1. Maintenance and operation of the tidal barrage required.	-3 (2)	-26 (-72 to +72)	-1.79 (-5 to +5)	No increased technical difficulty in maintaining option 6 than with options 2 and 3.	-1 (2)	-32 (-72 to +72)	-2.21 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Same level of technical and logistical difficulty for hard defences as in option 1. Unknown ground conditions and current services and utilities may make channel diversion technically difficult.	-2 (5)			Same level of technical and logistical difficulty for hard defences as in option 1. Construction of a tidal barrage will be technically and logistically difficult	-1 (5)			Improvement of channel conveyance will be the most difficult part of option 6 and as such the dominant factor in the scoring.	-4 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted. Future scenario would have to be designed into the diversion channel.	-3 (5)			The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted. Future scenario events would need to be designed into the tidal barrage.	-3 (5)			The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €90,747,466 Benefit = €14,490,682 BCR = 0.16	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €26,921,286 Benefit = €14,490,682 BCR = 0.54	-1 (5)	-5 (-30 to +30)	-5 (-30 to +30)	Cost = €24,660,808 Benefit = €14,490,682 BCR = 0.59	-1 (5)	-5 (-30 to +30)	-5 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance. Channel diversion will have a low maintenance frequency but will require maintenance to be carried out in confined spaces and at depth.	0 (4)	8 (-66 to +66)	3.64 (-30 to +30)	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance. Tidal barrage requires regular inspection and maintenance..	1 (4)	12 (-66 to +66)	5.45 (-30 to +30)	Same frequency and level of risk and maintenance required as in option 1	3 (4)	24 (-66 to +66)	10.91 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option 4 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 5 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 6 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible.	-2 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible.	-2 (2)			Upstream storage has the potential to create new waterside access and recreational facilities	1 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments will effect access.	0 (2)			The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments will effect access. Tidal barrage n	0 (2)			The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments will effect access.	-1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	There are a number of abandoned mills in the Assessment unit which are flooding. These areas may potentially have contamination issues due to the type of industry process they used such as paper production.	-1 (4)	-28 (-144 to +144)	-5.82 (-30 to +30)	There are a number of abandoned mills in the Assessment unit which are flooding. These areas may potentially have contamination issues due to the type of industry process they used such as paper production.	-1 (4)	-28 (-144 to +144)	-5.82 (-30 to +30)	There are a number of abandoned mills in the Assessment unit which are flooding. These areas may potentially have contamination issues due to the type of industry process they used such as paper production.	-1 (4)	-43 (-144 to +144)	-8.94 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Diversion of WC could potentially impact on the achievements of the WFD.	-2 (4)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Tidal barrage could potentially impact on the achievements of the WFD.	-2 (4)			Construction of walls and embankments will disconnect river from the floodplain and improving channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted.	-2 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Short term negative impacts on surrounding ecology. Potential impact is possible but unlikely. Other hots may be present and therefore works would be subject to licence. Further investigations would be needed at project stage/EIA stage.	-1 (5)			Tidal barrage likely to impact on migration of salmon upstream and may impact on habitats downstream in an area which is designated SAC.	-1 (5)			Bridge Improvements may affect bat roosts but there is also the potential for habitat creation. Weir alterations may also destroy habitats having significant impacts on flora communities due to changes in water levels, and may impact invertebrate commun	-4 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage.	-1 (5)			Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage. Tidal barrage has the potential to impact fisheries in the catchment	-1 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also destroy habitats having significant impacts on flora communities due to changes in water levels, also effects invertebrate communities, fish and fish spawn	-1 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	Raising defences may obstruct river vistas. Diversion of the watercourse could have short term impacts during construction.	-1 (2)			Obstruction to current vistas and tidal barrage could permanently impact on the visual amenity of the area.	-1 (2)			Raising defences may obstruct river vistas.	-1 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	There are a number of protected monuments traversing the proposed diversion route, however it is most likely that all of these can be avoided at route design stage. There is also the possibility of damage to underwater archaeology.	-1 (4)			There are a number of protected monuments which could be impacted. There is also the possibility of damage to underwater archaeology. Tidal barrage unlikely to impact on areas of known cultural heritage importance.	-1 (4)			London Bridge, New Bridge, Balls Bridge, Clonskeagh Road Bridge and Old Bridge are all protected Monuments. There are also a number of protected monuments located in areas where flood walls are proposed which may impact on the design/extent of the defenc	-1 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Channel diversion will discharge flood water into Dublin Bay. This is unlikely to increase the flood risk in Dublin Bay	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 5 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 6 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-999 (-100 to +100)				-7.16 (-100 to +100)				-5.24 (-100 to +100)
*Weighting mechanism		*Scoring mechanism														

*Weighting mechanism

- 5 = International importance
- 4 = National importance
- 3 = Regional importance
- 2 = Local importance
- 1 = Negligible importance

*Scoring mechanism

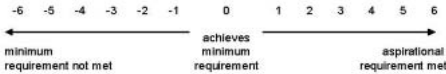


Table 4.2.3

Assessment Unit - Dodder

Assessment Unit - Dodder				Option 7 - Hard Defences with improvement of channel conveyance and upstream storage and tidal barrage (Drawing 402_007)				Option 8 - Hard Defences with improvement of channel conveyance and channel diversion (Drawing 402_008)				Option 9 - Hard Defences with improvement of channel conveyance and channel diversion and tidal barrage (Drawing 402_009)				
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	No increased technical difficulty in maintaining option 7 than with option 5. Maintaining the tidal barrage is the dominant factor in the scoring.	-3 (2)	-41 (-72 to +72)	-2.83 (-5 to +5)	No increased technical difficulty in maintaining option 8 than with option 4. Maintaining the channel diversion culvert is the dominant factor in the scoring.	-3 (2)	-41 (-72 to +72)	-2.83 (-5 to +5)	A combination of maintaining the channel diversion culvert and the tidal barrage will increase the level of technical difficulty than if considered individually as in options 4 and 5.	-5 (2)	-45 (-72 to +72)	-3.11 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Improvement of channel conveyance will be the most difficult part of option 7 and as such the dominant factor in the scoring.	-4 (5)			Improvement of channel conveyance will be the most difficult part of option 8 and as such the dominant factor in the scoring.	-4 (5)			Improvement of channel conveyance will be the most difficult part of option 9 and as such the dominant factor in the scoring.	-4 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	A large increase in hard defences required from present day scenario to future scenario. Additional measures have little effect on wall height. Future scenario will need to be designed into the additional measures.	-3 (5)			A large increase in hard defences required from present day scenario to future scenario. Additional measures have little effect on wall height. Future scenario will need to be designed into the additional measures.	-3 (5)			A large increase in hard defences required from present day scenario to future scenario. Additional measures have little effect on wall height. Future scenario will need to be designed into the additional measures.	-3 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €31,526,122 Benefit = €14,490,682 BCR = 0.46	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)	Cost = €92,693,686 Benefit = €14,490,682 BCR = 0.16	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €99,558,999 Benefit = €14,490,682 BCR = 0.15	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Same frequency and level of risk and maintenance required as in option 5	1 (4)	16 (-66 to +66)	7.27 (-30 to +30)	Same frequency and level of risk and maintenance required as in option 4. Channel diversion is the dominant factor in scoring.	0 (4)	6 (-66 to +66)	2.73 (-30 to +30)	Same frequency and level of risk and maintenance required as in option 4 and 5. Channel diversion is the dominant factor in scoring.	0 (4)	6 (-66 to +66)	2.73 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option 7 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 8 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 9 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Upstream storage has the potential to create new waterside access and recreational facilities	1 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible. No new green space or recreational facilities will be created.	-2 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible. No new green space or recreational facilities will be created.	-2 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	See option 5 and 6	-1 (2)			See option 2 and 4	-1 (2)			See option 2.4 and 5	-1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	See Option 1	-1 (4)	-72 (-144 to +144)	-14.98 (-30 to +30)	See Option 1	-1 (4)	-62 (-144 to +144)	-12.90 (-30 to +30)	See Option 1	-1 (4)	-84 (-144 to +144)	-17.47 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	See options 5 & 6	-1 (4)			See option 2 and 4	-1 (4)			See option 2.4 and 5	-1 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Potential negative impacts on surrounding ecology from hard defences. Improvement of channel conveyance has the potential to displace bat and other habitats but there is also the potential for habitat creation. There is also potential to impact flora co	-6 (5)			See option 2 and 4	-5 (5)			See option 2.4 and 5	-6 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	See options 5 & 6	-4 (5)			See option 2 and 4	-3 (5)			See option 2.4 and 5	-6 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	See options 5 & 6	-1 (2)			See option 2 and 4	-1 (2)			See option 2.4 and 5	-2 (2)		
f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	See options 5 & 6	-3 (4)	See option 2 and 4	-3 (4)	See option 2.4 and 5	-3 (4)								
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 7 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 8 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 9 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
*Weighting mechanism				*Scoring mechanism				-25.53 (-100 to +100)	-999 (-100 to +100)				-999 (-100 to +100)			

*Weighting mechanism
5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance



Table 4.2.4

Assessment Unit - Dodder

Assessment Unit - Dodder				Option 10 - Hard Defences with upstream storage and channel diversion (Drawing 402_010)				Option 11 - Hard Defences with upstream storage and channel diversion and tidal barrage (Drawing 402_011)				Option 12 - Hard Defences with Improvement of channel conveyance and upstream storage and channel diversion (Drawing 402_012)							
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)			
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	No increased technical difficulty in maintaining option 10 than with option 4. Maintaining the channel diversion culvert is the dominant factor in the scoring.	-3 (2)	-26 (-72 to +72)	-1.80 (-5 to +5)	A combination of maintaining the channel diversion culvert and the tidal barrage will increase the level of technical difficulty than if considered individually as in options 4 and 5.	-5 (2)	-30 (-72 to +72)	-2.08 (-5 to +5)	No increased technical difficulty in maintaining option 12 than with option 4. Maintaining the channel diversion culvert is the dominant factor in the scoring.	-3 (2)	-36 (-72 to +72)	-2.50 (-5 to +5)			
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Same level of technical and logistical difficulty for hard defences and upstream storage as in option 3. Unknown ground conditions and current services and utilities may make channel diversion technically difficult.	-2 (5)			Channel diversion will be the most difficult part of option 11 and as such the dominant factor in the scoring.	-2 (5)			Improvement of channel conveyance will be the most difficult part of option 12 and as such the dominant factor in the scoring.	-4 (5)					
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	A large increase in hard defences required from present day scenario to future scenario. Additional measures have little effect on wall height. Future scenario will need to be designed into the additional measures.	-2 (5)			A large increase in hard defences required from present day scenario to future scenario. Additional measures have little effect on wall height. Future scenario will need to be designed into the additional measures.	-2 (5)			A large increase in hard defences required from present day scenario to future scenario. Additional measures have little effect on wall height. Future scenario will need to be designed into the additional measures.	-2 (5)					
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €93,210,893 Benefit = €14,490,682 BCR = 0.16	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €100,076,207 Benefit = €14,490,682 BCR = 0.14	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €96,671,431 Benefit = €14,490,682 BCR = 0.15	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)			
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Same frequency and level of risk and maintenance required as in option 4. Channel diversion is the dominant factor in scoring.	0 (4)	14 (-66 to +66)	6.36 (-30 to +30)	Same as option 10 with additional maintenance required at the tidal barrage.	0 (4)	14 (-66 to +66)	6.36 (-30 to +30)	Same frequency and level of risk and maintenance required as in option 4 and 5 Channel diversion is the dominant factor in scoring.	0 (4)	14 (-66 to +66)	6.36 (-30 to +30)			
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option 10 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 11 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)			Option 12 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)					
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Upstream storage has the potential to create new waterside access and recreational facilities	1 (2)			Upstream storage has the potential to create new waterside access and recreational facilities	1 (2)			Upstream storage has the potential to create new waterside access and recreational facilities	1 (2)					
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	See option 3 and 4	0 (2)			See option 2, 4 and 5	0 (2)			See option 2, 3 and 4	0 (2)					
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	See Option 1	-1 (4)	-54 (-144 to +144)	-11.23 (-30 to +30)	See Option 1	-1 (4)	-82 (-144 to +144)	-17.06 (-30 to +30)	See Option 1	-1 (4)	-59 (-144 to +144)	-12.27 (-30 to +30)			
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	See option 3 and 4	-1 (4)			See option 2, 4 and 5	-2 (4)			See option 2, 3 and 4	-1 (4)					
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	See option 3 and 4	-5 (5)			See option 2, 4 and 5	-6 (5)			See option 2, 3 and 4	-5 (5)					
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	See option 3 and 4	-3 (5)			See option 2, 4 and 5	-6 (5)			See option 2, 3 and 4	-4 (5)					
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	See option 3 and 4	1 (2)			See option 2, 4 and 5	-1 (2)			See option 2, 3 and 4	1 (2)					
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	See option 3 and 4	-2 (4)			See option 2, 4 and 5	-2 (4)			See option 2, 3 and 4	-2 (4)					
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 10 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 11 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 12 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)			
*Weighting mechanism								*Scoring mechanism											
								-999 (-100 to +100)								-999 (-100 to +100)			

*Weighting mechanism

5 = International Importance
4 = National Importance
3 = Regional Importance
2 = Local Importance
1 = Negligible Importance

*Scoring mechanism

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6
minimum requirement not met achieves minimum requirement aspirational requirement met

Table 4.2.5

Assessment Unit - Dodder

Assessment Unit - Dodder				Option 13 - Hard Defences with improvement of channel conveyance and upstream storage and channel diversion and tidal barrage (Drawing 402_013)				
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	A combination of maintaining the channel diversion culvert and the tidal barrage will increase the level of technical difficulty than if considered individually as in options 4 and 5.	-5 (2)	-40 (-72 to +72)	-2.76 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Improvement of channel conveyance will be the most difficult part of option 13 and as such the dominant factor in the scoring.	-4 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	A large increase in hard defences required from present day scenario to future scenario. Additional measures have little effect on wall height. Future scenario will need to be designed into the additional measures.	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €103,536,745 Benefit = €14,490,682 BCR = 0.14	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Same frequency and level of risk and maintenance required as in option 4 and 5 Channel diversion is the dominant factor in scoring.	0 (4)	14 (-66 to +66)	6.36 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option 13 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Upstream storage has the potential to create new waterside access and recreational facilities	1 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	See option 2, 3 and 4	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	See Option 1	-1 (4)	-68 (-144 to +144)	-14.14 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	See option 2, 3 and 4	-1 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	See option 2, 3 and 4	-6 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon , Sea Trout and Brown Trout.	See option 2, 3 and 4	-4 (5)		
						-1 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	See option 2, 3 and 4	-2 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 13 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-999 (-100 to +100)

*Weighting mechanism
5 = International Importance
4 = National Importance
3 = Regional Importance
2 = Local Importance
1 = Negligible Importance

*Scoring mechanism
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6
← minimum requirement not met achieves minimum requirement aspirational requirement met →

Table 4.2.6

APSR - Downstream of Donnybrook

		Option 1 - Hard Defences (Drawing 402_101)						
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance.	3 (2)	1 (-72 to +72)	0.07 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments with sheet piles are not technically difficult however construction within the city will be logistically difficult.	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-4 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €9,025,400 Benefit = €9,930,895 BCR = 1.10	1 (5)	5 (-30 to +30)	5 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access to the WC to carry out other maintenance.	3 (4)	22 (-66 to +66)	10.00 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option 1 will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	4 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	0 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments will effect access.	-1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	There are a number of CSOs in the Assessment unit which are flooding. These may potentially have contamination issues.	2 (4)	-33 (-144 to +144)	-6.86 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-2 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Short term negative impacts on surrounding ecology. Potential impact is possible but unlikely. Other hots may be present and therefore works would be subject to licence. Further investigations would be needed at project stage/EIA stage.	-4 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage.	-1 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	Raising defences may obstruct river vistas.	-1 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	There are a number of protected monuments which could be impacted. There is also the possibility of damage to underwater archaeology	-1 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								8.20 (-100 to +100)

Weighting mechanism

5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

Scoring mechanism

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6

← minimum requirement not met

achieves minimum requirement

aspirational requirement met →

Table 4.2.7

APSR - Orwell Gardens

		Option 1 - Hard Defences (Drawing 402_201)						
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls are technically low maintenance.	3 (2)	11 (-72 to +72)	0.76 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls are technically straight forward but will cause temporary disruption to the residential area Orwell Gardens.	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls would not be easily adapted.	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €243,070 Benefit = €294,437 BCR = 1.21	1 (5)	5 (-30 to +30)	5 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Flood Walls require minimal maintenance	4 (4)	17 (-66 to +66)	7.73 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	1 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Flood wall will replace existing wall. Waterside access will remain unchanged. Flood wall may not be as aesthetically pleasing.	-1 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months.	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No polluting sources in the areas so no impact	0 (4)	-15 (-144 to +144)	-3.12 (-30 to +30)
		b	Support the achievement of good ecological status/potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Replacement of wall will not affect the ecological status	0 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Short term negative impacts on surrounding ecology. Potential impact is possible but unlikely. Other hots may be present and therefore works would be subject to licence. Further investigations would be needed at project stage/EIA stage.	-2 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage.	-1 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	Replacing wall will not change the landscape character or visual amenity	0 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	There are no known features of cultural heritage that would be affected by this option	0 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								10.37 (-100 to +100)

*Weighting mechanism

5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

*Scoring mechanism

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6
← minimum requirement not met achieves minimum requirement aspirational requirement met →

Table 4.2.8

APSR - Shanagarry Apartments and Smurfit Site

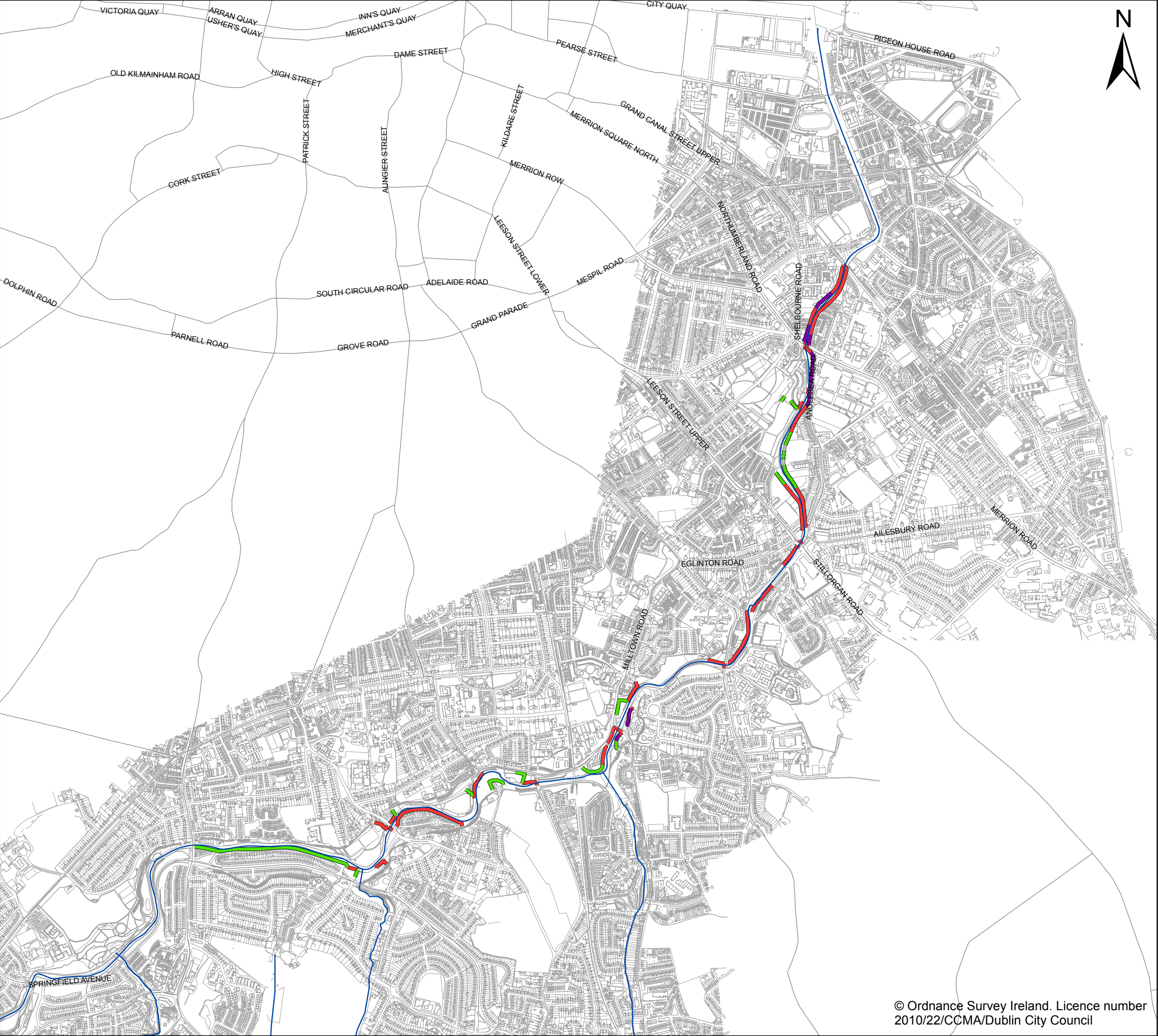
		Option 1 - Hard Defences (Drawing 402_301)						
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls are technically low maintenance.	3 (2)	11 (-72 to +72)	0.76 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls are technically straight forward but will cause temporary disruption to the residential area Orwell Gardens.	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls would not be easily adapted.	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €3,592,826 Benefit = €3,704,526 BCR = 1.03	1 (5)	5 (-30 to +30)	5 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Flood Walls require minimal maintenance but does restrict access to the WC to carry out other maintenance.	3 (4)	13 (-66 to +66)	5.91 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Option will not increase the road and rail infrastructure at risk and will protect some roads from flooding.	1 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Flood defence will protect parkland from flooding but will also remove riverside access	-1 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	The Dodder supports Atlantic salmon, Sea trout and resident Brown Trout. Construction would have to be carried out in consultation with the ERFB and during the specified months.	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	There is a CSO in the Assessment unit which are flooding. This may potentially have contamination issues.	2 (4)	-31 (-144 to +144)	-6.45 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-2 (4)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Short term negative impacts on surrounding ecology. Potential impact is possible but unlikely. Other hots may be present and therefore works would be subject to licence. Further investigations would be needed at project stage/EIA stage.	-4 (5)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage.	-1 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	Raising defences may obstruct river vistas.	-1 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	There are a number of protected monuments which could be impacted. There is also the possibility of damage to underwater archaeology	-1 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								5.22 (-100 to +100)

*Weighting mechanism

5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

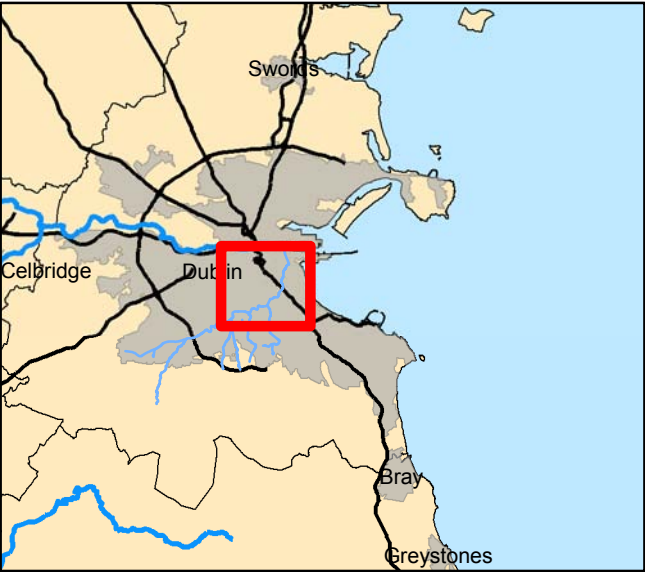
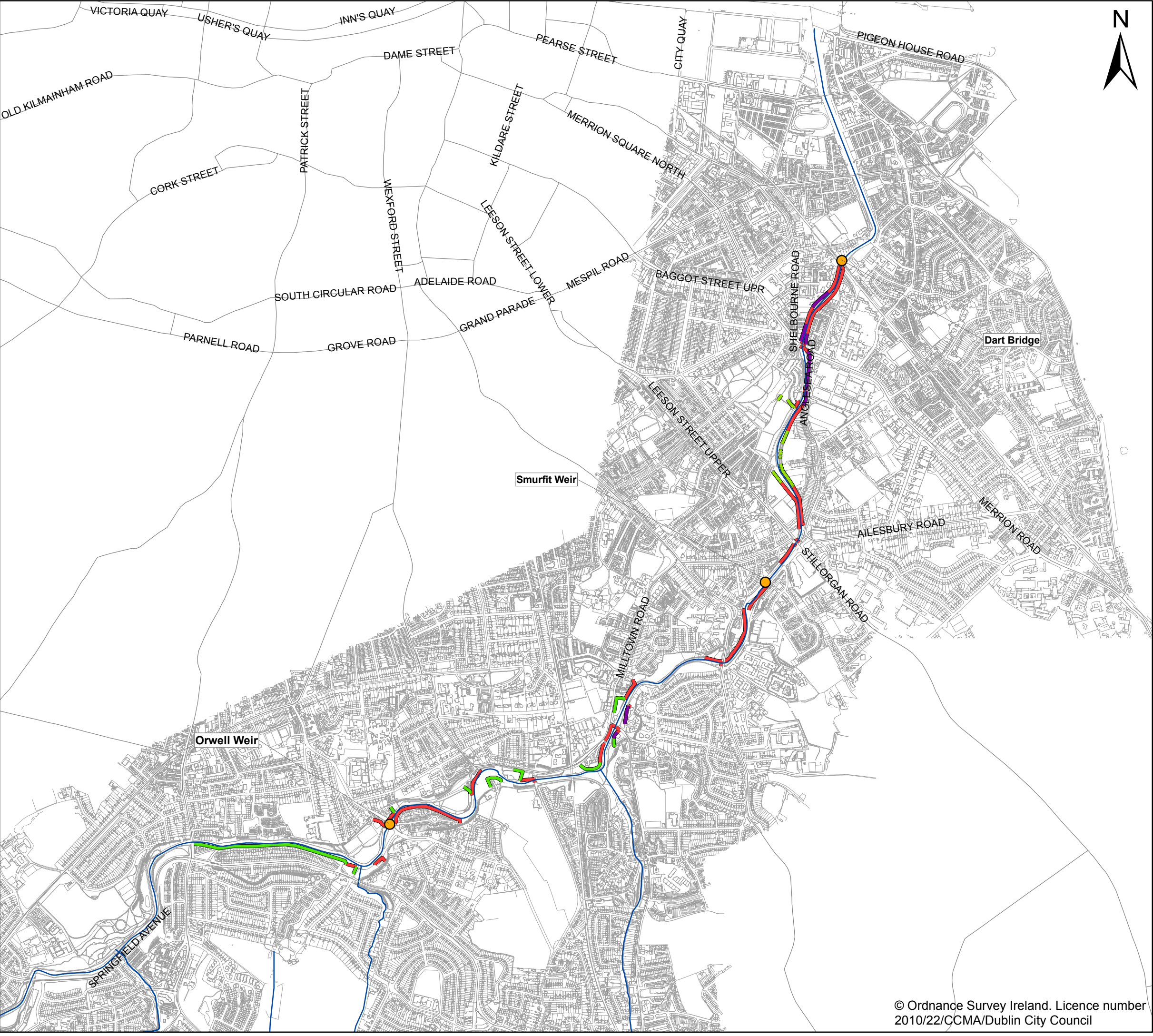
*Scoring mechanism

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6
← minimum requirement not met achieves minimum requirement aspirational requirement met →








- Legend**
- River Channel
 - Earth Embankment
 - Flood Wall
 - Incidental Defences

CLIENT	Dublin City Council
PROJECT	Dodder Catchment Flood Risk Management Study
TITLE	Option Development Stage 4 Dodder Option 1 - Hard Defences
<div><div>RPS</div><div>Elmwood House 74 Boucher Road Belfast BT12 6RZ</div><div>T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com</div></div>	
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Legend

-  Channel Conveyance to be upgraded
-  River Channel
-  Incidental Defences
-  Earth Embankment
-  Flood Wall

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dodder
Option 2 - Hard Defences And Improvement Of Channel Conveyance



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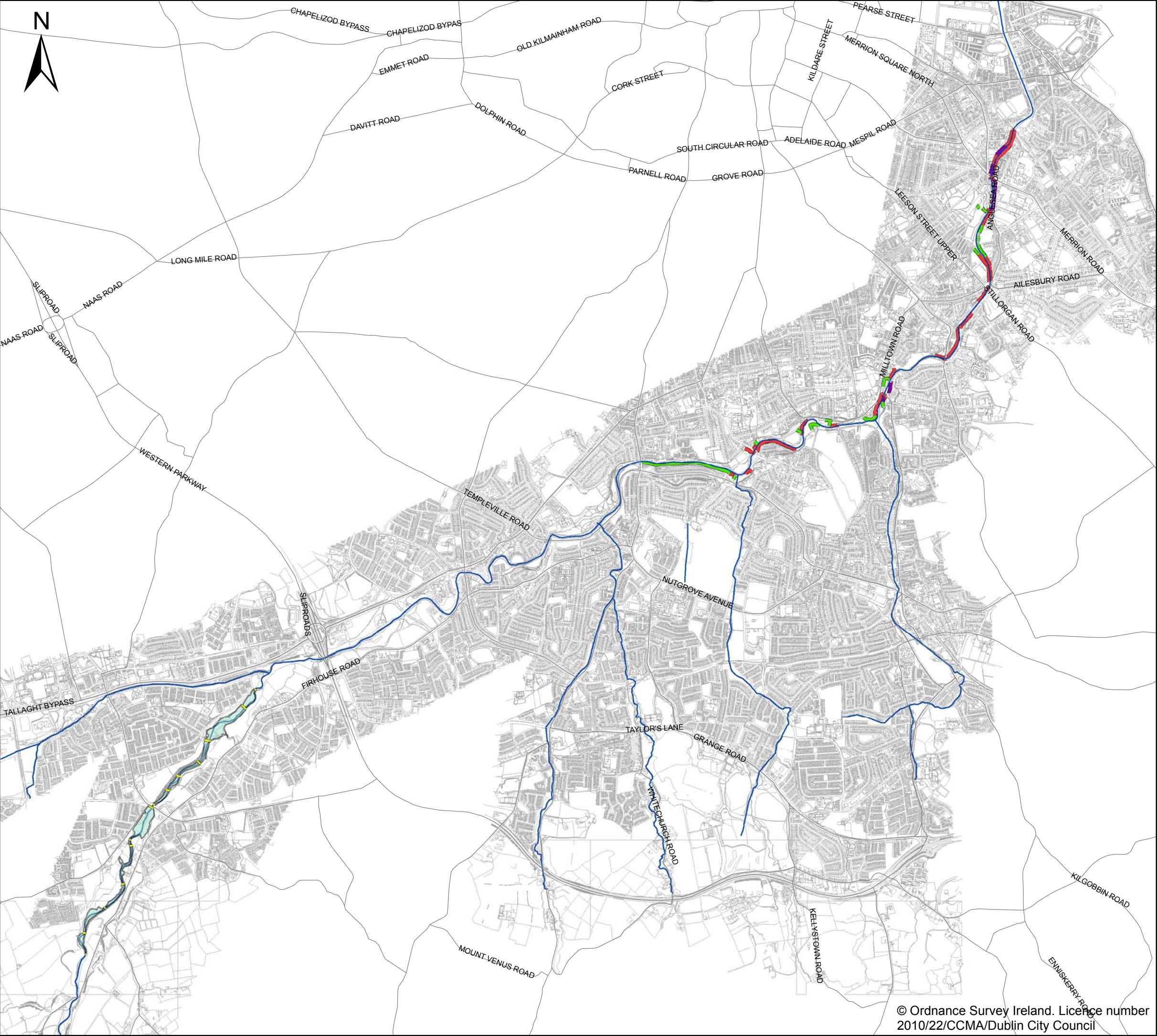
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Kilometers

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Approved By : A.J.
Date : 04/08/09

SCALE : 1:20,000



Legend

- River Channel
- Earth Embankment
- Flood Wall
- Incidental Defences
- storage walls
- River Dodder Upstream Storage

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dodder
Option 3 - Hard Defences
And Upstream Storage

Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

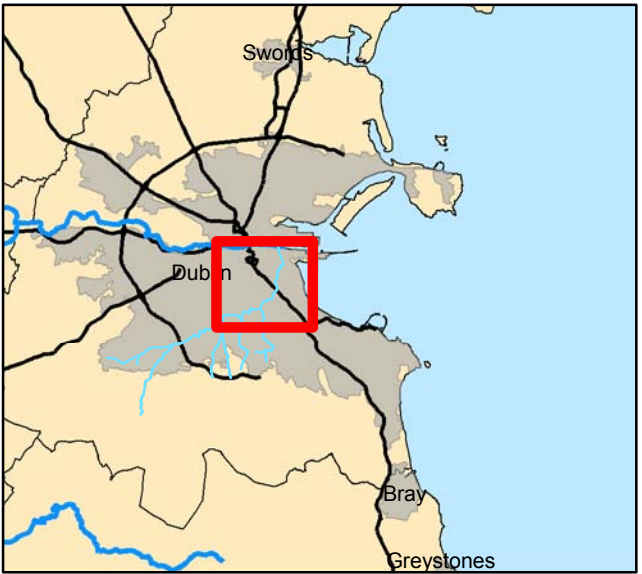
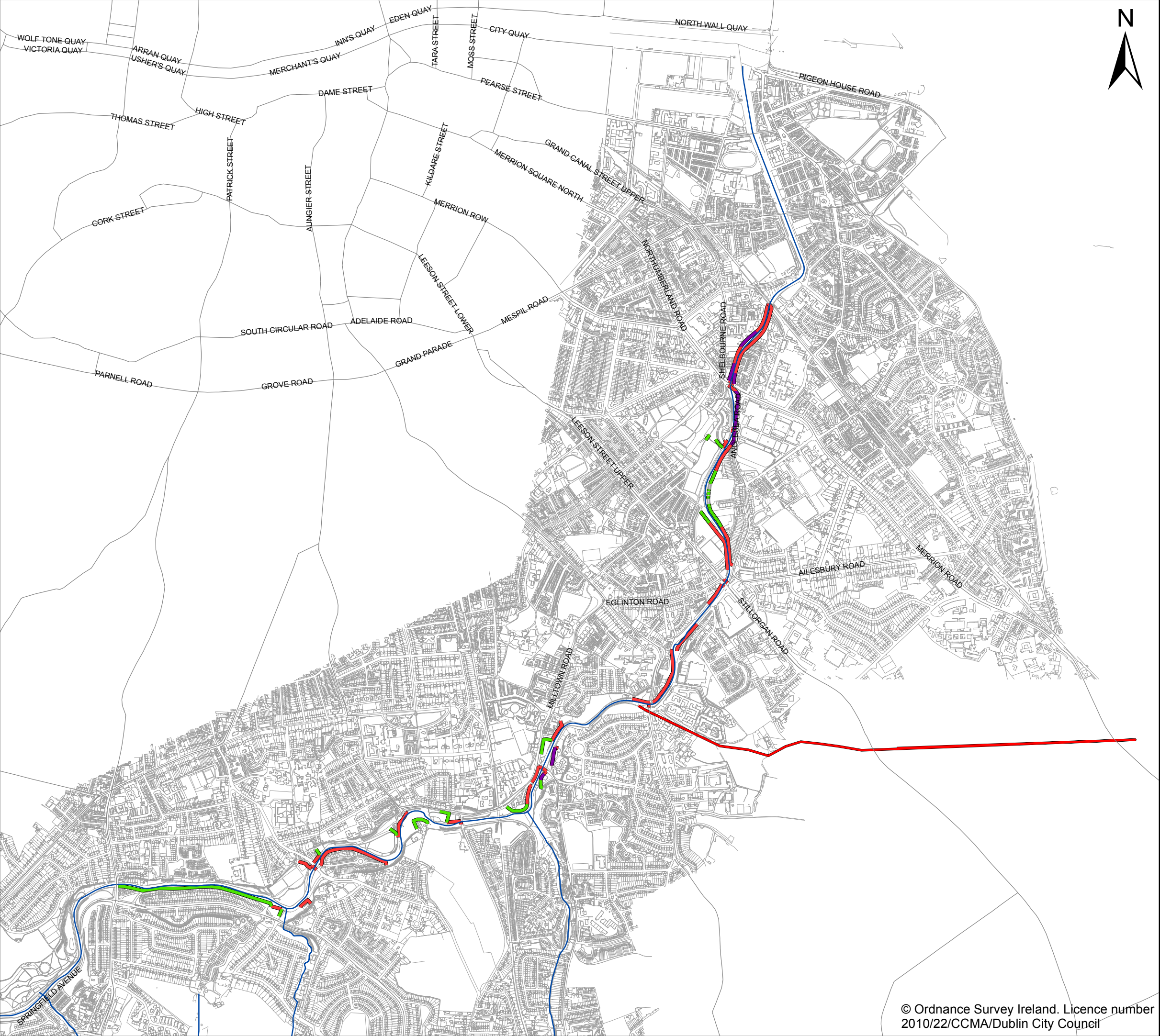
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- Legend**
- River Channel
 - Earth Embankment
 - Flood Wall
 - Incidental Defences
 - Diversion Channel

CLIENT
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PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dodder
Option 4 - Hard Defences And Diversion Of Watercourses



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

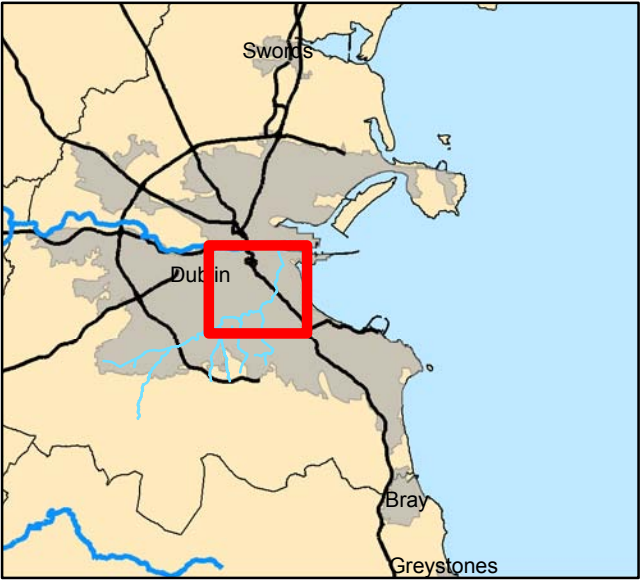
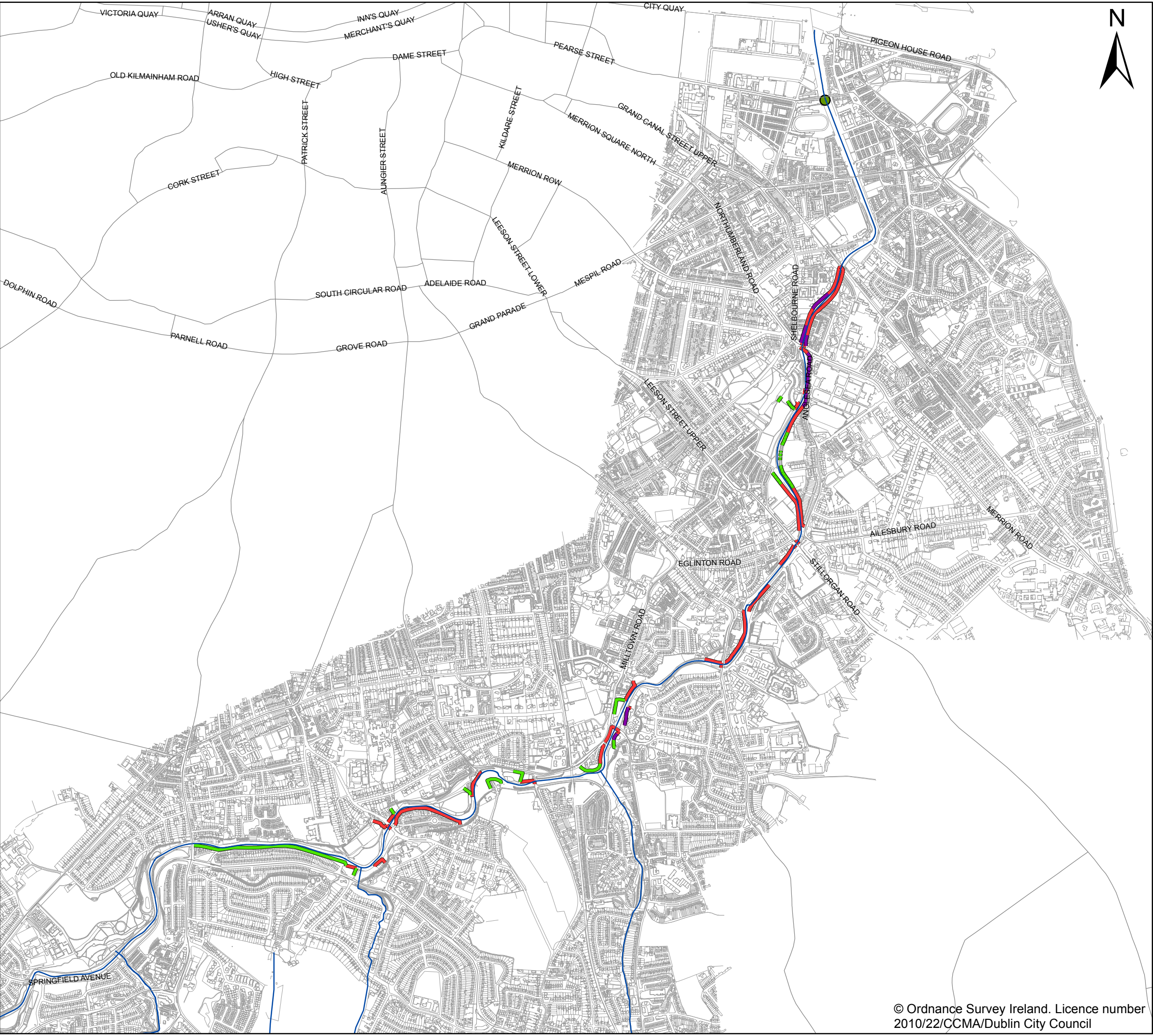
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Kilometers


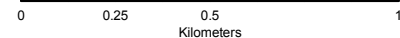
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Date : 04/08/09

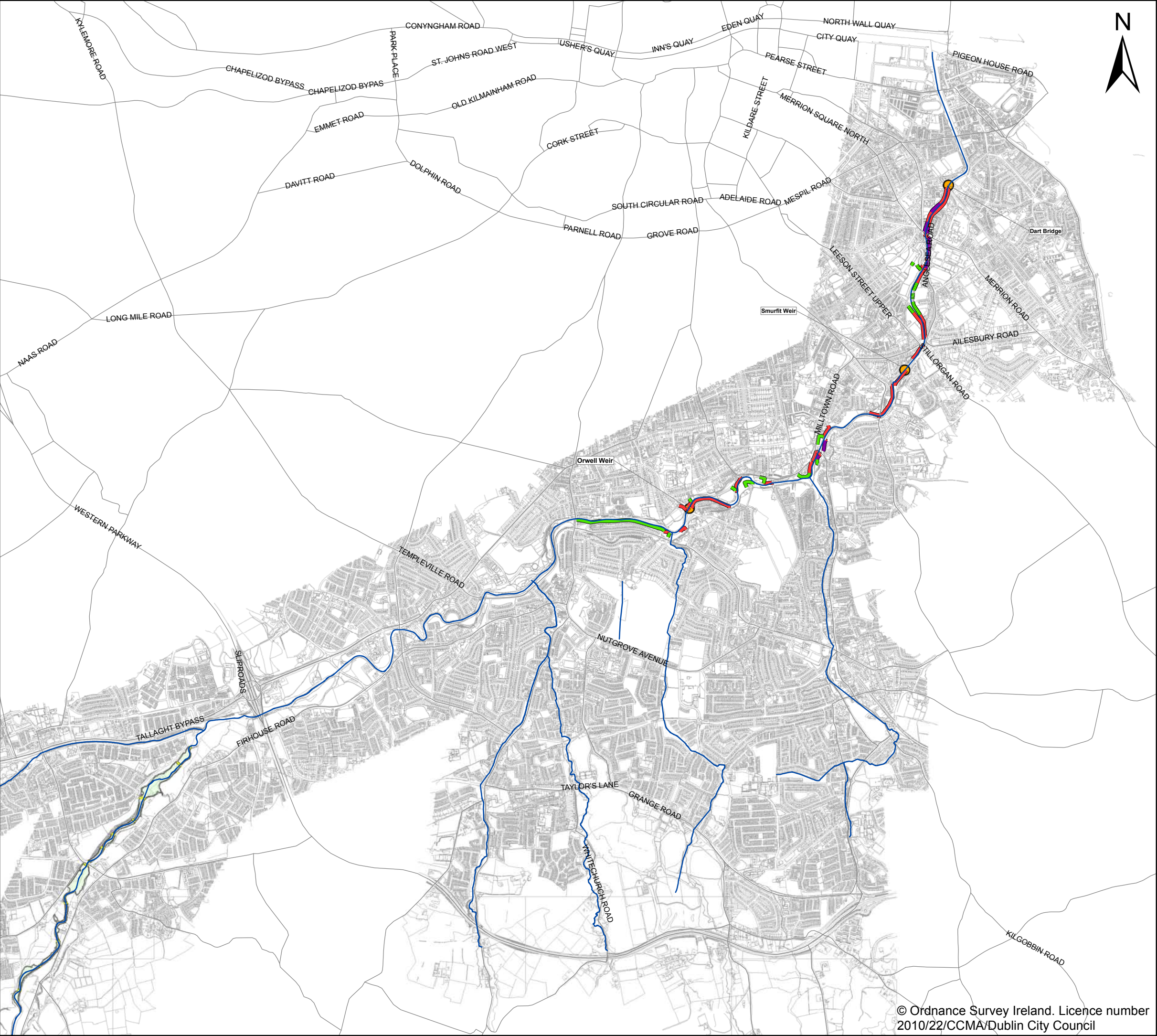
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Legend

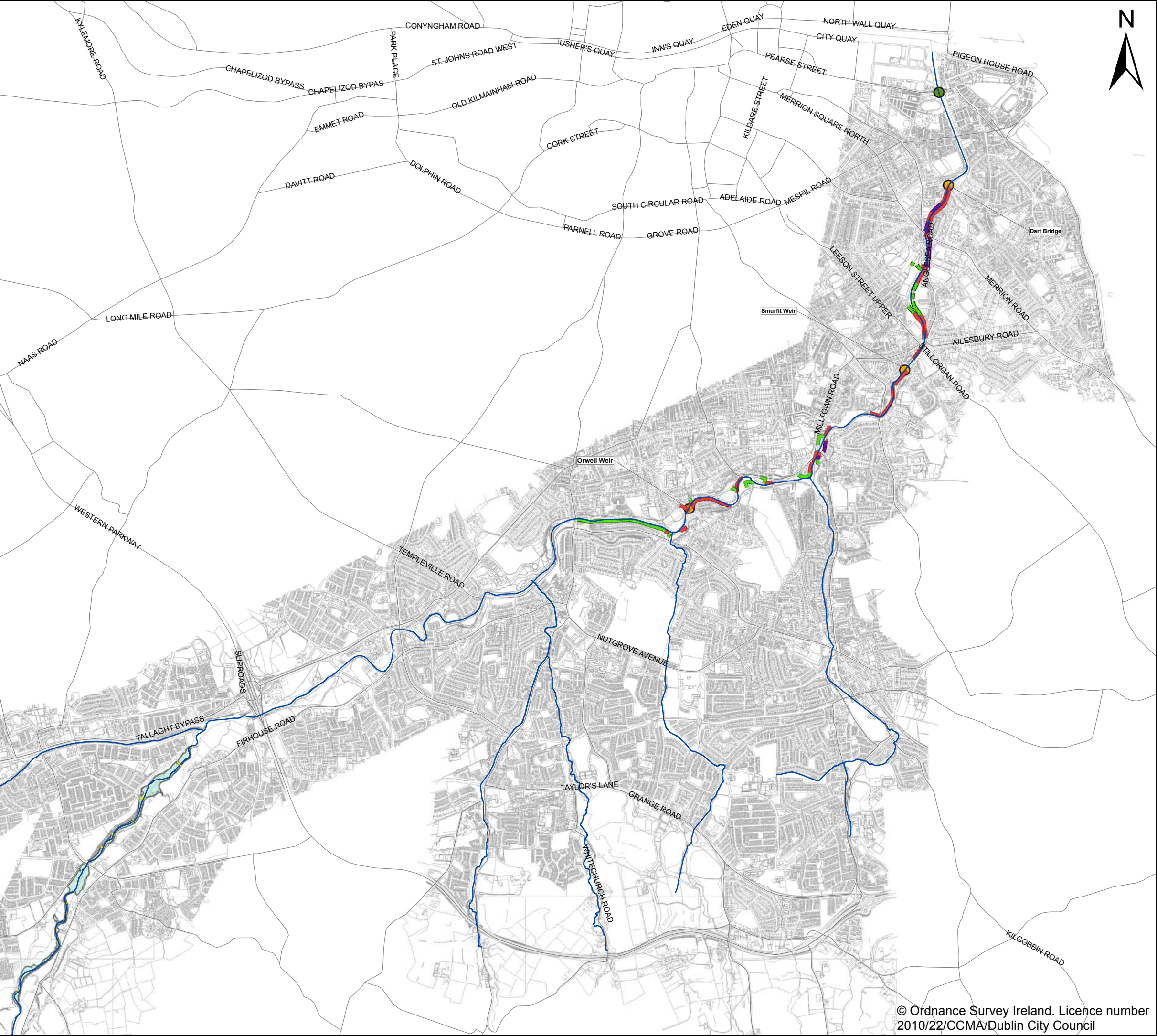
-  River Channel
-  Earth Embankment
-  Flood Wall
-  Incidental Defences
-  Tidal Barrage

CLIENT	Dublin City Council		
PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Dodder Option 5 - Hard Defences And Tidal Barrage		
		Elmwood House 74 Boucher Road Belfast BT12 6RZ	
		T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com	
Drawing No. : IBE0064_402_005		Drawn By : R.C. Checked By : M.W. Approved By : A.J. Date : 04/08/09	
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- Legend**
- River Channel
 - Earth Embankments
 - Flood Walls
 - Incidental Defences
 - Storage Walls
 - Upstream Storage
 - Channel conveyance to be upgraded

CLIENT	Dublin City Council
PROJECT	Dodder Catchment Flood Risk Management Study
TITLE	Option Development Stage 4 Dodder Option 6 - Hard Defences, Improvement of Channel Conveyance And Upstream Storage
	Elmwood House 74 Boucher Road Belfast BT12 6RZ T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com
Drawing No. : IBE0064_402_006	Drawn By : R.C. Checked By : M.W. Approved By : A.J. Date : 04/08/09
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Legend

- River Channel
- Earth Embankments
- Flood Walls
- Incidental Defences
- Storage Walls
- River Dodder Upstream Storage
- Channel Conveyance to be upgraded
- Tidal Barrage

CLIENT
Dublin City Council

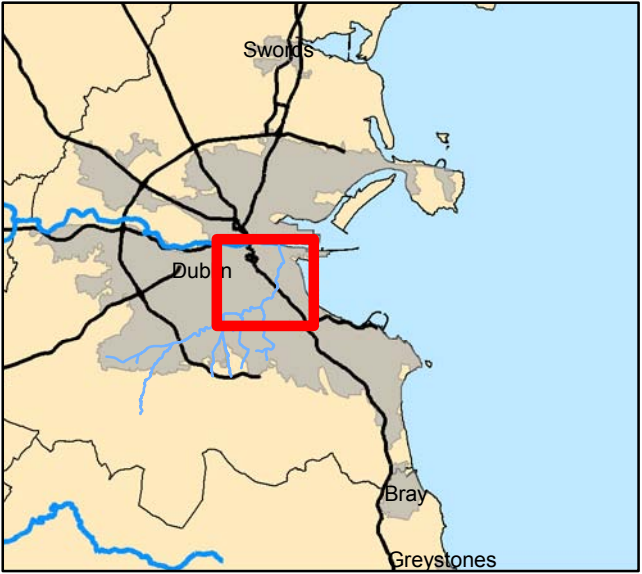
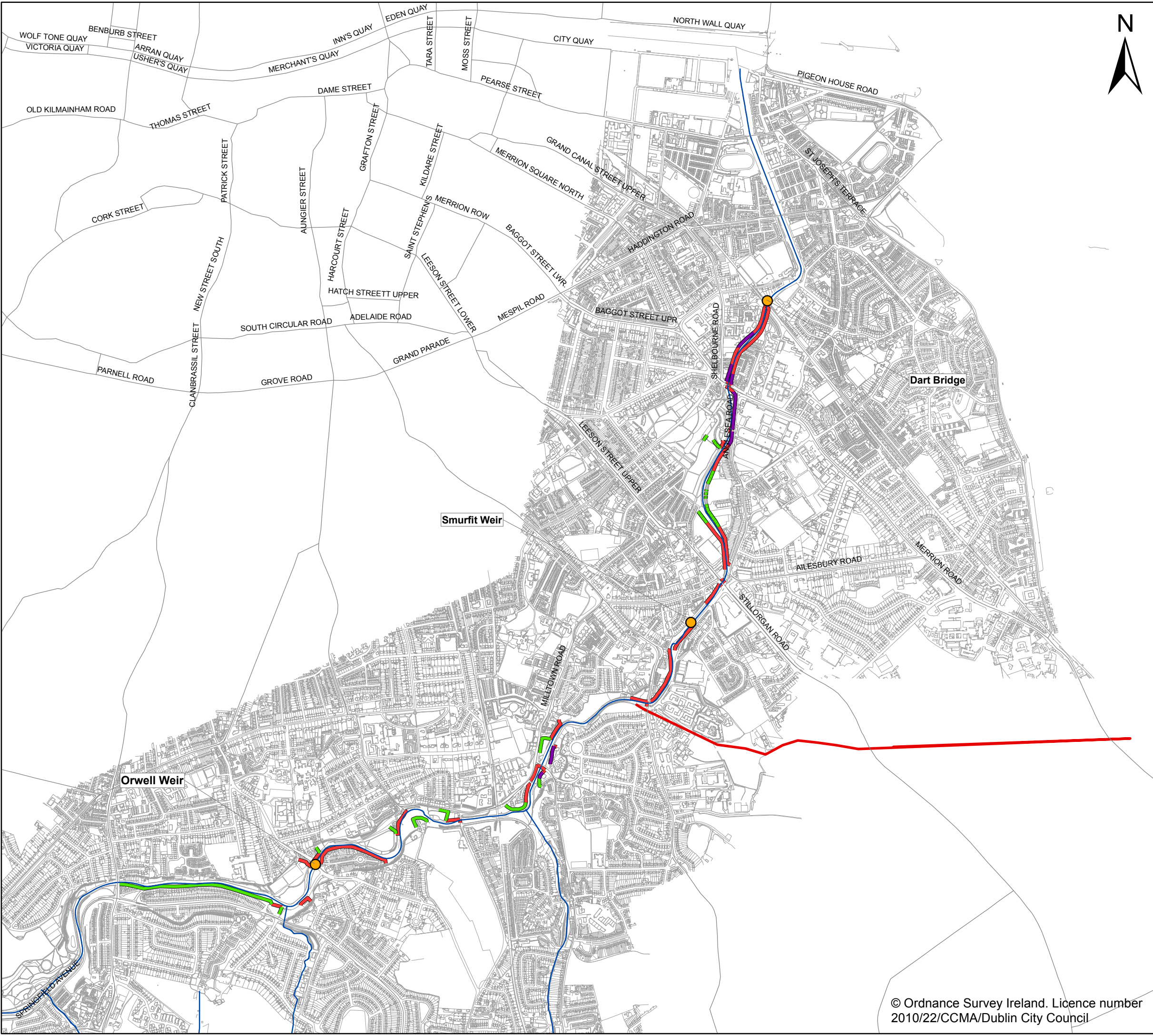
PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dodder
Option 7 - Hard Defences, Improvement of Channel Conveyance, Upstream Storage And Tidal Barrage

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Date: 04/08/09

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SCALE: 1:35,000



Legend

River Channel

Earth Embankments

Flood Walls

incidental defences

Diversion Channel

Channel Conveyance to be upgraded

CLIENT

Dublin City Council

PROJECT

Dodder Catchment Flood Risk Management Study

TITLE

Option Development Stage 4
Dodder
Option 8 - Hard Defences, Improvement of Channel Conveyance And Diversion of Watercourses

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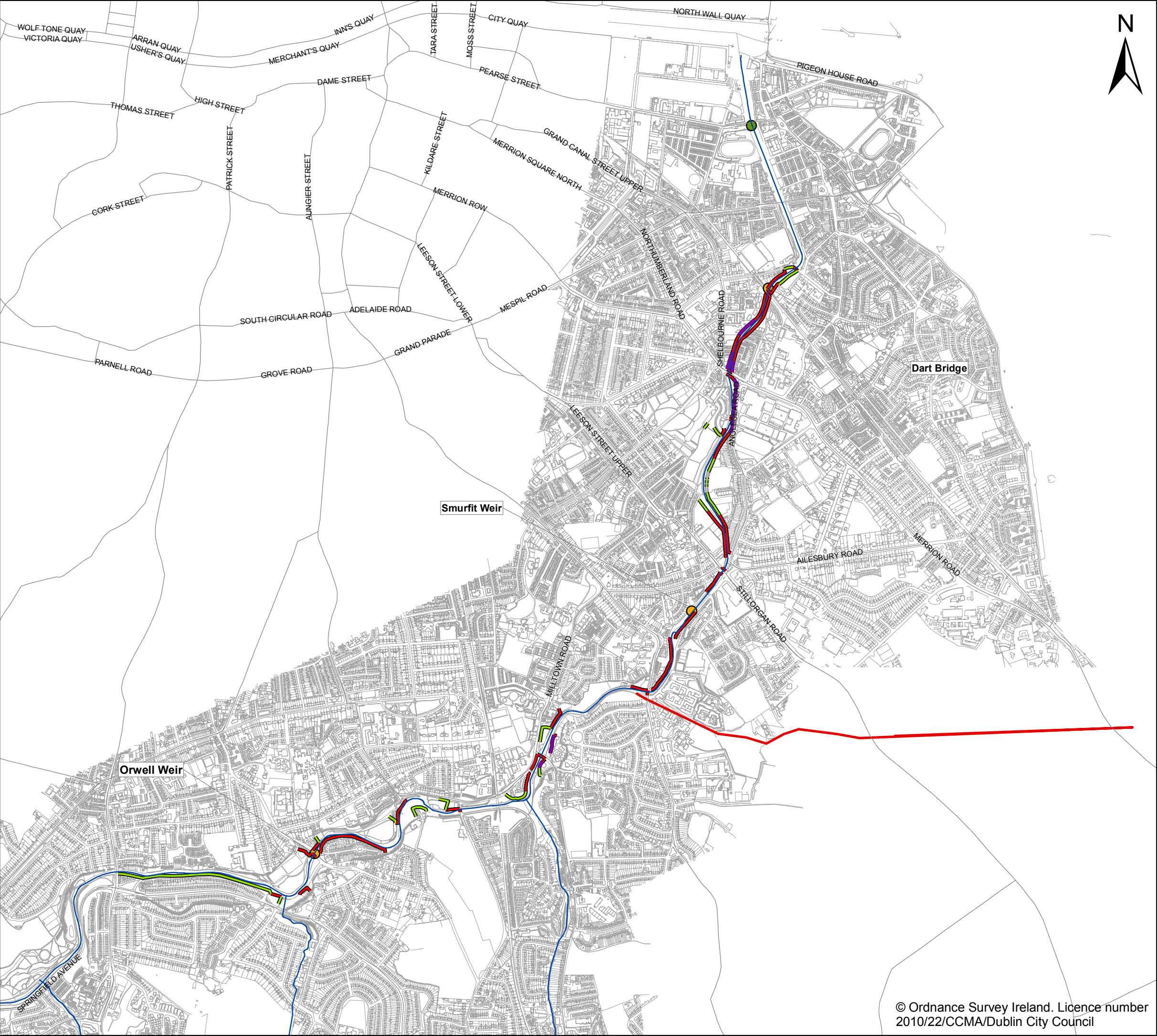
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Approved By : A.J.
Date : 17/02/09

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Kilometers

SCALE : 1:20,000

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Legend

River Channel

Incidental Defences

Earth Embankments

Flood Walls

Diversion Channel

Channel conveyance to be upgraded

Tidal Barrage

CLIENT

Dublin City Council

PROJECT

Dodder Catchment Flood Risk Management Study

TITLE

Option Development Stage 4
Dodder
Option 9 - Hard Defences, Improvement of Channel Conveyance, Diversion of Watercourses And Tidal Barrage

RPS

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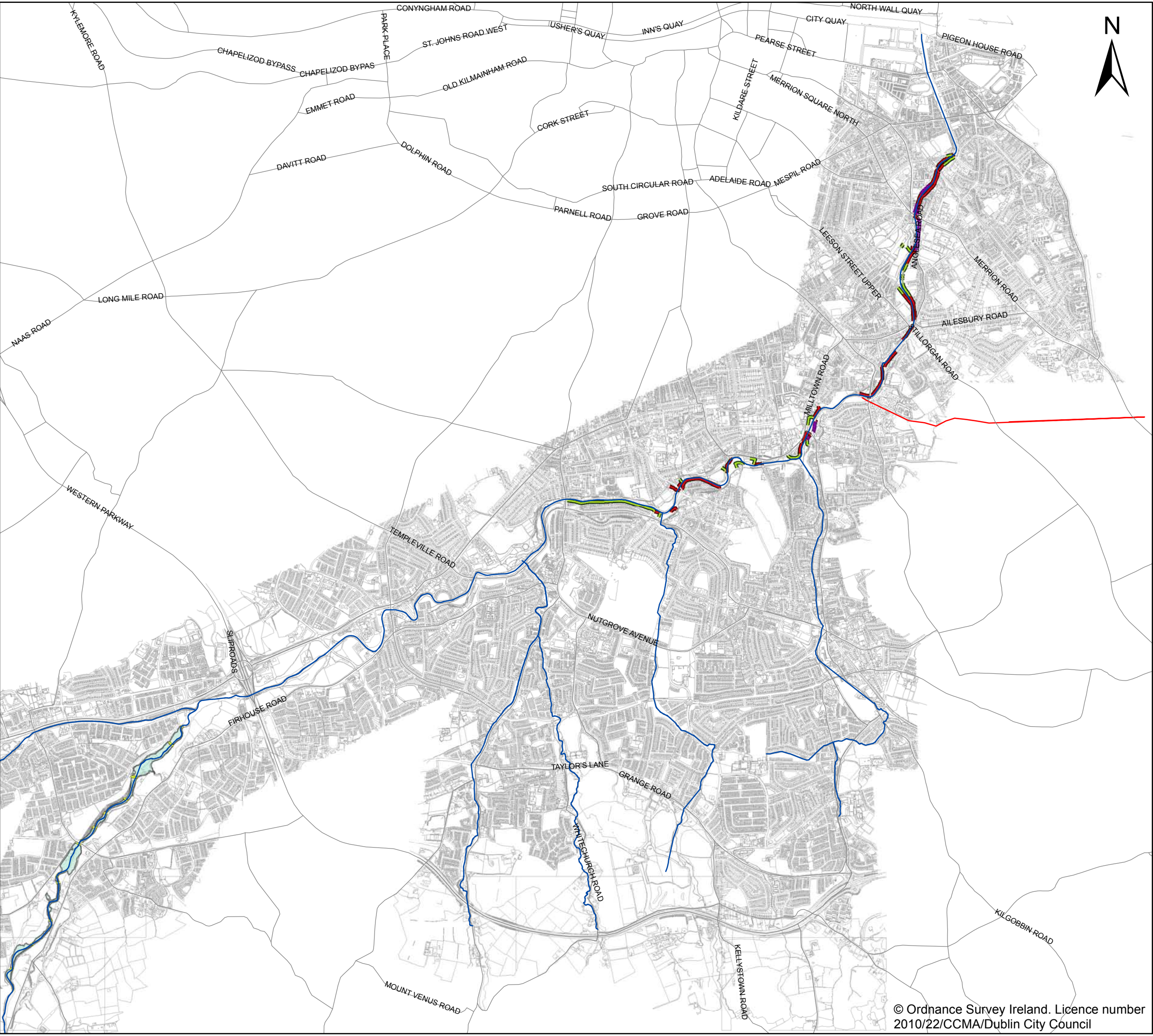
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Approved By : A.J.
Date : 04/08/09

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Kilometers

SCALE : 1:20,000

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Legend

- River Channel
- Earth Embankments
- Flood Walls
- Incidental Defences
- Diversion Channel
- storage walls
- River Dodder Upstream Storage

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dodder
Option 10 - Hard Defences with Upstream Storage And Diversion of Watercourses

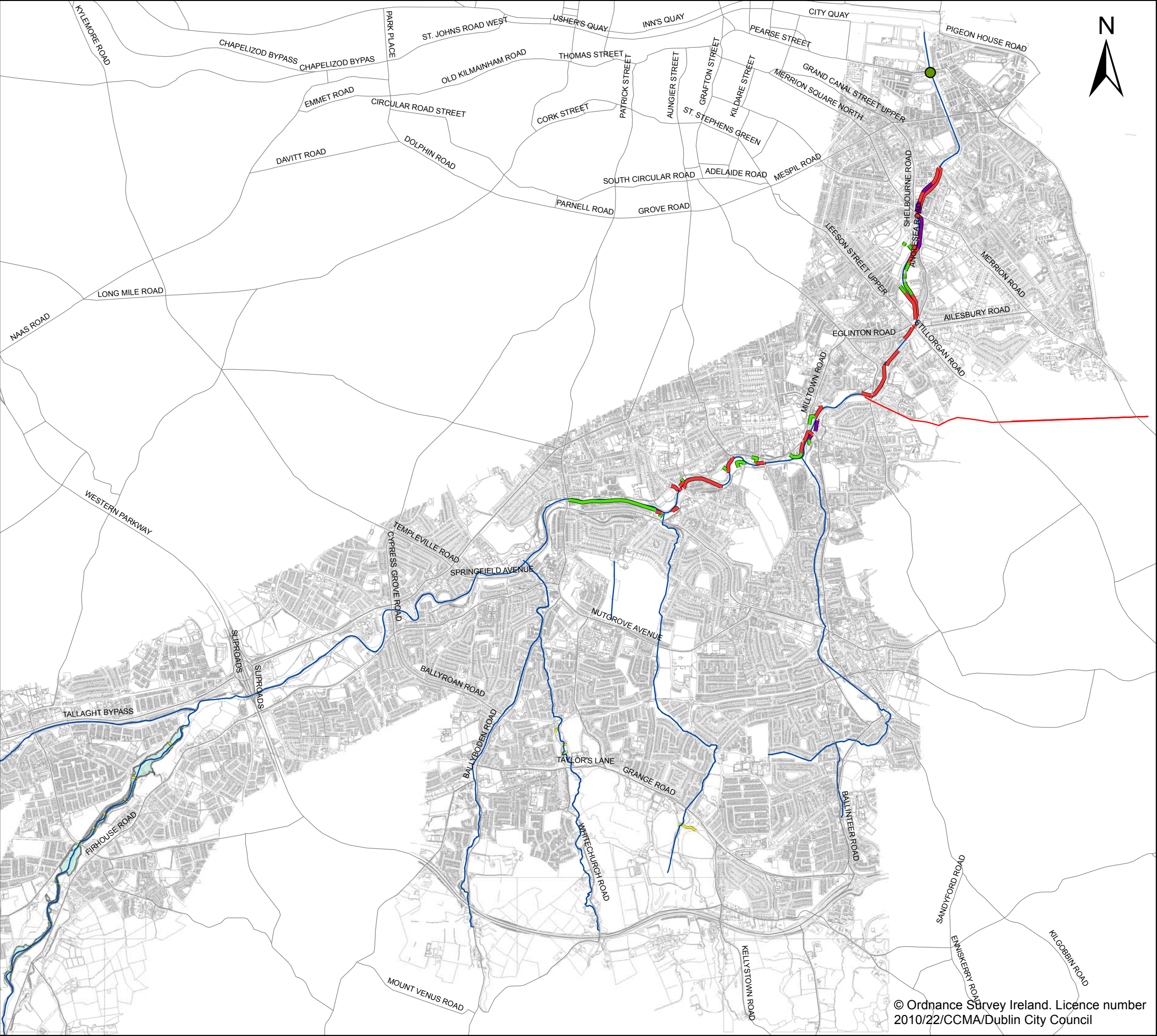
Elmwood House
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 Checked By : M.W.
 Approved By : A.J.
 Date : 04/08/09

SCALE : 1:35,000




- ### Legend
- River Channel
 - Earth Embankments
 - Flood Walls
 - incidental defences
 - Diversion Channel
 - storage walls
 - River Dodder Upstream Storage
 - Tidal Barrage

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dodder
Option 11 - Hard Defences, Upstream Storage, Diversion of Watercourses And Tidal Barrage

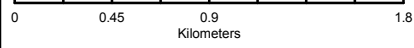


Elmwood House
 74 Boucher Road
 Belfast
 BT12 6RZ

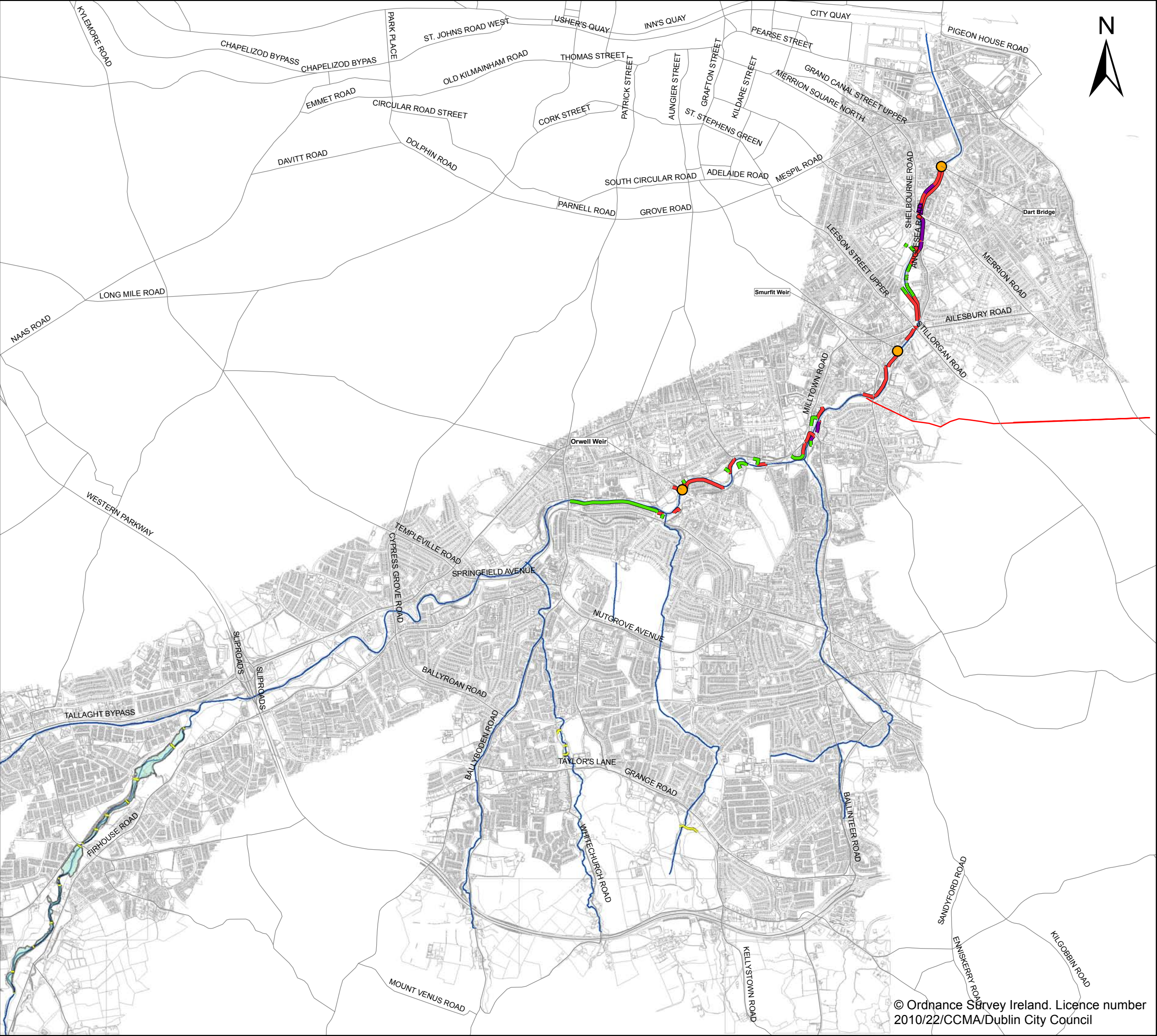
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 Date : 17/02/09



SCALE : 1:35,000



Legend

River Channel

Earth Embankments

Flood Walls

Incidental Defences

Diversion Channel

Storage Walls

River Dodder Upstream Storage

Channel conveyance to be upgraded

CLIENT

Dublin City Council

PROJECT

Dodder Catchment Flood Risk Management Study

TITLE

Option Development Stage 4
Dodder
Option 12 - Hard Defences, Improvement Of Channel Conveyance,Upstream Storage And Diversion Of Watercourses

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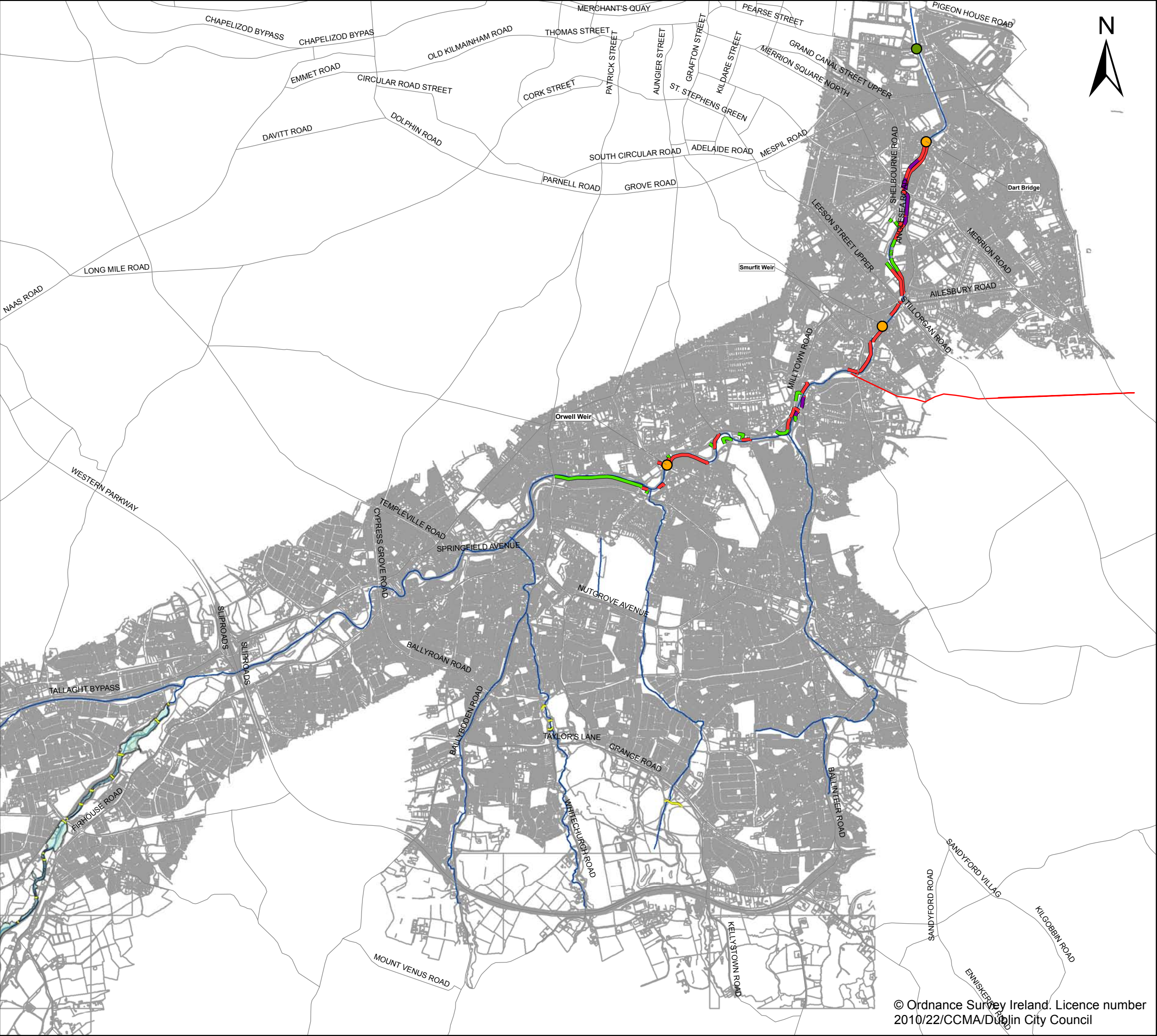
Drawn By :
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Approved By :
Date :

R.C.
M.W
A.J
17/02/09

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Kilometers

SCALE : 1:35,000

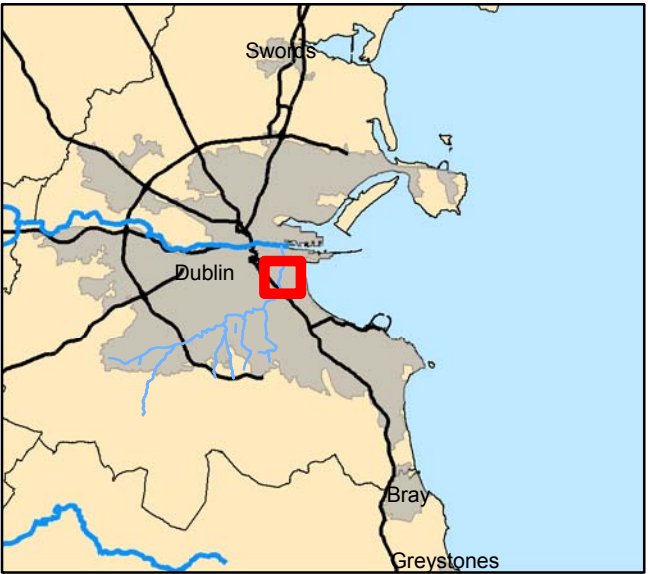
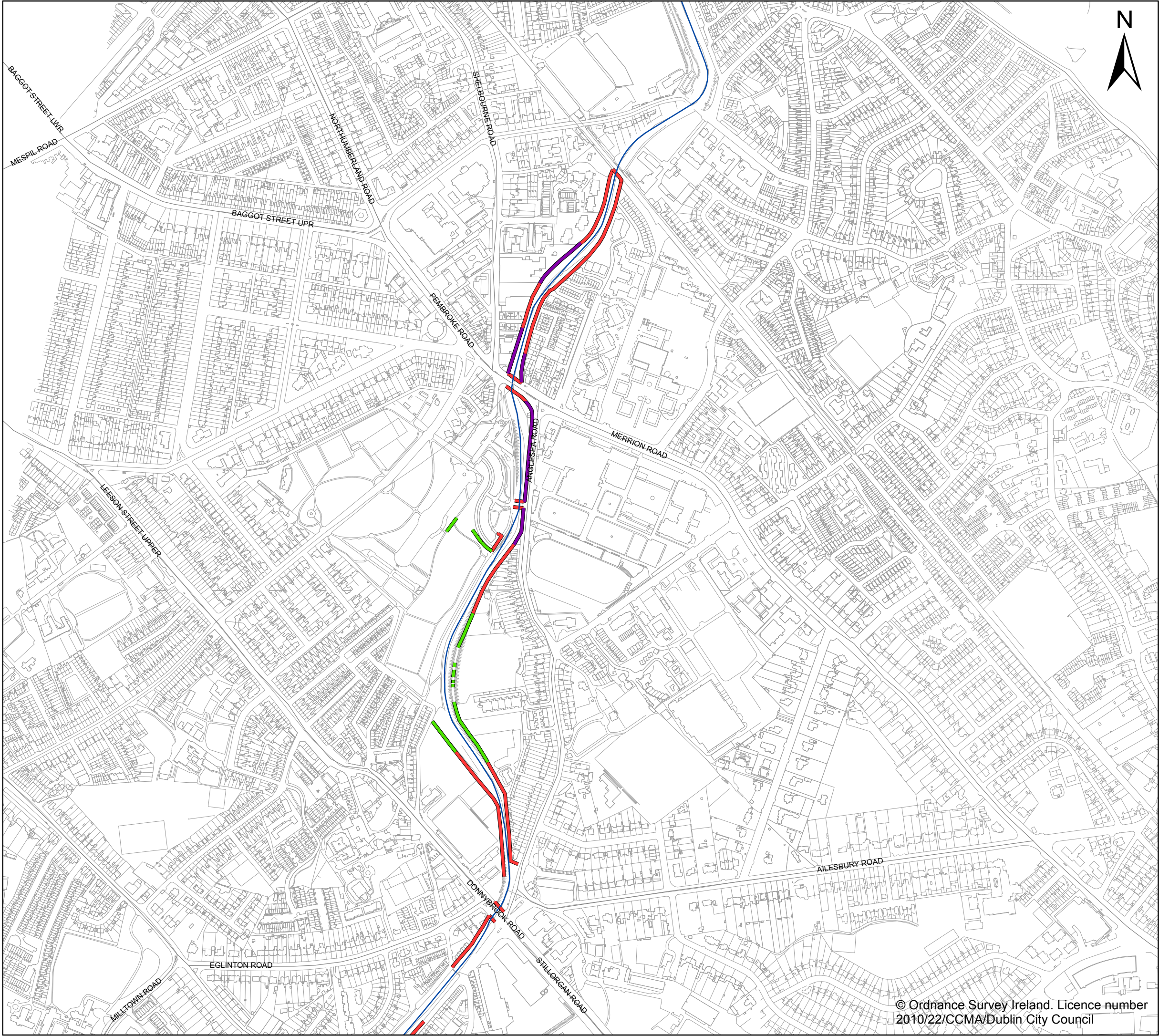
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Legend

- River Channel
- FW_DodderCopy
- EE_DodderCopy
- incidental defences
- Diversion Channel
- storage walls
- River Dodder Upstream Storage
- Channel conveyance to be upgraded
- Tidal Barrage

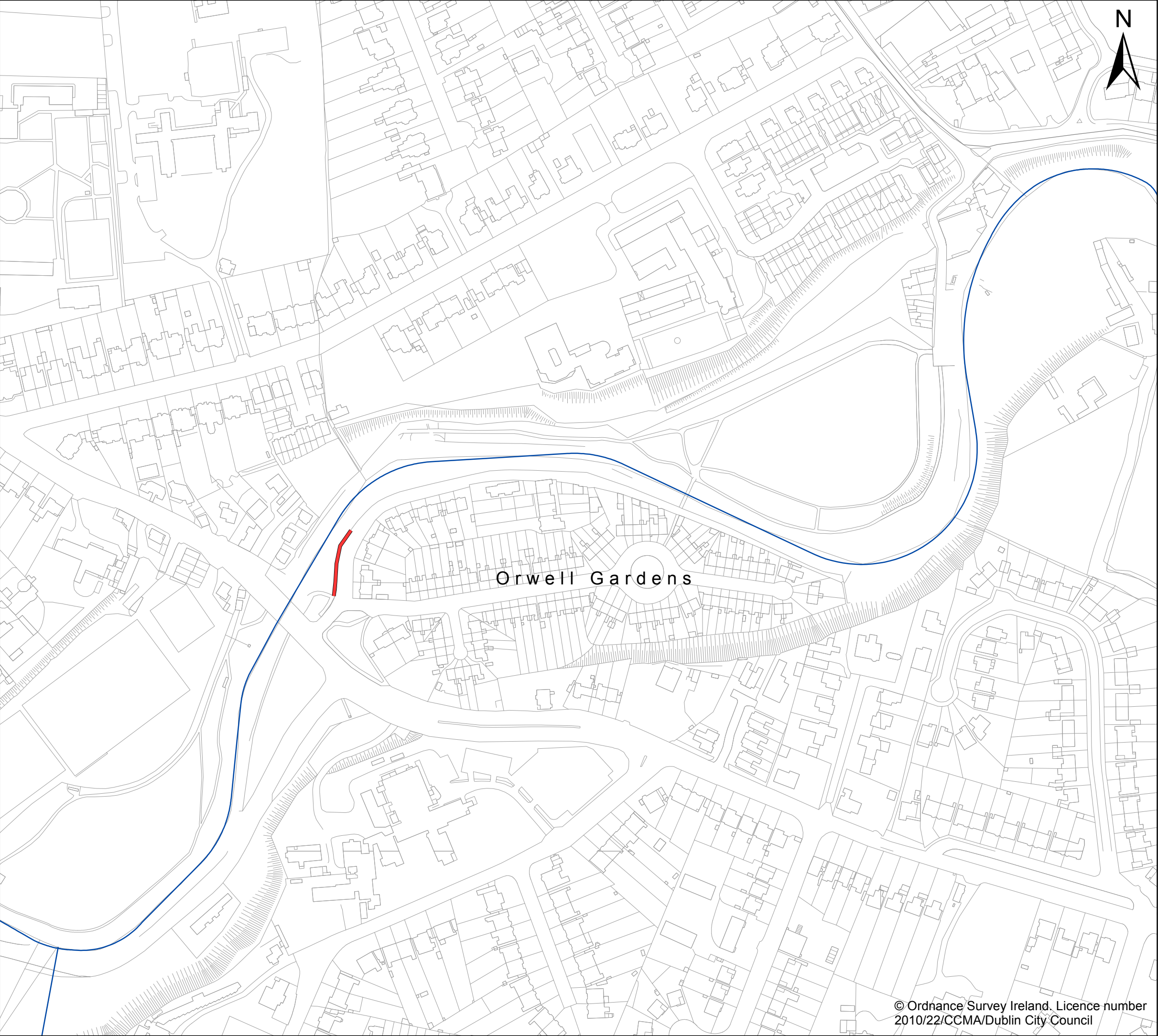
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PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Dodder Option 13 - Hard Defences, Improvement Of Channel Conveyance,Upstream Storage, Diversion Of Watercourses And Tidal Barrage		
		Elmwood House 74 Boucher Road Belfast BT12 6RZ	
		T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com	
Drawing No. :	IBE0064_402_013		Drawn By : R.C. Checked By : M.W. Approved By : A.J. Date : 17/02/09
			SCALE : 1:35,000



Legend

- River Channel
- Earth Embankment
- Flood Wall
- Incidental Defences

CLIENT	Dublin City Council
PROJECT	Dodder Catchment Flood Risk Management Study
TITLE	Option Development Stage 4 Dodder, DS Donnybrook Option 1 - Hard Defences
<div><div></div><div><p>Elmwood House 74 Boucher Road Belfast BT12 6RZ</p><p>T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com</p></div></div>	
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Legend

River Channel

_FD

CLIENT

Dublin City Council

PROJECT

Dodder Catchment Flood Risk Management Study

TITLE

Option Development Stage 4
Dodder, Orwell Gardens
Option 1 - Hard Defences

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Drawing No. :
IBE0064_402_201

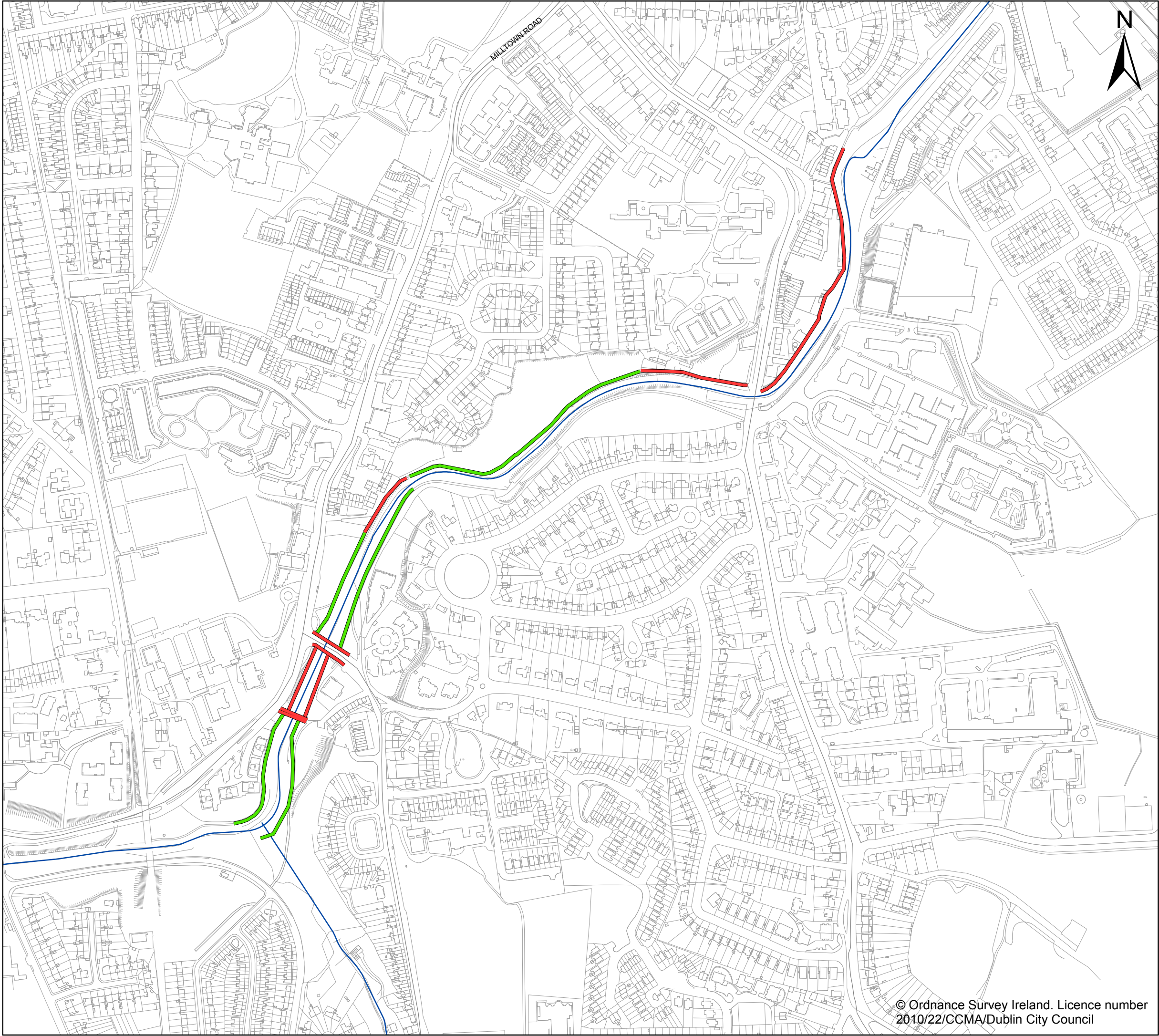
Drawn By :
Checked By :
Approved By :
Date :

R.C.
M.W.
A.J.
04/08/09


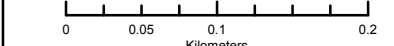
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Kilometers

SCALE : 1:2,500



- Legend**
- River Channel
 - Flood Walls
 - Earth Embankments

CLIENT	Dublin City Council		
PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Shanagarry Apt. and Smurfit Site Option 1 - Hard Defences		
	Elmwood House 74 Boucher Road Belfast BT12 6RZ	T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com	
	Drawing No.: IBE0064_402_301		
		Drawn By: R.C. Checked By: M.W. Approved By: A.J. Date: 04/08/09	SCALE: 1:5,000

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4.3 OPTIONS FOR OWENDOHER/WHITECHURCH

The following options have been considered for the Owendoher/Whitechurch;

- Option 1 Hard Defences
- Option 2 Hard Defences and Improvement of Channel Conveyance
- Option 3 Hard Defences and Upstream Storage
- Option 4 Hard Defences and Diversion of Watercourses
- Option 5 Hard Defences, Improvement of Channel Conveyance and Upstream Storage
- Option 6 Hard Defences, Improvement of Channel Conveyance and Diversion of Watercourses
- Option 7 Hard Defences, Upstream Storage and Diversion of Watercourses
- Option 8 Hard Defences, Improvement of Channel Conveyance, Upstream Storage and Diversion of Watercourses

Secondary options which are considered with all of the above include;

- Option 1 Proactive and Reactive Maintenance Regime
- Option 2 Public Awareness Campaign

The following options have been considered for the APSR Tara Hill & St Endas;

- Option 1 Hard Defences
- Option 2 Hard Defences and Improvement of Channel Conveyance
- Option 3 Hard Defences and Improvement of Channel Conveyance

Table 4.3.1

Assessment Unit - Owendoher and Whitechurch

Assessment Unit - Owendoher and Whitechurch					Option 1 - Hard Defences (Drawing 403_001)				Option 2 - Hard Defences with Improvement of Channel Conveyance (Drawing 403_002)				Option 3 - Hard Defences with Upstream Storage (Drawing 403_003)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance. Current maintenance on culverts will become technically more difficult to carry out with added access restrictions.	-1 (2)	-7 (-72 to +72)	-0.48 (-5 to +5)	Current maintenance on culverts reduced where culverts are upgraded. Access to watercourse restricted due to hard defences as in option 1, however need for access is reduced.	2 (2)	-11 (-72 to +72)	-0.76 (-5 to +5)	No additional maintenance activities expected than with option 1.	-1 (2)	3 (-72 to +72)	0.21 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments are technically straightforward although ground conditions may dictate sheet piles. Logistically difficult to construct in built up area	3 (5)			Flood walls and earth embankments are technically straightforward although ground conditions may dictate sheet piles. Logistically difficult to construct in built up areas. Technically and logistically difficult to upgrade culverts on busy roads	1 (5)			Same level of technical and logistical difficulty for hard defences as in option 1. Upstream storage should be relatively straightforward	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment, economically, socially and environmentally. Future costs are of international importance	A large increase in hard defences required from present day scenario to future scenario	-4 (5)			A large increase in hard defences required from present day scenario to future scenario	-4 (5)			A large increase in hard defences required from present day scenario to future scenario	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €7,739,255 Benefit = €2,074,448 BCR = 0.27	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)	Cost = €8,851,199 Benefit = €2,074,448 BCR = 0.23	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)	Cost = €10,190,160 Benefit = €2,074,448 BCR = 0.20	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	3 (4)	13 (-66 to +66)	5.91 (-30 to +30)	Same level of risk and maintenance required as in option 1. Frequency will be reduced as upgraded culverts are less likely to block.	4 (4)	19 (-66 to +66)	8.64 (-30 to +30)	Same level of maintenance required on hard defences in option 1.	3 (4)	27 (-66 to +66)	12.27 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Whitechurch and Owendoher area are local roads	Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 1 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 2 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 3 will protect the roads and reduce risk to an acceptable level.	3 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-3 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)			Upstream storage has the potential to create new waterside access and recreational facilities in St Enda's Park.	3 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Heights of flood walls and embankments may effect access	-1 (2)			Heights of flood walls and embankments may effect access	-1 (2)			Heights of flood walls and embankments may effect access. The creation of storage may also create more amenity areas and fishing areas	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit, therefore no impacts predicted	0 (3)	-28 (-108 to +108)	-7.78 (-30 to +30)	no impacts predicted	0 (3)	-33 (-108 to +108)	-9.17 (-30 to +30)	no impacts predicted	0 (3)	-18 (-108 to +108)	-5.00 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-3 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-3 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Upstream storage is not likely to impact on the GES/GEP.	-2 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Locally important are for flora and fauna. May also have otters	Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-3 (4)			Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage. Improvement of the channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted.	-3 (4)			Could have negative effects on the terrestrial ecology. Upstream storage may provide opportunity for habitat creation/enhancement	-2 (4)		
		d	Protect, and where possible enhance, fisheries within the catchment	The Owendoher is regarded as the best wild brown trout nursery fisheries in Ireland (Dodder Anglers). All tributaries are salmonid and provide spawning and nursery grounds.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-1 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also negatively affect habitats having significant impacts on flora communities due to changes in water levels also affects invertebrate communities, fish and	-2 (5)			There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	0 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	Raising defences may obstruct river vistas.	-1 (2)			Current vistas may be obstructed..	-1 (2)			Raising defences may obstruct river vistas. Flooding of St.Enda's park may take away from the landscape character of the area	-2 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	No known features of cultural heritage importance	No known features of cultural heritage importance	0 (1)			No known features of cultural heritage importance	0 (1)			No known features of cultural heritage importance	0 (1)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 2 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 3 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-17.36 (-100 to +100)				-16.30 (-100 to +100)				-7.52 (-100 to +100)

*Weighting mechanism

- 5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

*Scoring mechanism

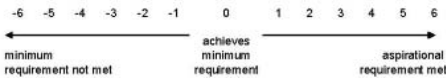


Table 4.3.2

Assessment Unit - Owendoher and Whitechurch

Assessment Unit - Owendoher and Whitechurch					Option 4 - Hard defences and Channel Diversion (Drawing 403_004)				Option 5 - Hard defences with Improvement of Channel Conveyance and Upstream Storage (Drawing 403_005)				Option 6 - Hard Defences with Improvement of Channel Conveyance and Channel Diversion (Drawing 403_006)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Maintenance of hard defences are as in option 1. Technically difficult to maintain channel diversion culvert due to working in confined spaces.	-2 (2)	-4 (-72 to +72)	-0.28 (-5 to +5)	No increased technical difficulty in maintaining option 5 than with option 2.	-1 (2)	-17 (-72 to +72)	-1.17 (-5 to +5)	No increased technical difficulty in maintaining option 6 than with option 4. Maintaining the channel diversion culvert is the dominant factor in the scoring.	-1 (2)	-32 (-72 to +72)	-2.21 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Same level of technical and logistical difficulty for hard defences as in option 1. Culverting from Whitechurch to Little Dargle should be relatively straightforward.	2 (5)			Same level of technical and logistical difficulty for as in option 2. improvement of channel conveyance is the dominant factor in scoring.	-1 (5)			All parts of option 6 are relatively straightforward but will be logistically difficult to construct in a built up area.	-4 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	A large increase in hard defences required from present day scenario to future scenario	-2 (5)			A large increase in hard defences required from present day scenario to future scenario	-2 (5)			A large increase in hard defences required from present day scenario to future scenario	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €4,538,648 Benefit = €2,074,448 BCR = 0.46	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)	Cost = €10,081,071 Benefit = €2,074,448 BCR = 0.21	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)	Cost = €8,744,895 Benefit = €2,074,448 BCR = 0.24	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Same level of maintenance required on hard defences in option 1. Working in confined spaces may be required for maintaining the channel diversion culvert.	0 (4)	5 (-66 to +66)	2.27 (-30 to +30)	Same level of risk and maintenance required as in option 1. Frequency will be reduced as upgraded culverts are less likely to block.	4 (4)	19 (-66 to +66)	8.64 (-30 to +30)	The same health and safety issues as in option 4.	0 (4)	5 (-66 to +66)	2.27 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Whitechurch and Owendoher area are local roads	Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 4 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 5 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 6 will protect the roads and reduce risk to an acceptable level.	3 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible.	-2 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible.	-3 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible.	-2 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Heights of flood walls and embankments may effect access. Diversion of watercourse may create access for fishing.	0 (2)			Heights of flood walls and embankments may effect access. The creation of storage may also create more amenity areas and fishing areas	0 (2)			Heights of flood walls and embankments may effect access. Diversion of watercourse may create access for fishing.	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	no impacts predicted	0 (3)	-29 (-108 to +108)	-8.06 (-30 to +30)	no impacts predicted	0 (3)	-12 (-108 to +108)	-3.34 (-30 to +30)	no impacts predicted	0 (3)	-22 (-108 to +108)	-6.12 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Diversion of WVC could potentially impact on the achievements of the WFD	-3 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Upstream storage is not likely to impact on the GES/GEP	0 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Diversion of WVC could potentially impact on the achievements of the WFD	0 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Locally important are for flora and fauna. May also have otters	Could have negative effects on the terrestrial and aquatic ecology. Diversion of watercourses may provide opportunity for habitat creation/enhancement	-2 (4)			Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage. Improvement of the channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted. Upstream storag	-2 (4)			Could have negative effects on the terrestrial and aquatic ecology. Diversion of watercourses may provide opportunity for habitat creation/enhancement	-2 (4)		
		d	Protect, and where possible enhance, fisheries within the catchment	The Owendoher is regarded as the best wild brown trout nursery fisheries in Ireland (Dodder Anglers). All tributaries are salmonid and provide spawning and nursery grounds.	The diversion of the water course could have a negative impact on fisheries. Further investigations would be needed at project stage/EIA stage	-2 (5)			There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	0 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also negatively affect habitats having significant impacts on flora communities due to changes in water levels, also affects invertebrate communities, fish and	-2 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	May obstruct current vistas. Diversion of the water course could have short term impacts during construction.	-1 (2)			Raising defences may obstruct river vistas. Flooding of StEnda's park may take away from the landscape character of the area	-2 (2)			May obstruct current vistas. Diversion of the water course could have short term impacts during construction.	-2 (2)		
f	Protect and where possible enhance known features of cultural heritage importance and their settings	No known features of cultural heritage importance	No known features of cultural heritage importance	0 (1)	No known features of cultural heritage importance	0 (1)	No known features of cultural heritage importance	0 (1)								
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 4 will cause flooding to the Little Dargle area	-999 (5)	-999 (-30 to +30)	-999.00 (-5 to +5)	Option 5 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 6 will cause flooding to the Little Dargle area	-999 (5)	-999 (-30 to +30)	-999 (-5 to +5)
								-999 (-100 to +100)				-10.87 (-100 to +100)				-999 (-100 to +100)
*Weighting mechanism		*Scoring mechanism														

*Weighting mechanism
5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance



Table 4.3.3

Assessment Unit - Owendoher and Whitechurch

Assessment Unit - Owendoher and Whitechurch					Option 7 - Hard Defences with Upstream Storage and Channel Diversion (Drawing 403_007)				Option 8 - Hard Defences with Improvement of Channel Conveyance and Upstream Storage and Channel Diversion (Drawing 403_008)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	No increased technical difficulty in maintaining option 7 than with option 4. Maintaining the channel diversion culvert is the dominant factor in the scoring.	-2 (2)	1 (-72 to +72)	0.07 (-5 to +5)	No increased technical difficulty in maintaining option 8 than with option 4.	-2 (2)	-4 (-72 to +72)	-0.28 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	All parts of option 7 are relatively straightforward but will be logistically difficult to construct in a built up area.	2 (5)			Same level of technical and logistical difficulty as in option 2. Improvement of channel conveyance is the dominant factor in scoring.	1 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	A large increase in hard defences required from present day scenario to future scenario	-1 (5)			A large increase in hard defences required from present day scenario to future scenario	-1 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €9,760,718 Benefit = €2,074,448 BCR = 0.21	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)	Cost = €9,612,266 Benefit = €2,074,448 BCR = 0.22	-3 (5)	-15 (-30 to +30)	-15 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	The same health and safety issues as in option 4.	0 (4)	1 (-66 to +66)	0.45 (-30 to +30)	The same health and safety issues as in option 4.	0 (4)	5 (-66 to +66)	2.27 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Whitechurch and Owendoher area are local roads	Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 7 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 8 will protect the roads and reduce risk to an acceptable level.	3 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible.	-2 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible. No new green space or recreational facilities will be created.	-3 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Heights of flood walls and embankments may effect access. Diversion of water course may create access for fishing. The creation of storage may also create more amenity areas and fishing areas	-2 (2)			Heights of flood walls and embankments may effect access. The creation of storage may also create more amenity areas and fishing areas. Diversion of watercourse may create access for fishing.	1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	no impacts predicted	1 (3)	-21 (-108 to +108)	-5.84 (-30 to +30)	no impacts predicted	0 (3)	-20 (-108 to +108)	-5.56 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Upstream storage is not likely to impact on the GES/GEP. Diversion of WC could potentially impact	0 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime. Upstream storage is not likely to impact on the GES/GEP. Diversion of WC could potentially impact	-1 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Locally important are for flora and fauna. May also have otters	Could have negative effects on the terrestrial and aquatic ecology. Diversion of watercourses may provide opportunity for habitat creation/enhancement	-2 (4)			Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage. Improvement of the channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted. Upstream storag	-2 (4)		
		d	Protect, and where possible enhance, fisheries within the catchment	The Owendoher is regarded as the best wild brown trout nursery fisheries in Ireland (Dodder Anglers). All tributaries are salmonid and provide spawning and nursery grounds.	No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation with ERFB. Further investigations would be needed at project stage/EIA stage. The creatio	-2 (5)			There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-1 (5)		
					e	Protect, and where possible enhance, landscape character and visual amenity			There are no Landscape Protection Zones within the area.	Raising defences may obstruct river vistas. Flooding of St.Enda's park may take away from the landscape character of the area. Diversion of the water course could have short term impacts during construction.		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	No known features of cultural heritage importance	No known features of cultural heritage importance	-2 (1)			No known features of cultural heritage importance	0 (1)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 7 will increase flow to Little Dargle	-999 (5)	-999 (-30 to +30)	-999.00 (-5 to +5)	Option 8 will increase flow to Little Dargle	-999 (5)	-999 (-30 to +30)	-999.00 (-5 to +5)
								-999 (-100 to +100)				-999 (-100 to +100)
*Weighting mechanism		*Scoring mechanism										

*Weighting mechanism

- 5 = International importance
- 4 = National importance
- 3 = Regional importance
- 2 = Local importance
- 1 = Negligible importance

*Scoring mechanism

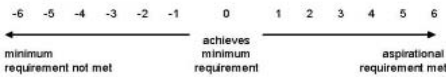


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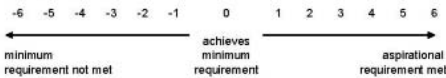
APSR - Tara Hill & St Enda's

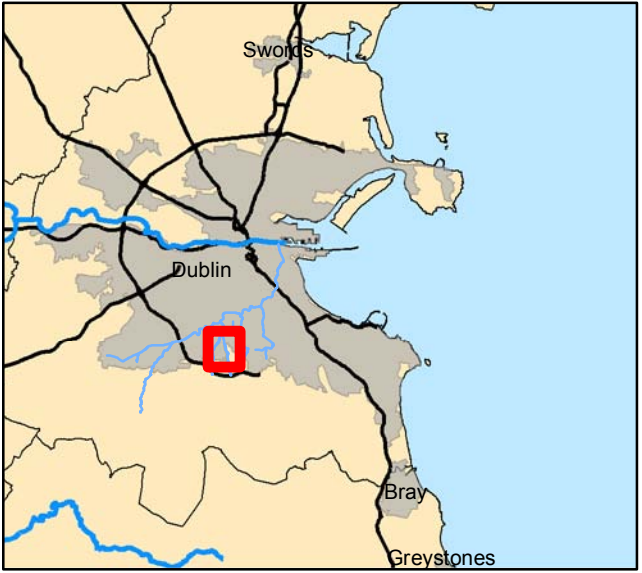
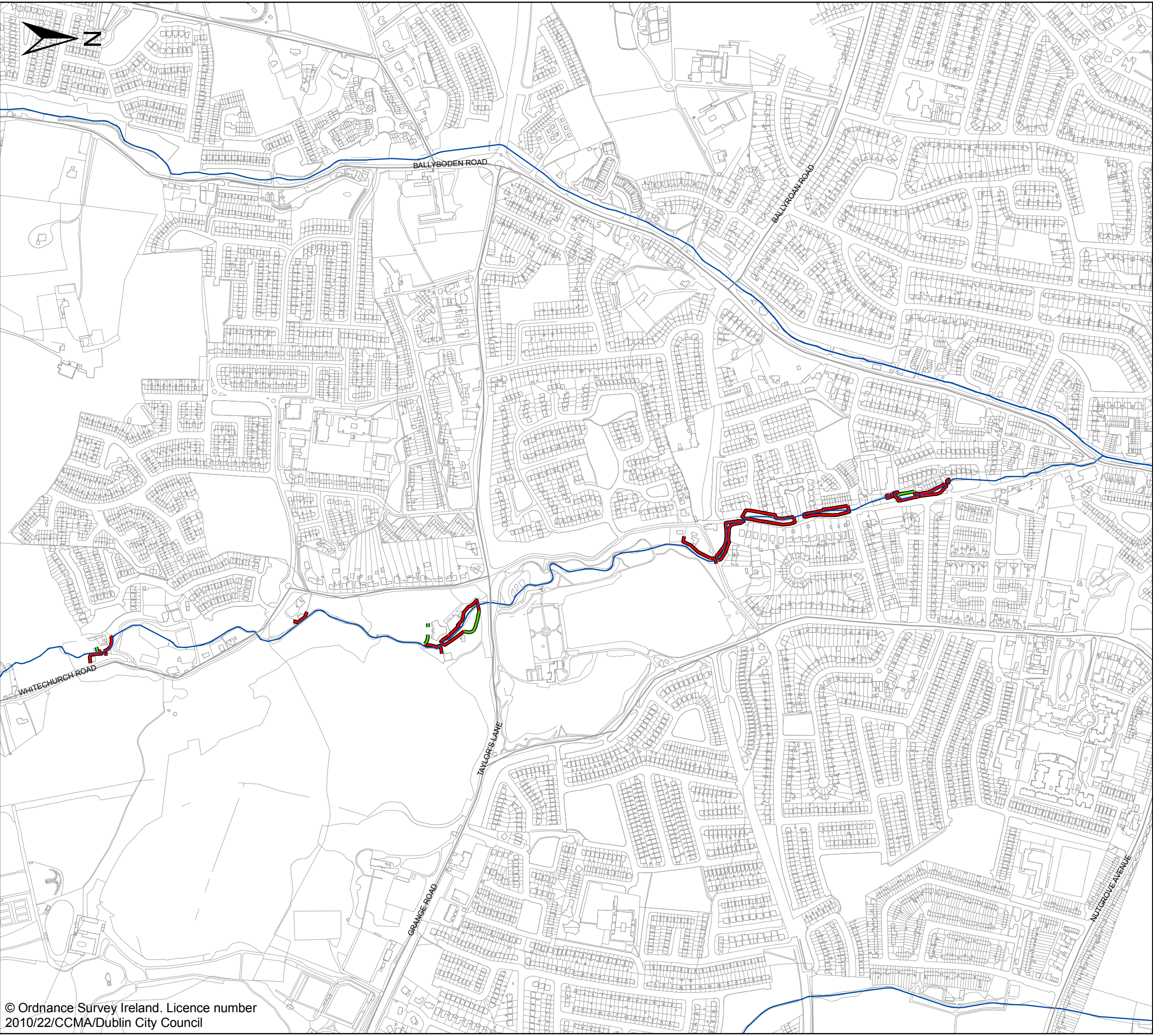
APSR - Tara Hill & St Enda's					Option 1 - Hard Defences (Drawing 403_101)				Option 2 - Hard Defences with Improvement of Channel Conveyance (Drawing 403_102)				Option 3 - Hard Defences with Improvement of Channel Conveyance (Drawing 403_103)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance. Current maintenance on culverts will become technically more difficult to carry out with added access restrictions.	-1 (2)	-7 (-72 to +72)	-0.48 (-5 to +5)	Maintenance may increase as channel capacity will need to be maintained	0 (2)	0 (-72 to +72)	0.00 (-5 to +5)	No additional maintenance activities expected than with option 1.	0 (2)	5 (-72 to +72)	0.35 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments are technically straightforward although ground conditions may dictate sheet piles. Logistically difficult to construct in built up area	3 (5)			Access difficulties with dredging the channel but the amount of hard defence required is reduced.	0 (5)			Same level of technical and logistical difficulty for hard defences as in option 1. Upstream storage should be relatively straightforward	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	A large increase in hard defences required from present day scenario to future scenario	-4 (5)			Scope to add hard defences in the future but channel capacity is limited	0 (5)			A large increase in hard defences required from present day scenario to future scenario	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €2,497,126 Benefit = €1,970,915 BCR = 0.79	-1 (5)	-5 (-30 to +30)	-5 (-30 to +30)	Cost = €1,848,800 Benefit = €1,970,915 BCR = 1.07	1 (5)	5 (-30 to +30)	5 (-30 to +30)	Cost = €2,010,553 Benefit = €1,970,915 BCR = 0.98	-1 (5)	-5 (-30 to +30)	-5 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	3 (4)	13 (-66 to +66)	5.91 (-30 to +30)	Conveyance of channel will be increased but culvert sizes will remain as is current.	0 (4)	9 (-66 to +66)	4.09 (-30 to +30)	Conveyance of channel will be increased but culvert sizes will remain as is current.	0 (4)	9 (-66 to +66)	4.09 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Whitechurch and Owendoher area are local roads	Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 1 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 2 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Grange Road, Talyors Lane and Nutgrove Avenue. Option 3 will protect the roads and reduce risk to an acceptable level.	3 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-3 (2)			No recreational or community facilities will be lost.	1 (2)			No recreational or community facilities will be lost.	1 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Heights of flood walls and embankments may effect access	-1 (2)			Heights of flood walls and embankments may effect access	-1 (2)			Heights of flood walls and embankments may effect access	-1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit, therefore no impacts predicted	0 (3)	-42 (-108 to +108)	-11.68 (-30 to +30)	No impacts predicted	0 (3)	-29 (-108 to +108)	-8.06 (-30 to +30)	No impacts predicted	0 (3)	-33 (-108 to +108)	-9.17 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-3 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-2 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-2 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Locally important are for flora and fauna. May also have otters	Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-3 (4)			Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage. Improvement of the channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted.	-2 (4)			Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage. Improvement of the channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted.	-2 (4)		
		d	Protect, and where possible enhance, fisheries within the catchment	The Owendoher is regarded as the best wild brown trout nursery fisheries in Ireland (Dodder Anglers). All tributaries are salmonid and provide spawning and nursery grounds.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-3 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also negatively affect habitats having significant impacts on flora communities due to changes in water levels also affects invertebrate communities and fish.	-3 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also negatively affect habitats having significant impacts on flora communities due to changes in water levels also affects invertebrate communities and fish.	-3 (5)		
						e			Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.			Raising defences may obstruct river vistas.	-2 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	No known features of cultural heritage importance	No known features of cultural heritage importance	0 (1)			No known features of cultural heritage importance	0 (1)			No known features of cultural heritage importance	0 (1)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 2 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 3 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-11.25 (-100 to +100)				1.03 (-100 to +100)				-9.74 (-100 to +100)
*Weighting mechanism		*Scoring mechanism														

*Weighting mechanism

- 5 = International importance
- 4 = National importance
- 3 = Regional importance
- 2 = Local importance
- 1 = Negligible importance


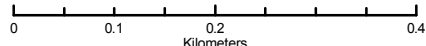
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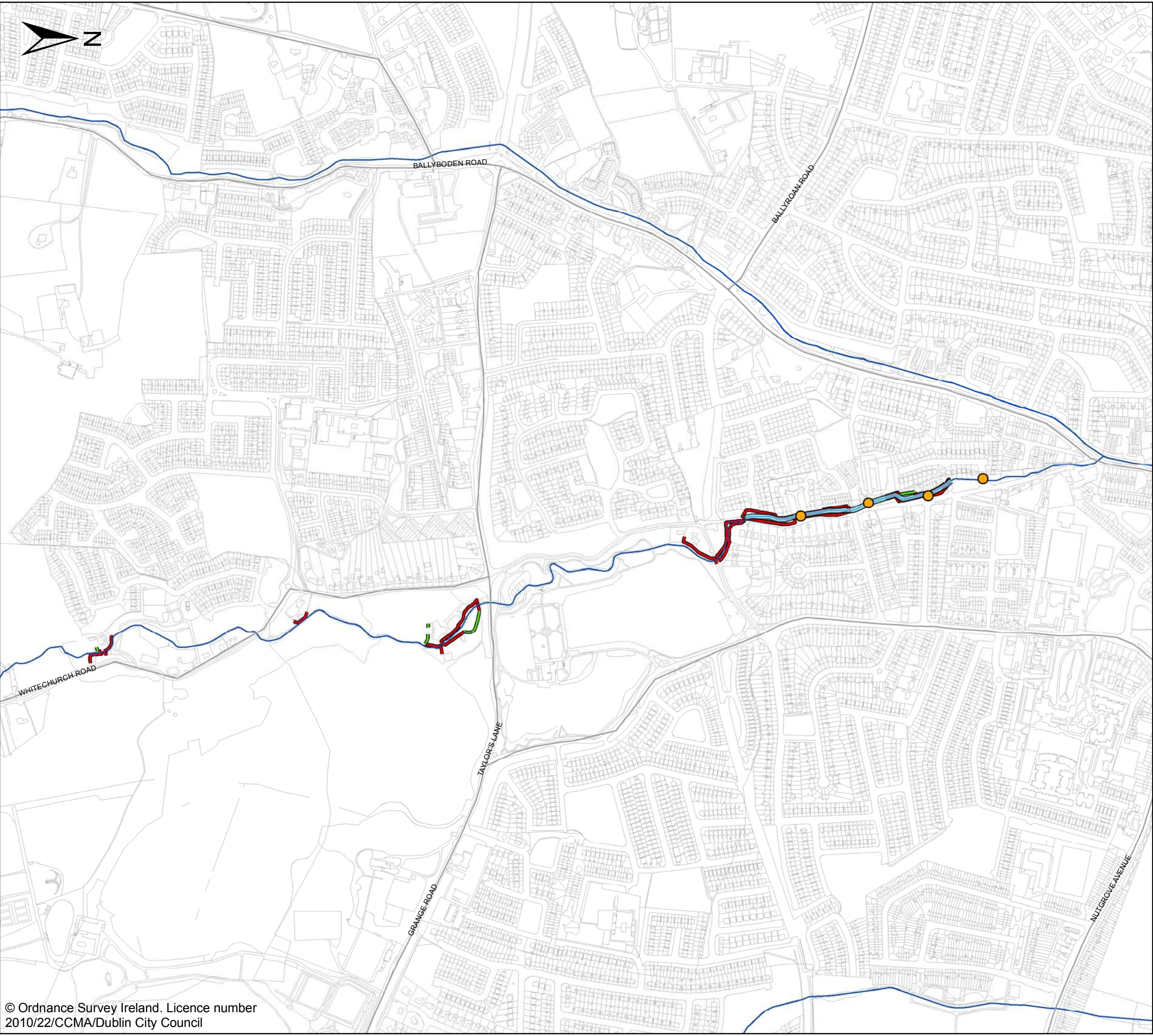




Legend

- River Channel
- Earth Embankments
- Flood Walls

CLIENT	Dublin City Council		
PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Whitechurch/Owendoher Option 1 - Hard Defences		
	Elmwood House	T: 028 9066 7914	
	74 Boucher Road	F: 028 9066 8286	
	Belfast	W: www.rpsgroup.com/Ireland	
	BT12 6RZ	E: Ireland@rpsgroup.com	
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		<u>Approved By :</u>	A.J.
		<u>Date :</u>	04/08/09
		<u>SCALE :</u> 1:7,500	



Legend

- River Channel
- Earth Embankments
- Flood Walls
- Dredged Channel
- Channel Conveyance to be upgraded

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Whitechurch/Owendoher
Option 2 - Hard Defences And Improvement Of Channel Conveyance



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

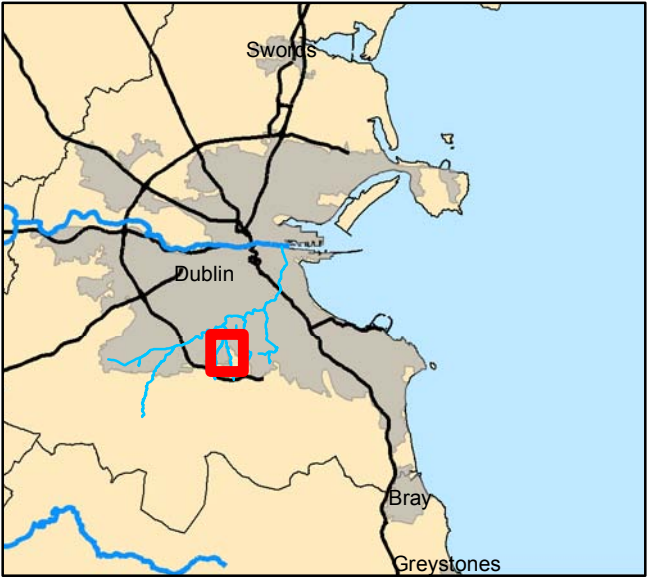
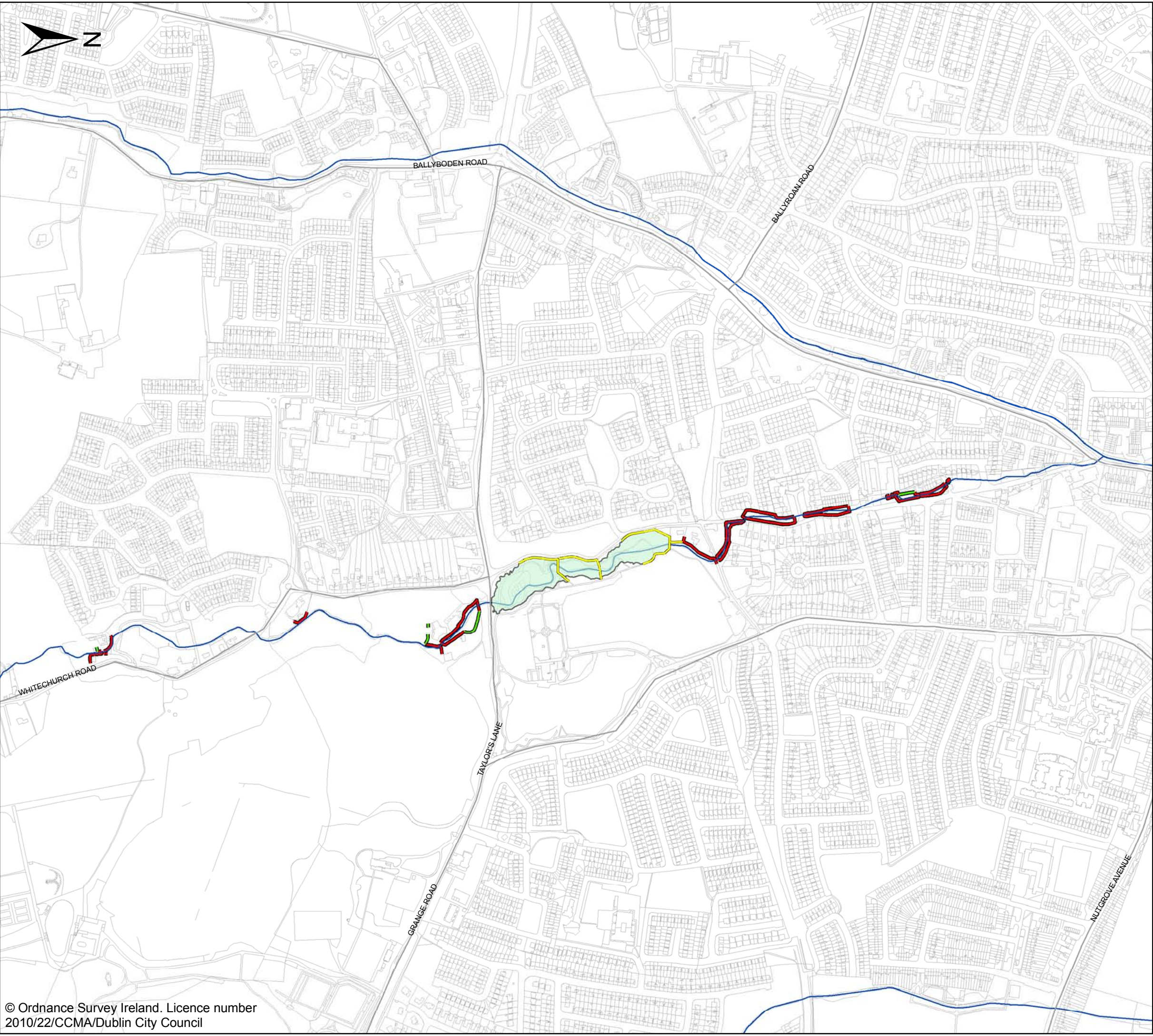
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F: 028 9066 8286
W: www.rpsgroup.com/Ireland
E: Ireland@rpsgroup.com

Drawing No. :
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Drawn By : R.C.
Checked By : M.W.
Approved By : A.J.
Date : 04/08/09

SCALE : 1:7,500




- Legend**
- River Channel
 - Earth Embankments
 - Flood Walls
 - Storage Walls
 - Upstream Storage (St Enda's Park)

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Whitchurch/Owendoher
Option 3 - Hard Defences And Upstream Storage



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

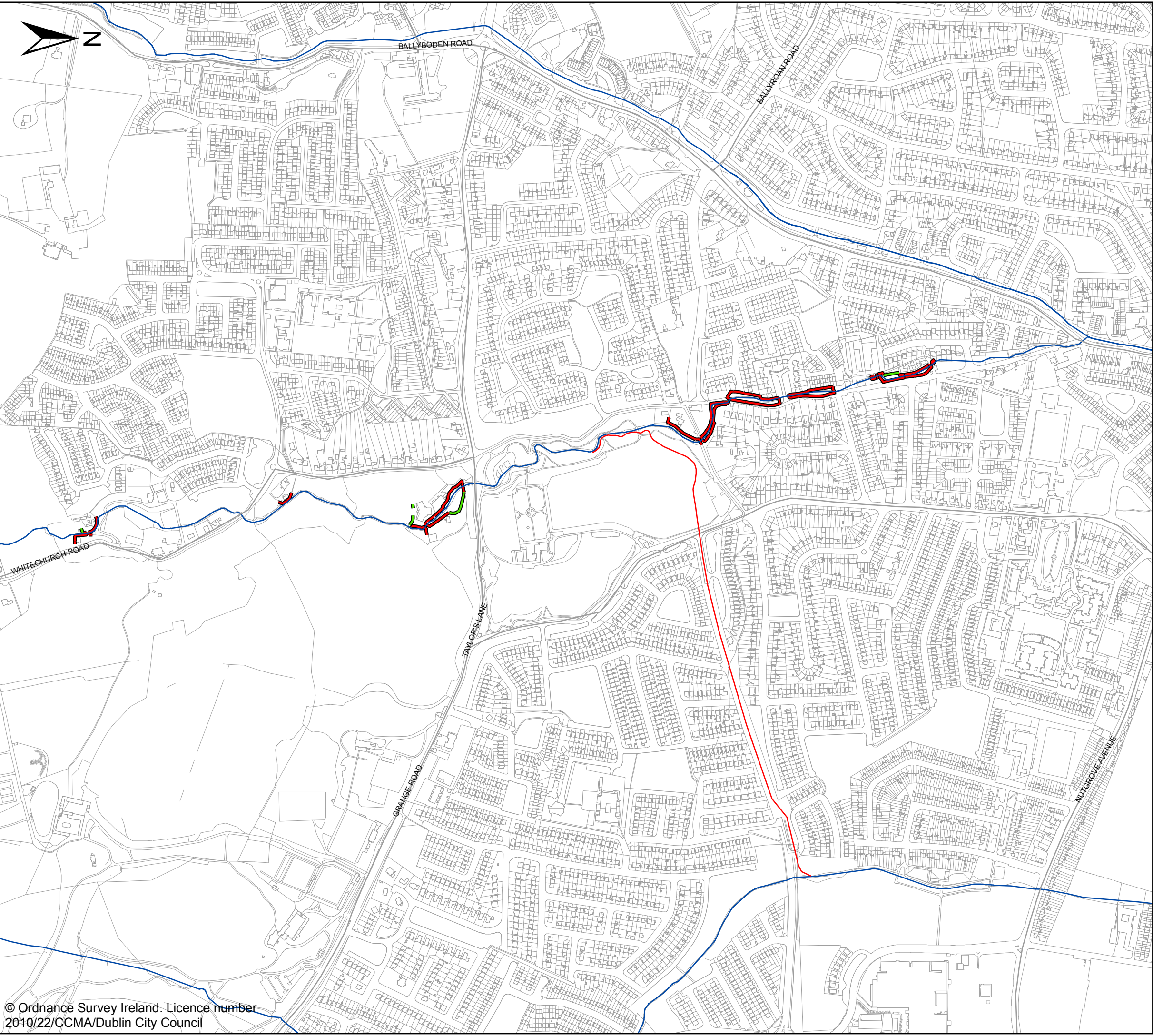
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Drawing No. :
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Kilometers

Drawn By : R.C.
Checked By : M.W.
Approved By : A.J.
Date : 04/08/09

SCALE : 1:7,500




- Legend**
- River Channel
 - Earth Embankments
 - Flood Walls
 - Whitechurch Diversion Channel

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Whitechurch/Owendoher
Option 4 - Hard Defences And
Diversion Of Watercourses



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

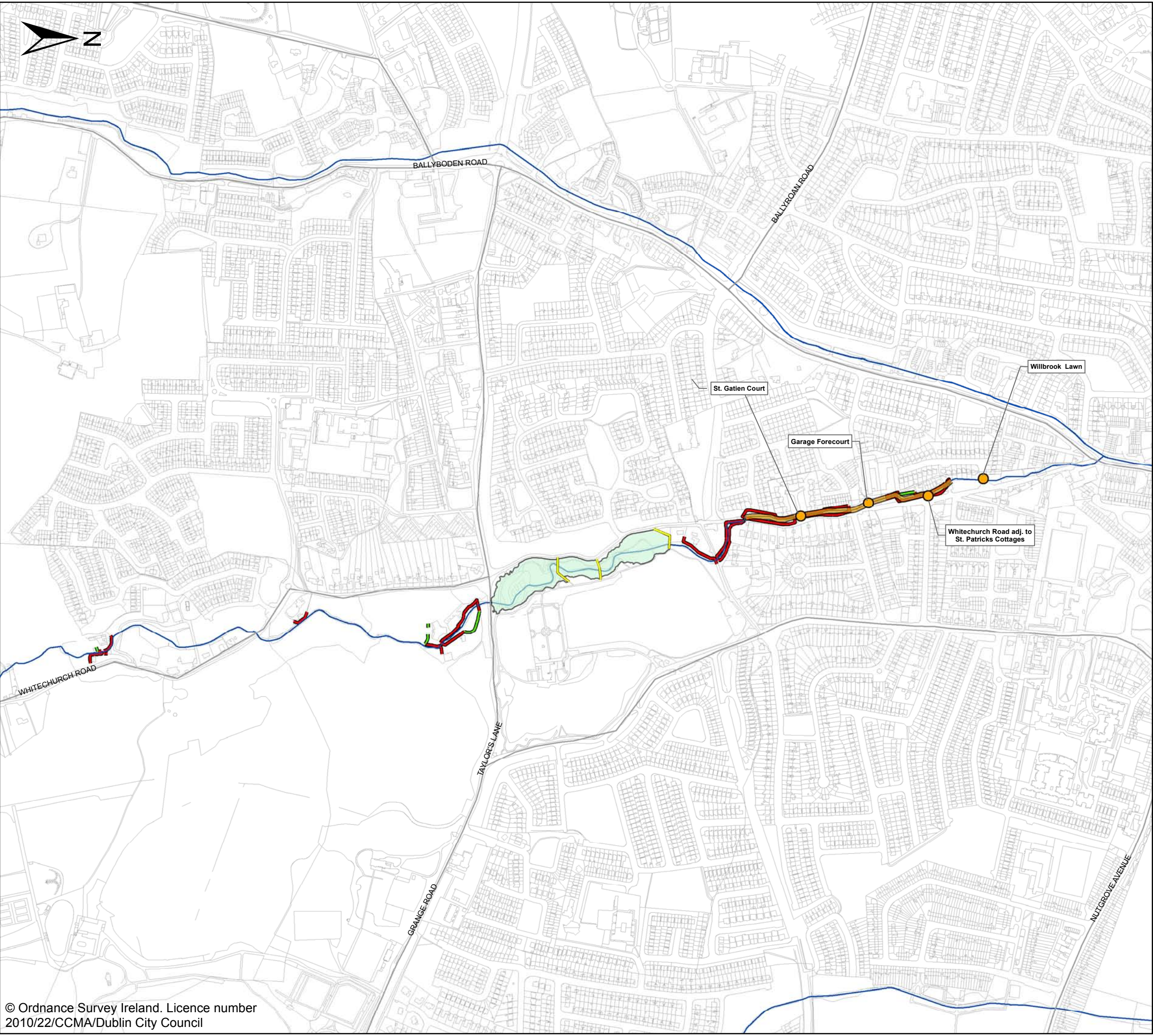
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Drawing No. :
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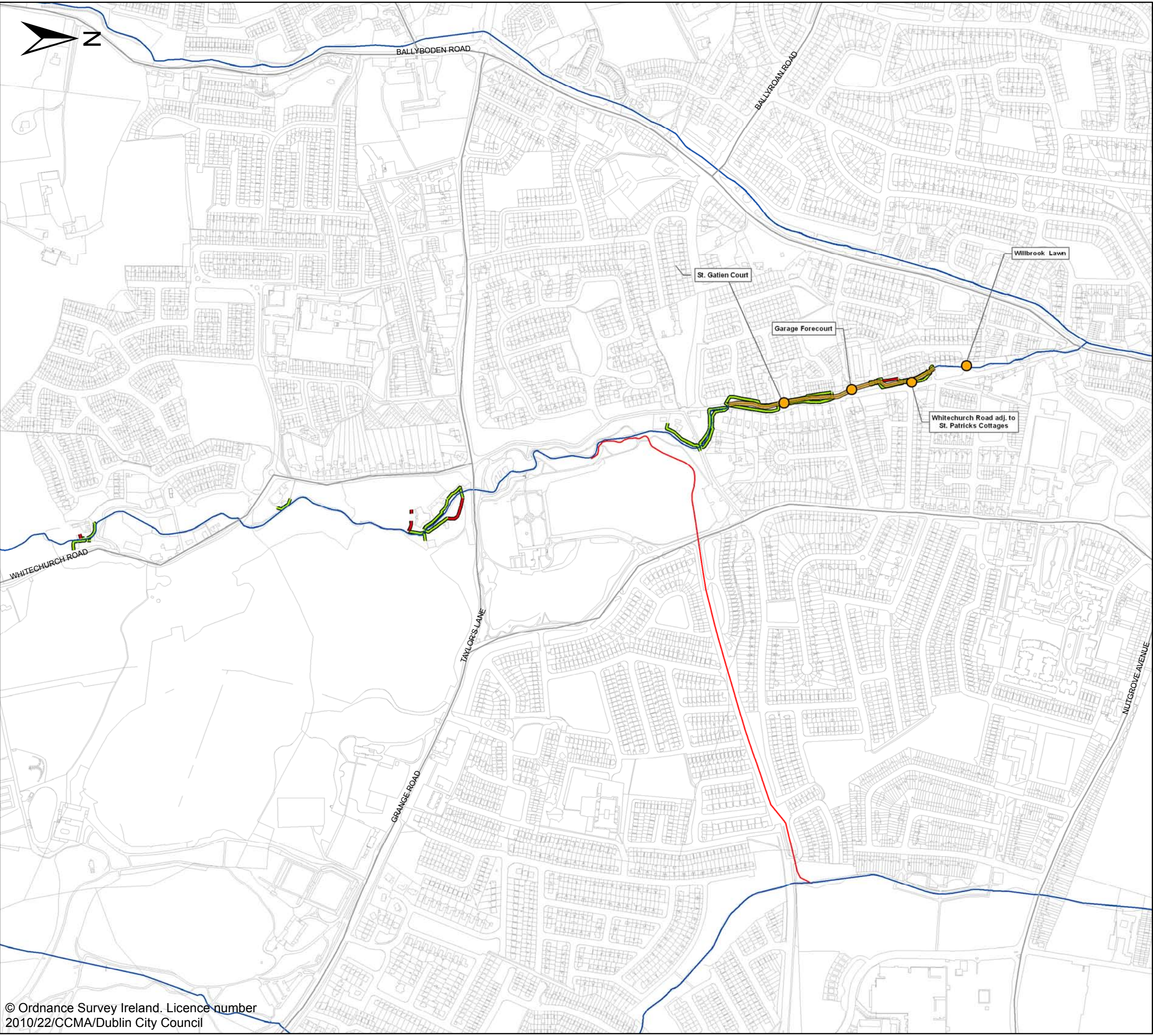
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Checked By : M.W.
Approved By : A.J.
Date : 04/08/09

SCALE : 1:7,500



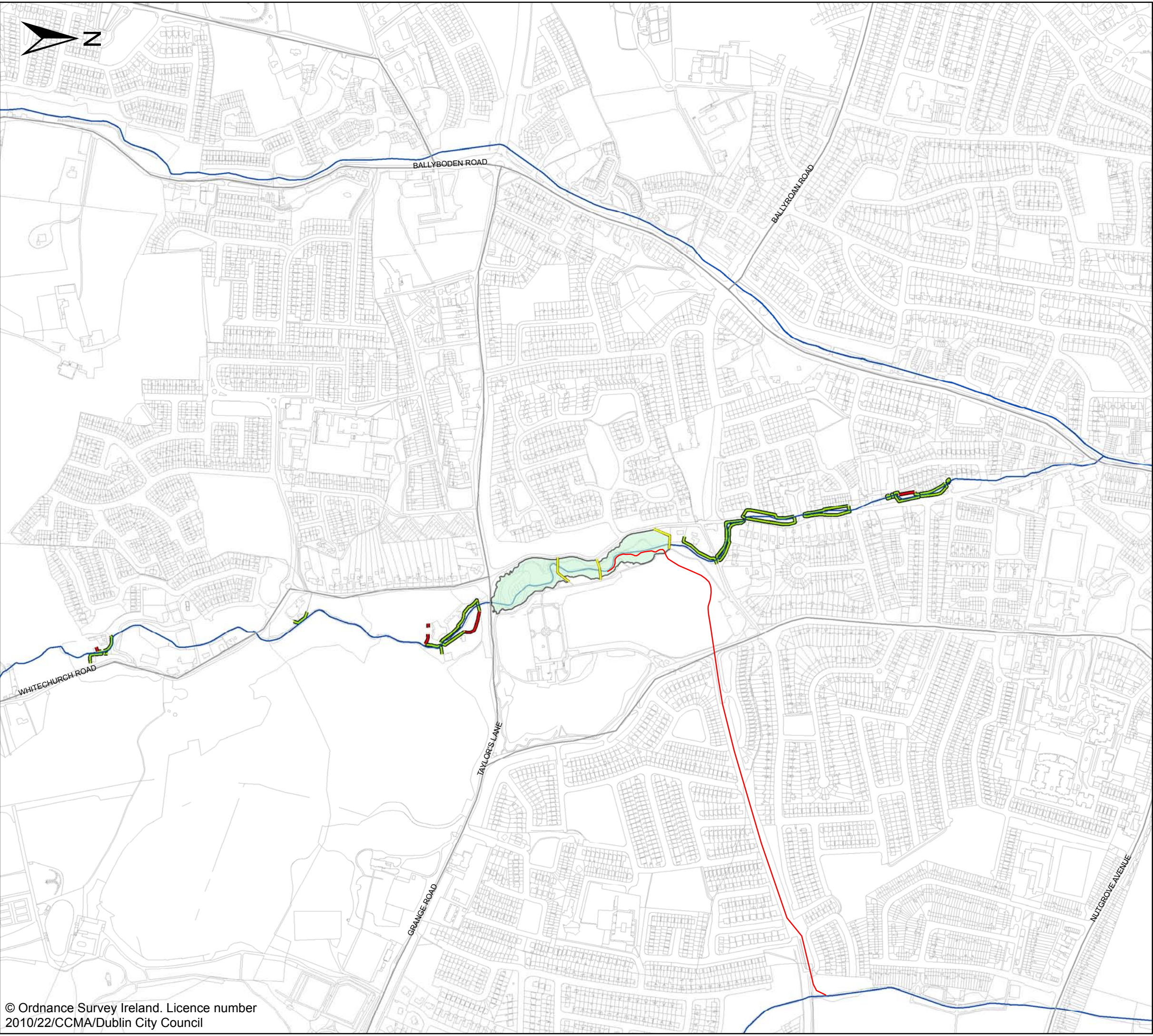
- Legend**
- River Channel
 - Earth Embankments
 - Flood Walls
 - Dredged Channel
 - storage walls
 - Upstream Storage (St Enda's Park)
 - Channel Conveyance to be upgraded

CLIENT	Dublin City Council
PROJECT	Dodder Catchment Flood Risk Management Study
TITLE	Option Development Stage 4 Whitechurch/Owendoher Option 5 - Hard Defence, Improvement Of Channel Conveyance And Upstream Storage
	Elmwood House 74 Boucher Road Belfast BT12 6RZ T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com
Drawing No. : IBE0064_403_005	Drawn By : R.C. Checked By : M.W. Approved By : A.J. Date : 04/08/09
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- Legend**
- River Channel
 - Earth Embankments
 - Flood Walls
 - Whitechurch Diversion Channel
 - Dredged Channel
 - Channel Conveyance to be upgraded

CLIENT	Dublin City Council											
PROJECT	Dodder Catchment Flood Risk Management Study											
TITLE	Option Development Stage 4 Whitechurch/Owendoher Option 6 - Hard Defence, Improvement Of Channel Conveyance And Diversion Of Watercourses											
	Elmwood House 74 Boucher Road Belfast BT12 6RZ	T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com										
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IBE0064_403_006	Checked By :	M.W.										
	Approved By :	A.J.										
	Date :	04/08/09										
		SCALE : 1:7,500										




Legend

- Whitechurch Diversion Channel
- River Channel
- Earth Embankments
- Flood Walls
- storage walls
- Upstream Storage (St Enda's Park)

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Whitechurch/Owendoher
Option 7 - Hard Defence,
Upstream Storage and
Diversion of Watercourse



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

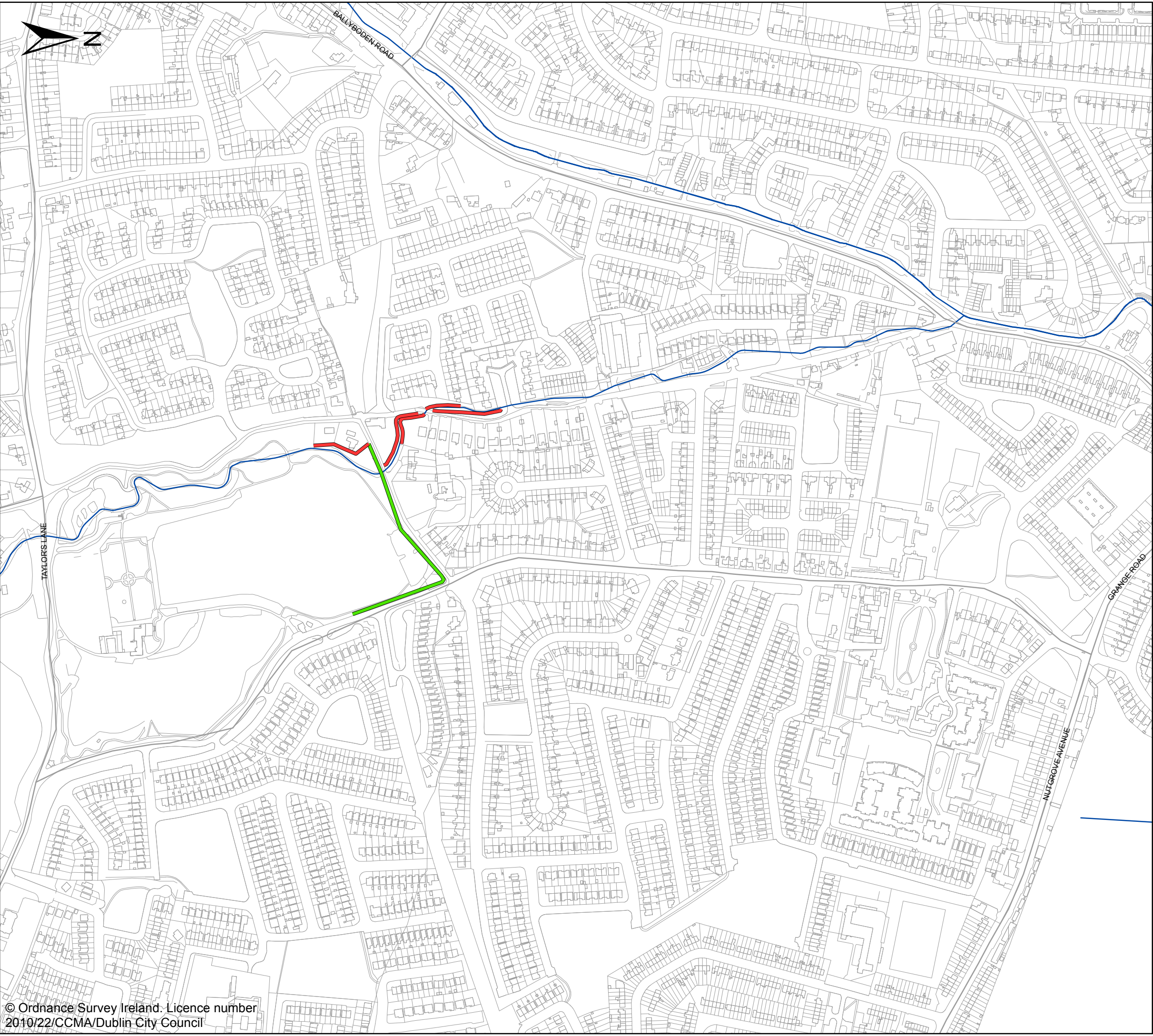
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E: Ireland@rpsgroup.com

Drawing No. :
IBE0064_403_007

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Kilometers

Drawn By : R.C.
Checked By : M.W.
Approved By : A.J.
Date : 04/08/09

SCALE : 1:7,500




Legend

- River Channel
- Earth Embankments
- Flood Walls

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
St.Enda's and Tara Hill
Option 1 - Hard Defences



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

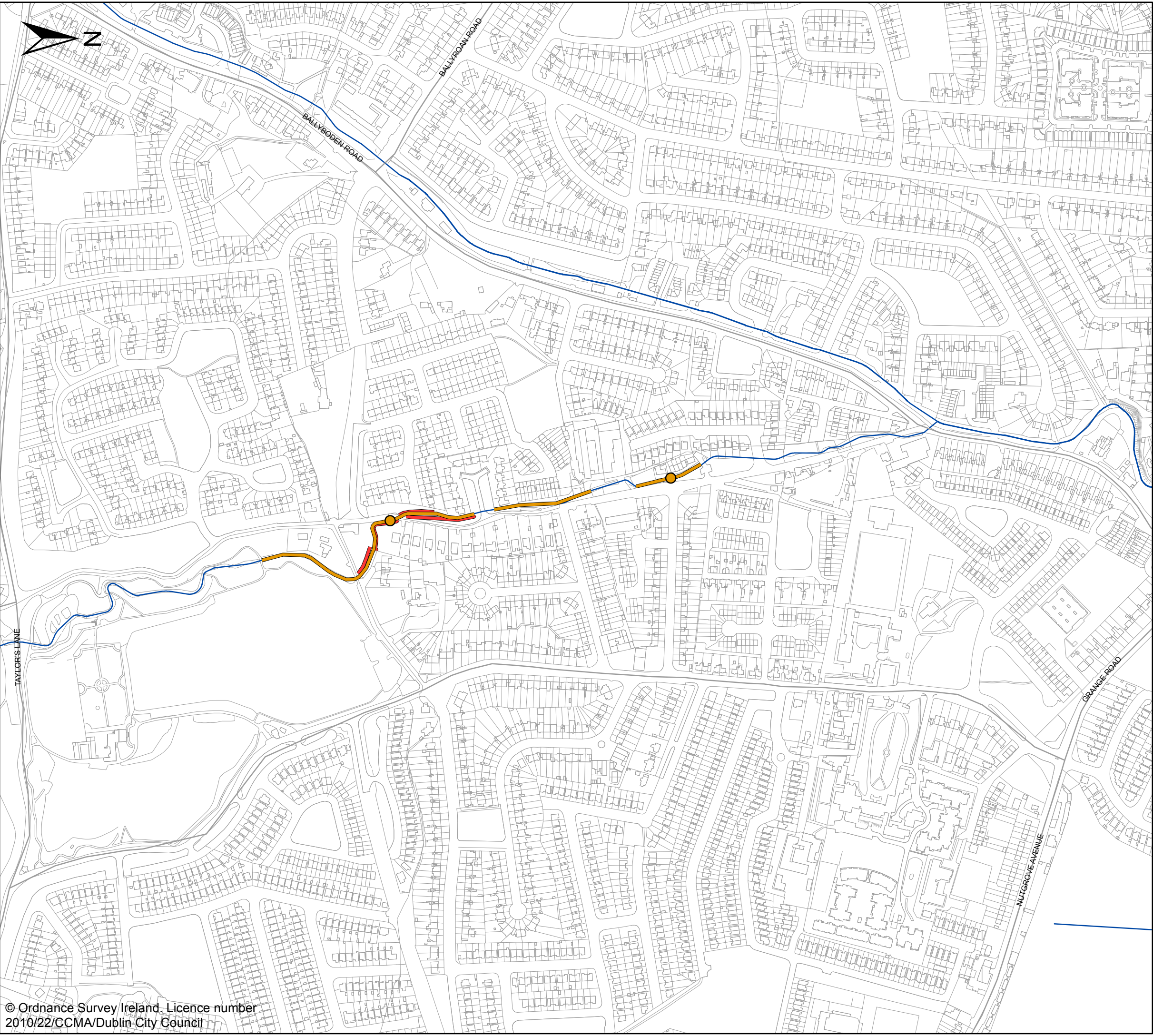
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E: Ireland@rpsgroup.com

Drawing No. :
IBE0064_403_101

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Kilometers

Drawn By : R.C.
Checked By : M.W.
Approved By : A.J.
Date : 04/08/09

SCALE : 1:5,000




Legend

- River Channel
- Flood Walls
- Dredged Channel
- Channel conveyance to be upgraded

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
St.Enda's and Tara Hill
Option 2 - Hard Defences And Improvement Of Channel Conveyance



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

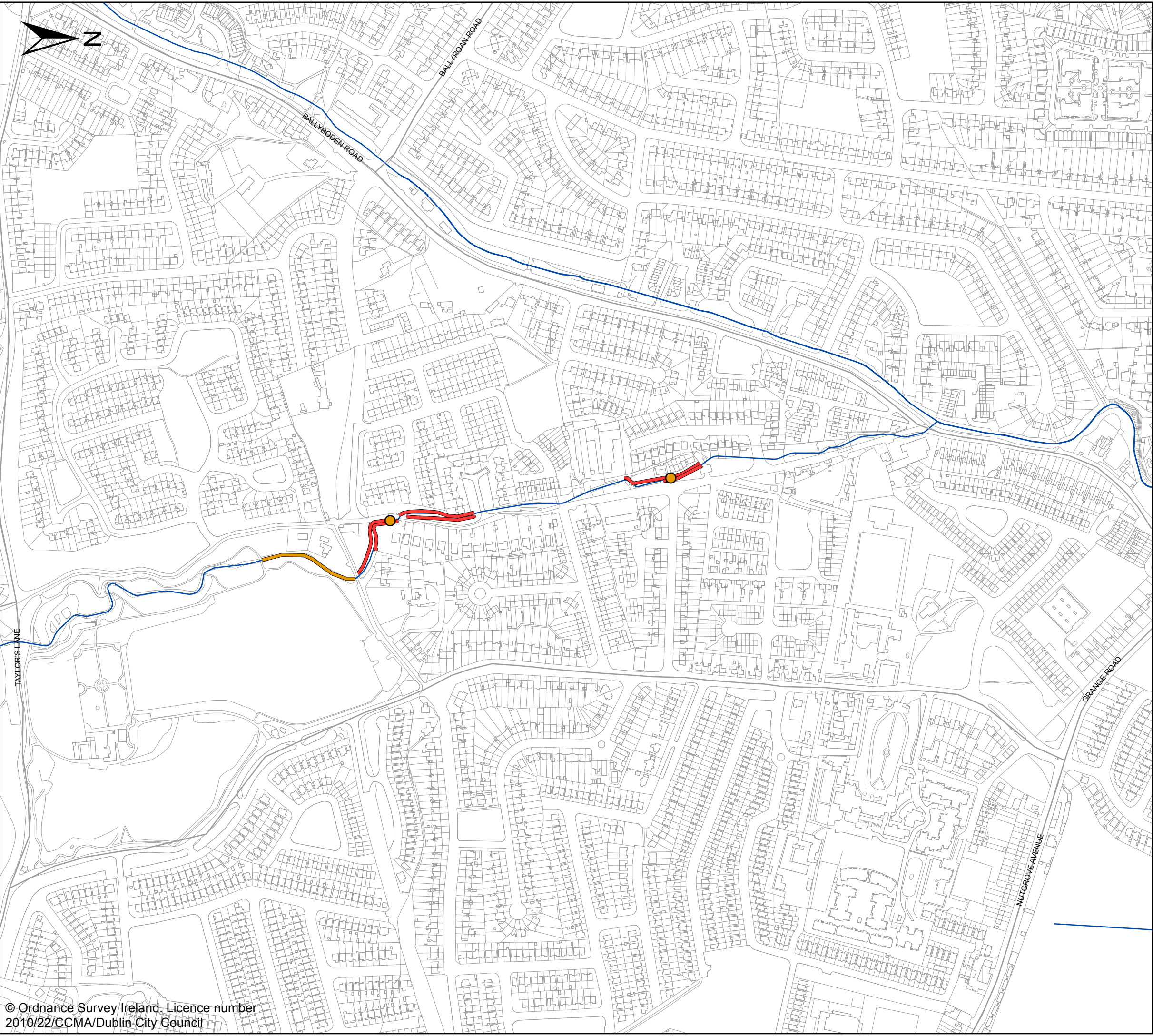
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W: www.rpsgroup.com/Ireland
E: Ireland@rpsgroup.com

Drawing No. :
IBE0064_403_102


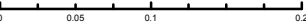
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Kilometers

Drawn By : R.C.
Checked By : M.W.
Approved By : A.J.
Date : 04/08/09

SCALE : 1:5,000



- Legend**
- River Channel
 - Tara_Endas_op3_FW
 - Tara_Endas_op3_dredging
 - Channel conveyance to be upgraded

CLIENT	Dublin City Council																	
PROJECT	Dodder Catchment Flood Risk Management Study																	
TITLE	Option Development Stage 4 St.Endas and Tara Hill Option 3 - Hard Defences And Improvement Of Channel Conveyance																	
	Elmwood House 74 Boucher Road Belfast BT12 6RZ	T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com																
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		Checked By :	M.W.															
		Approved By :	A.J.															
		Date :	04/08/09															
		SCALE : 1:5,000																

4.4 OPTIONS FOR LITTLE DARGLE

The following options have been considered for the Little Dargle;

- Option 1 Hard Defences
- Option 2 Diversion of Watercourses
- Option 3 Upstream Storage
- Option 4 Improvement of Channel Conveyance
- Option 5 Diversion of Watercourses and Upstream Storage

Secondary options which are considered with all of the above include;

- Option 1 Proactive and Reactive Maintenance Regime
- Option 2 Public Awareness Campaign

Table 4.4.1

Assessment Unit - Little Dargle

Assessment Unit - Little Dargle					Option 1 - Hard Defences (Drawing 404_001)				Option 2 - Diversion Channel (Drawing 404_002)				Option 3 - Upstream Storage (Drawing 404_003)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Technically straightforward to maintain.	4 (2)	48 (-72 to +72)	3.31 (-5 to +5)	Channel diversion will require routine inspections but minimal maintenance.	-2 (2)	-14 (-72 to +72)	-0.97 (-5 to +5)	Technically straightforward to maintain.	4 (2)	-2 (-72 to +72)	-0.14 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Technically straightforward to construct.	4 (5)			Relatively straightforward to construct the diversion channel culvert but technically and logistically difficult to upgrade the existing castle golf course culvert.	0 (5)			Technically straightforward to construct.	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	Earth embankments are easily adapted for future scenarios	4 (5)			Future scenarios will have to be designed into the culverts.	-2 (5)			No additional storage will be available	-5 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €14,860 Benefit = €76,164 BCR = 5.13	3 (5)	15 (-30 to +30)	15 (-30 to +30)	Cost = €1,104,987 Benefit = €76,164 BCR = 0.07	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €1,243,987 Benefit = €76,164 BCR = 0.06	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance. Access to the watercourse still available.	4 (4)	14 (-66 to +66)	6.36 (-30 to +30)	Possible working in confined spaces required to maintain diversion channel culvert.	0 (4)	0 (-66 to +66)	0.00 (-30 to +30)	minimal maintenance required.	4 (4)	14 (-66 to +66)	6.36 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	All roads will be protected by option 1	2 (3)			All roads will be protected by option 3	2 (3)			All roads will be protected by option 4	2 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible. No new green space or recreational facilities will be created.	-3 (2)			No access or recreational and community facilities will be created or destroyed.	-3 (2)			Marley Park will flood during extreme events	-4 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments may affect access	-1 (2)			Unlikely to impact on waterside access for fishing	0 (2)			No anticipated impact	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit	0 (2)	-12 (-108 to +108)	-3.33 (-30 to +30)	No anticipated impact	0 (2)	-13 (-108 to +108)	-3.61 (-30 to +30)	Helps to promote sustainable land use	1 (2)	2 (-108 to +108)	0.56 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will decrease the floodplain and increase peak flow during flood events which disturbs natural regime.	-1 (3)			Diversion of WC could potentially impact on the achievements of the WFD	-2 (3)			Upstream storage is not likely to impact on the GES/GEP.	0 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-1 (2)			Could have negative effects on the terrestrial ecology	-1 (2)			May negatively impact terrestrial ecology. May positively impact aquatic ecology	0 (2)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-1 (5)			The diversion of the water course could have a negative impact on fisheries. Further investigations would be needed at project stage/EIA stage	-1 (5)			No effects anticipated	0 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	May obstruct current vistas.	-1 (2)			Diversion of the watercourse could have short term impacts during construction.	0 (2)			No effects anticipated	0 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	No protected monuments located in the proposed area, further assessment maybe needed at EIA stage.	0 (4)			No protected monuments located in the proposed area, further assessment maybe needed at EIA stage	0 (4)			No protected monuments located in the proposed area, further assessment maybe needed at EIA stage	0 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 3 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 4 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								21.34 (-100 to +100)				-999 (-100 to +100)				-999 (-100 to +100)

*Weighting mechanism

- 5 = International importance
- 4 = National importance
- 3 = Regional importance
- 2 = Local importance
- 1 = Negligible importance

*Scoring mechanism



Table 4.4.2

Assessment Unit - Little Dargle

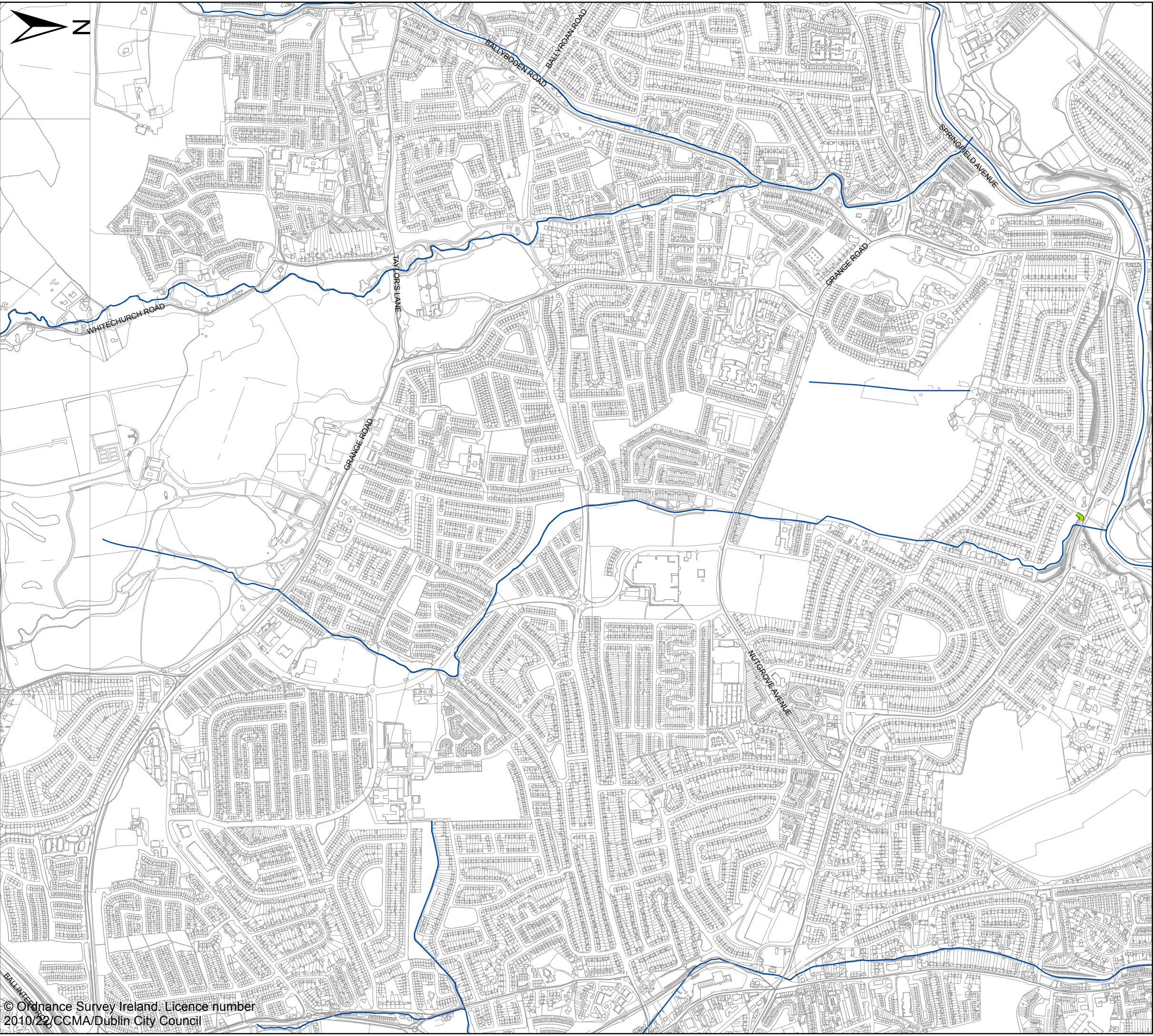
Assessment Unit - Little Dargle					Option 4 - Improvement of channel Conveyance (Drawing 404_004)				Option 5 - Channel Diversion and Upstream Storage (Drawing 404_005)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Reduced likelihood of blockages and therefore level of maintenance required.	5 (2)	10 (-72 to +72)	0.69 (-5 to +5)	No increased technical difficulty in maintaining option 6 than with options 3 and 4. Maintaining the channel diversion culvert is the dominant factor in the scoring.	-2 (2)	-4 (-72 to +72)	-0.28 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Logistically difficult to upgrade culvert at busy road.	2 (5)			The channel diversion will be the most difficult part of option 6 and as such the dominant factor in the scoring.	2 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	Future scenarios will have to be designed into the culverts.	-2 (5)			Future scenarios will need to be designed into the channel diversion as it cannot be readily adapted once built.	-2 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €539,915 Benefit = €76,164 BCR = 0.14	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €2,348,974 Benefit = €76,164 BCR = 0.03	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	minimal maintenance required. Less likelihood of blockages.	5 (4)	18 (-66 to +66)	8.18 (-30 to +30)	Maintenance of the channel diversion is the dominant factor as in option 3.	0 (4)	-2 (-66 to +66)	-0.91 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	All roads will be protected by option 5	2 (3)			All roads will be protected by option 6	2 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible. No new green space or recreational facilities will be created.	-4 (2)			Marley Park will flood during extreme events	-4 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Unlikely to impact access. Construction would have to be carried out in consultation with the ERFB and during the specified months.	0 (2)			No anticipated impact	0 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No anticipated impact	0 (2)	-10 (-108 to +108)	-2.78 (-30 to +30)	No anticipated impact	1 (2)	2 (-108 to +108)	0.56 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	improving the channel conveyance could alter current water levels, therefore the natural regime of the river could be impacted.	-1 (3)			Upstream storage helps to promote sustainable land use. Diversion of WC could potentially impact on the achievements of the WFD	1 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Could have negative effects on the terrestrial/aquatic ecology by altering the natural regime of the river	-1 (2)			May negatively impact terrestrial ecology. May positively impact aquatic ecology	-1 (2)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	May have a negative impact on the low flow regime during times of medium to low flow which may also have a negative impact on habitats. May have significant negative impacts on floral communities due to changes in water levels, also effects invertebrate	-1 (5)			The diversion of the water course could have a negative impact on fisheries. Further investigations would be needed at project stage/EIA stage	-1 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	Could have short term negative impacts during construction phase	0 (2)			Diversion of the watercourse could have short term impacts during construction.	0 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	No protected monuments located in the proposed area, further assessment maybe needed at EIA stage	0 (4)			No protected monuments located in the proposed area, further assessment maybe needed at EIA stage	1 (4)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 4 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 6 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-999 (-100 to +100)				-999 (-100 to +100)

*Weighting mechanism

- 5 = International importance
- 4 = National importance
- 3 = Regional importance
- 2 = Local importance
- 1 = Negligible importance


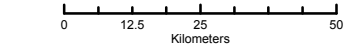
*Scoring mechanism

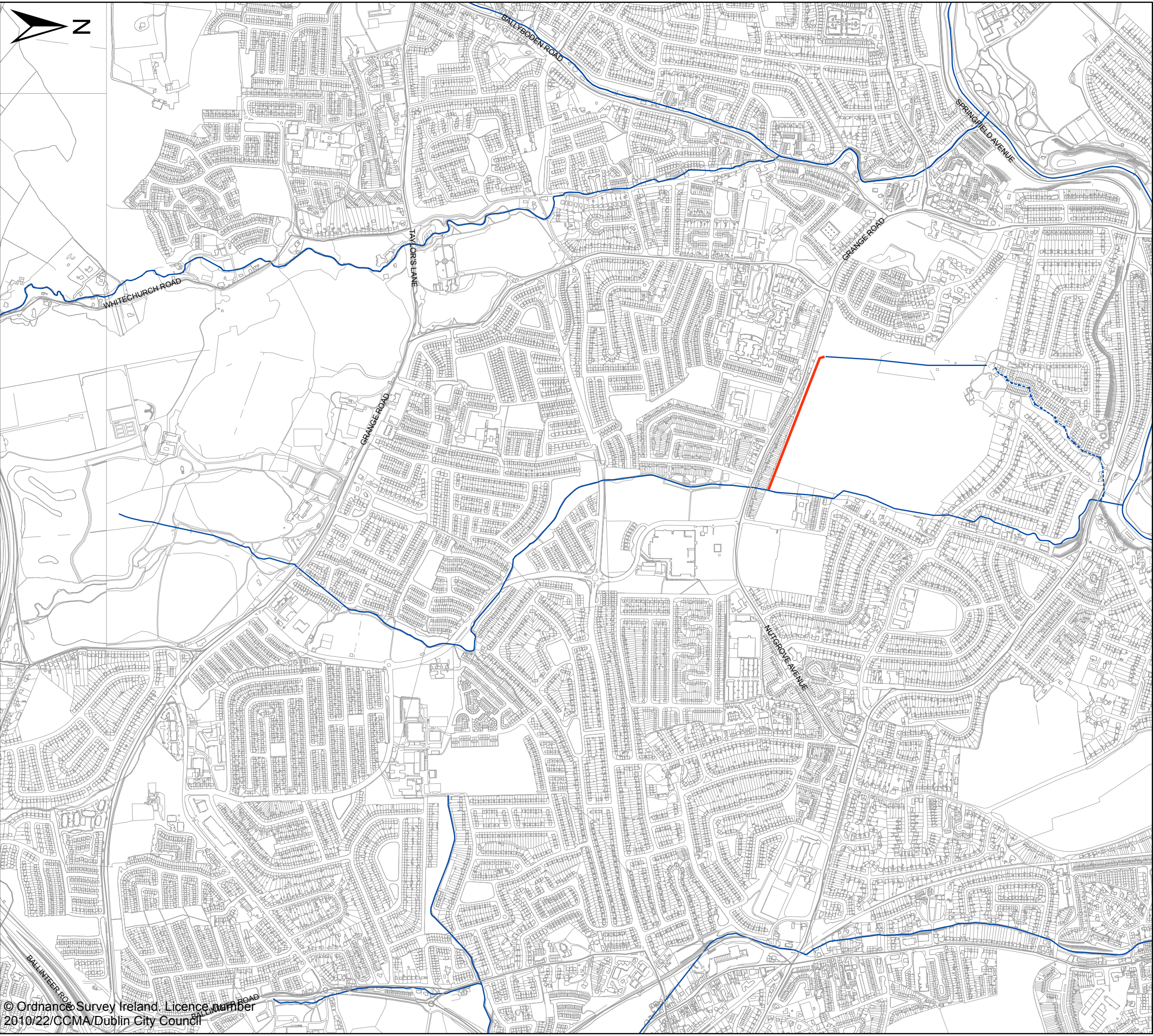




Legend


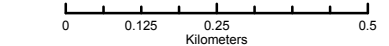
- River Channel
- Earth Embankment

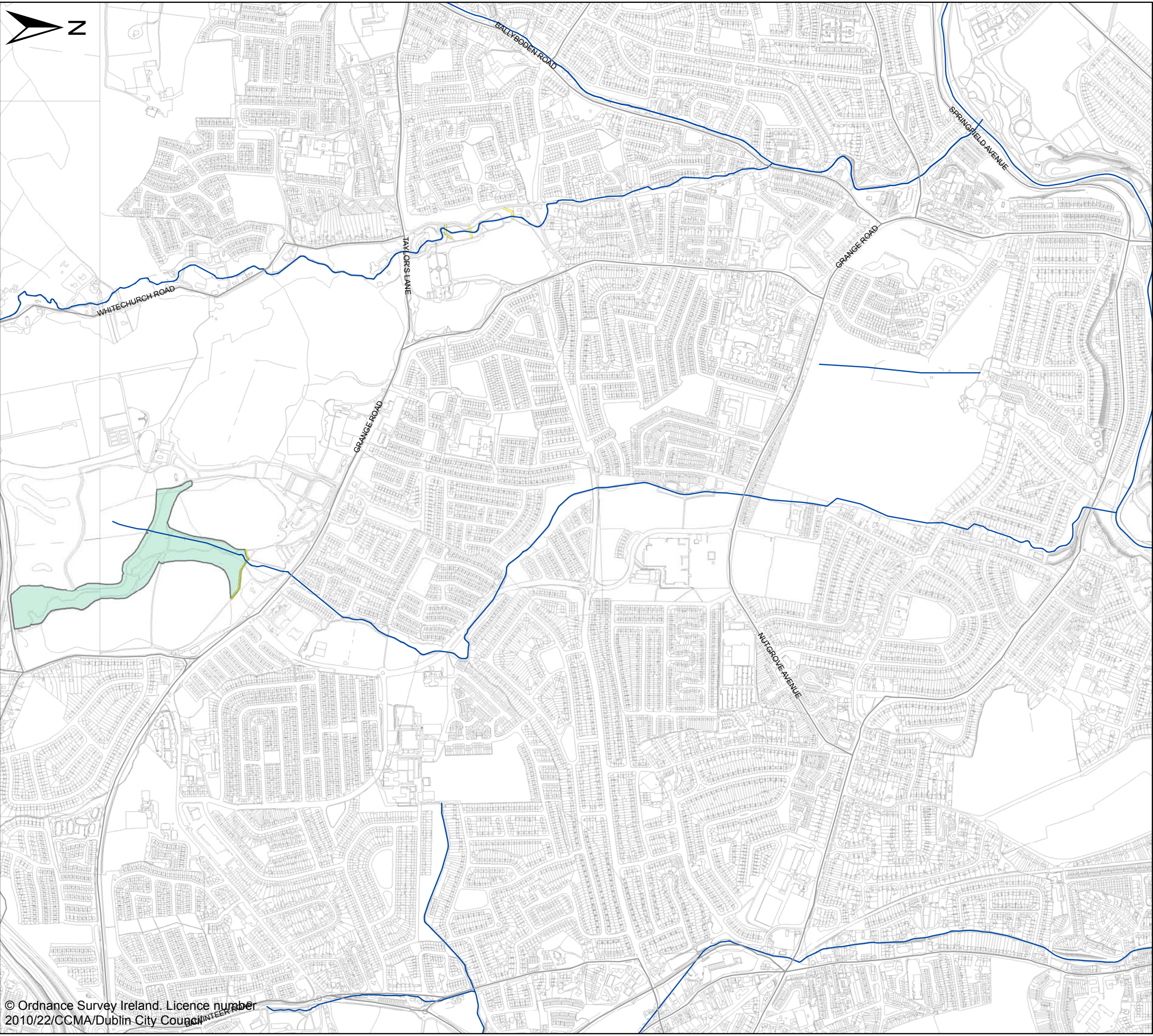
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PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Little Dargle Option 1 - Hard Defences		
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	Drawing No.: IBE0064_404_001		
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Legend


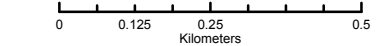
- River Channel
- Channel Diversion

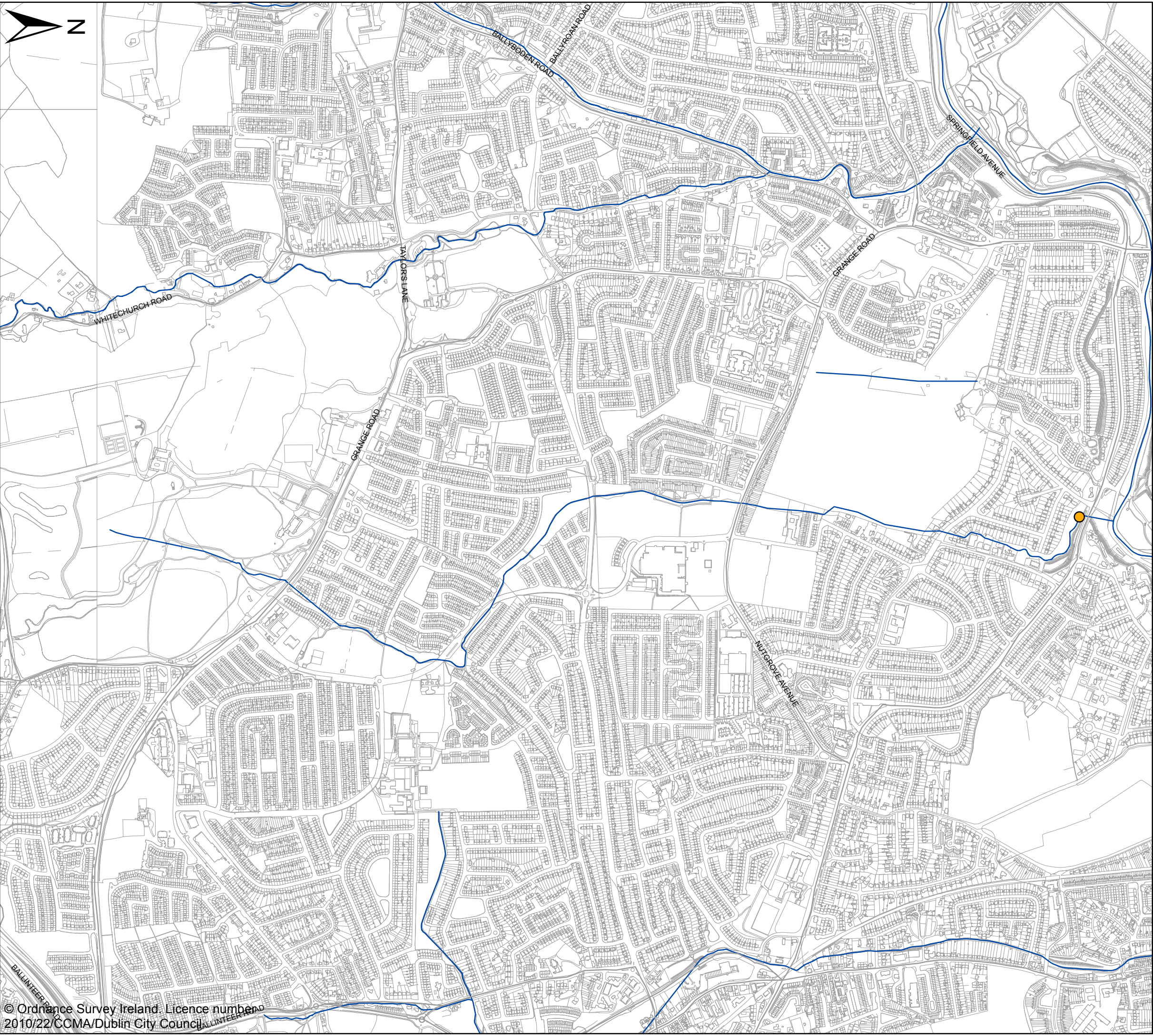
CLIENT	Dublin City Council		
PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Little Dargle Option 2 - Diversion Channel		
	Elmwood House 74 Boucher Road Belfast BT12 6RZ	T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com	
	Drawing No.: IBE0064_404_002		
		Drawn By: R.C. Checked By: M.W. Approved By: A.J. Date: 17/02/09	SCALE: 1:12,500



Legend

-  River Channel
-  storage walls dargle
-  Upstream Storage

CLIENT	Dublin City Council		
PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Little Dargle Option 3 - Upstream Storage		
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	Drawing No.: IBE0064_404_003		
		Drawn By: R.C. Checked By: M.W. Approved By: A.J. Date: 17/02/09	SCALE: 1:12,500



Legend

- River Channel
- Channel Conveyance to be upgraded

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Little Dargle
Option 4 - Improvement of Channel Conveyance

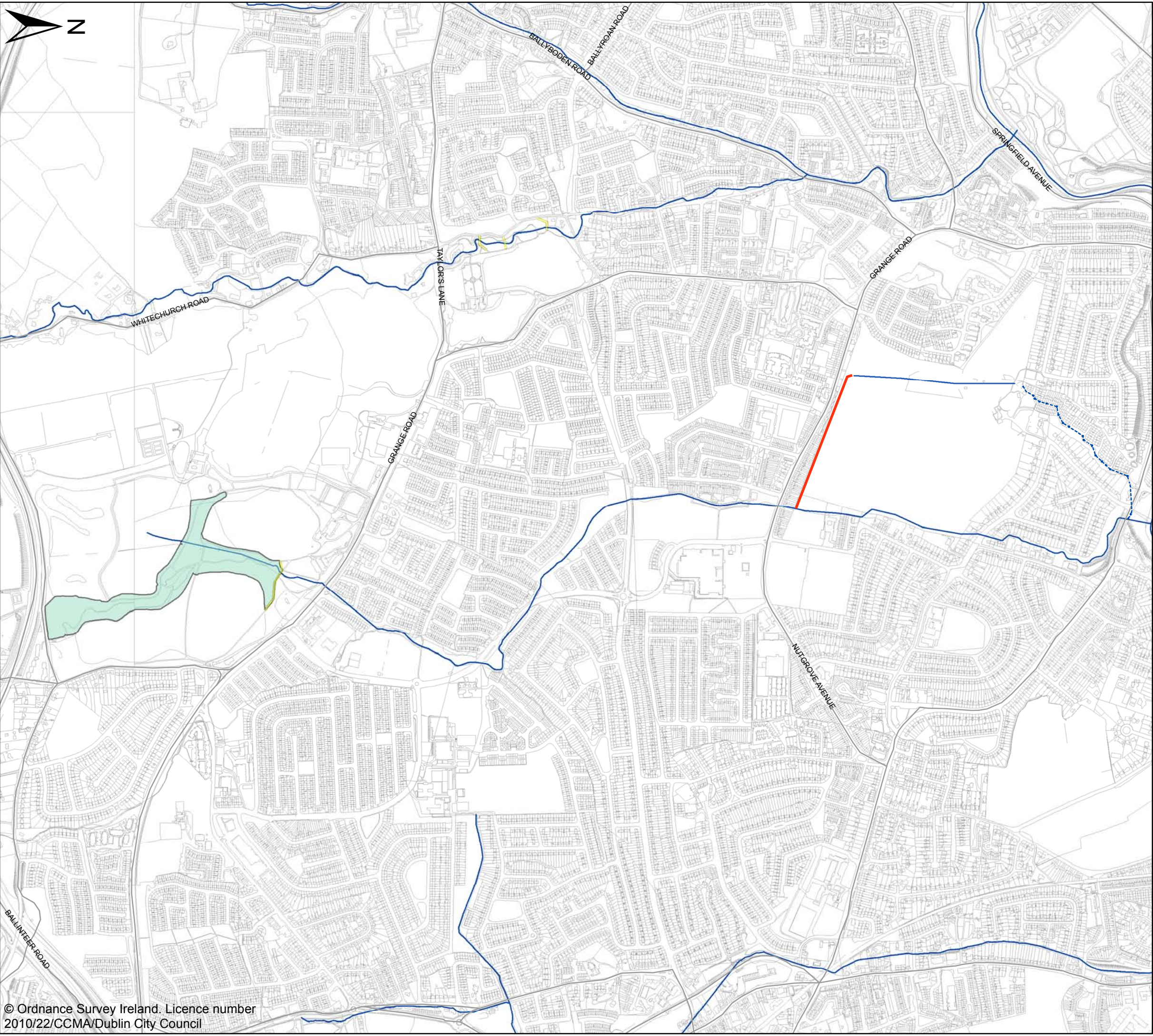
RPS Elmwood House T: 028 9066 7914
74 Boucher Road F: 028 9066 8286
Belfast W: www.rpsgroup.com/Ireland
BT12 6RZ E: Ireland@rpsgroup.com

Drawing No.:
IBE0064_404_004

Drawn By: R.C.
Checked By: M.W.
Approved By: A.J.
Date: 17/02/09

0 0.125 0.25 0.5
Kilometers

SCALE: 1:12,500



Legend

- River Channel
- Channel Diversion
- storage walls dargle
- Upstream Storage

CLIENT	Dublin City Council
PROJECT	Dodder Catchment Flood Risk Management Study
TITLE	Option Development Stage 4 Little Dargle Option 5 - Diversion Of Watercourses And Upstream Storage
<div><div>RPS</div><div>Elmwood House 74 Boucher Road Belfast BT12 6RZ</div><div>T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com</div></div>	
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4.5 OPTIONS FOR DUNDRUM SLANG

The following options have been considered for the Dundrum Slang;

- Option 1 Hard Defences
- Option 2 Improvement of Channel Conveyance
- Option 3 Hard Defences and Improvement of Channel Conveyance

Secondary options which are considered with all of the above include;

- Option 1 Proactive and Reactive Maintenance Regime
- Option 2 Public Awareness Campaign

The following options have been considered for the APSR Dundrum & Sandyford Bypass;

- Option 1 Hard Defences
- Option 2 Hard Defences and Improvement of Channel Conveyance
- Option 3 Improvement of Channel Conveyance

The following options have been considered for the APSR Dundrum Upper & Lower;

- Option 1 Hard Defences

Table 4.5.1

Assessment Unit - Dundrum Slang

Assessment Unit - Dundrum Slang					Option 1 - Hard Defences (Drawing 405_001)				Option 2 - Improvement of Channel Conveyance (Drawing 405_002)				Option 3 - Hard Defences and Improvement of Channel Conveyance (Drawing 405_003)			
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance.	3 (2)	1 (-72 to +72)	0.07 (-5 to +5)	Reduced likelihood of blockages and therefore level of maintenance required.	5 (2)	5 (-72 to +72)	0.35 (-5 to +5)	Reduced likelihood of blockages and therefore level of maintenance required. However access reduced to watercourse by hard defences.	4 (2)	-7 (-72 to +72)	-0.48 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments are technically straightforward although ground conditions may dictate sheet piles. Logistically difficult to construct in built up area	3 (5)			Technically and logistically difficult to carry out on busy roads	1 (5)			Improvement of channel conveyance will be the most difficult part of option 4 and as such the dominant factor in the scoring.	1 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-4 (5)			Future scenarios need to be designed into culvert upgrades.	-2 (5)			Future scenarios need to be designed into culvert upgrades. Difficult to upgrade hard defences	-4 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €8,548,514 Benefit = €581,301 BCR = 0.07	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €3,782,966 Benefit = €581,301 BCR = 0.15	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €10,358,746 Benefit = €581,301 BCR = 0.06	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	-1 (4)	-1 (-66 to +66)	-0.45 (-30 to +30)	Reduced likelihood of blockages will reduce the amount of maintenance required.	0 (4)	5 (-66 to +66)	2.27 (-30 to +30)	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	-1 (4)	-1 (-66 to +66)	-0.45 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Flood risk to regional roads; Dundrum Bypass and Wyckham Way. Option 1 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Dundrum Bypass and Wyckham Way. Option 3 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Dundrum Bypass and Wyckham Way. Option 4 will protect the roads and reduce risk to an acceptable level.	3 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments may effect access	-1 (2)			Unlikely to impact access. Construction would have to be carried out in consultation with the ERFB and during the specified months.	0 (2)			Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments may effect access	-1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit	0 (3)	-12 (-96 to +96)	-3.75 (-30 to +30)	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit	0 (3)	-13 (-96 to +96)	-4.06 (-30 to +30)	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit	0 (3)	-17 (-96 to +96)	-5.31 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-1 (3)			No anticipated impact	-1 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-1 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-1 (2)			Could have negative effects on the terrestrial ecology by altering the natural regime of the river. Removal of culverts could have a positive effect through habitat creation.	0 (2)			Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage. Removal of culverts could have a positive effect through habitat creation.	-1 (2)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon, Sea Trout and Brown Trout.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-1 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also destroy habitats having significant impacts on flora communities due to changes in water levels, also effects invertebrate communities, fish and fish spawn	-2 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also destroy habitats having significant impacts on flora communities due to changes in water levels, also effects invertebrate communities, fish and fish spawn	-2 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	May obstruct current vistas.	-1 (2)			No anticipated impact	0 (2)			May obstruct current vistas.	-1 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	Not likely to impact on features of known cultural Heritage	0 (1)			No anticipated impact on features of known cultural heritage	0 (1)			Not likely to impact on features of known cultural Heritage	0 (1)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 3 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	A combination of option 1 and 3 will increase flow in the River Dodder but will not increase the risk to properties	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-999 (-100 to +100)				-999 (-100 to +100)				-999 (-100 to +100)

*Weighting mechanism

- 5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

*Scoring mechanism



Table 4.5.2

APSR - Dundrum and Sandyford Bypass

APSR - Dundrum and Sandyford Bypass					Option 1 - Hard Defences (Drawing 405_101)				Option 2 - Hard Defences and Dredging (Drawing 405_102)				Option 3 - Improvement of Channel Conveyance (Dredging) (Drawing 405_103)				
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance.	3 (2)	-9 (-72 to +72)	-0.62 (-5 to +5)	Continual periodic maintenance required to dredge river	-1 (2)	-17 (-72 to +72)	-1.17 (-5 to +5)	Continual dredging will be required to maintain channel capacity	-1 (2)	-2 (-72 to +72)	-0.14 (-5 to +5)	
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments are technically straightforward although ground conditions may dictate sheet piles. Logistically difficult to construct in built up area	1 (5)			May be logistically difficult to gain access to the watercourse to dredge to required areas	-2 (5)			Access difficulties with dredging the channel.	-1 (5)			
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-4 (5)			Will be difficult to adapt these measures to future scenarios	-1 (5)			Scope to add hard defences in the future but channel capacity is limited	1 (5)			
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €1,875,743 Benefit = €211,441 BCR = 0.11	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €2,115,140 Benefit = €211,441 BCR = 0.10	-1 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €551,085 Benefit = €104,332 BCR = 0.19	-999 (5)	-4995 (-30 to +30)	-4995 (-30 to +30)	
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	-1 (4)	-1 (-66 to +66)	-0.45 (-30 to +30)	Conveyance of channel will be increased but culvert sizes will remain as is current. H&S risk increases slightly as more maintenance is required	-1 (4)	3 (-66 to +66)	1.36 (-30 to +30)	Conveyance of channel will be increased but culvert sizes will remain as is current. H&S risk increases slightly as more maintenance is required	-1 (4)	5 (-66 to +66)	2.27 (-30 to +30)	
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Flood risk to regional roads; Dundrum Bypass. Option 1 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Dundrum Bypass. Option 2 will protect the roads and reduce risk to an acceptable level.	3 (3)			Flood risk to regional roads; Dundrum Bypass. Option 3 will protect the roads and reduce risk to an acceptable level.	3 (3)			
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)			No recreational or community facilities will be lost or created.	0 (2)			No recreational or community facilities will be lost or created.	0 (2)			
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments may effect access	-1 (2)			Heights of flood walls and embankments may effect access	-1 (2)			Access will not be affected by this option	0 (2)			
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No known contaminated land or WWTPs and landfills/waste sites in APSR	0 (3)	-36 (-96 to +96)	-11.25 (-30 to +30)	No known contaminated land or WWTPs and landfills/waste sites in APSR	0 (3)	-44 (-96 to +96)	-13.75 (-30 to +30)	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit	0 (3)	-44 (-96 to +96)	-13.75 (-30 to +30)	
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-3 (3)			Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-4 (3)			Dredging constitutes a morphological pressure and can negatively effect ecological status	-4 (3)			
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-3 (2)			Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-4 (2)			Dredging activities could directly and indirectly negatively effect flora and fauna and habitat	-4 (2)			
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon , Sea Trout and Brown Trout.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-3 (5)			There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-4 (5)			May have a negative impact on the low flow regime during times of medium to low flow which may also destroy habitats having significant impacts on flora communities due to changes in water levels, also effects invertebrate communities, fish and fish spawn	-4 (5)			
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	May obstruct current vistas.	-2 (2)			May obstruct current vistas.	-1 (2)			Dredged areas could be visually intrusive	-2 (2)			
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	Not likely to impact on features of known cultural Heritage	0 (1)			Not likely to impact on features of known cultural Heritage	0 (1)			No anticipated impact on features of known cultural heritage	0 (1)			
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 2 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 3 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	
								-999 (-100 to +100)				-999 (-100 to +100)				-999.00 (-100 to +100)	
*Weighting mechanism		*Scoring mechanism														(-100 to +100)	

Table 4.5.3

APSR - Dundrum and Sandyford Bypass

APSR - Dundrum and Sandyford Bypass				Option 4 - Hard Defences 2%AEP (Drawing 405_104)				
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance.	3 (2)	1 (-72 to +72)	0.07 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments are technically straightforward although ground conditions may dictate sheet piles. Logistically difficult to construct in built up area	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-4 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €1,333,828 Benefit = €3,105 BCR = 0.00	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	-1 (4)	-7 (-66 to +66)	-3.18 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Flood risk to regional roads; Dundrum Bypass. Option 4 will protect the roads and reduce risk to an acceptable level.	1 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments may effect access	-1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit	0 (3)	-36 (-96 to +96)	-11.25 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-3 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-3 (2)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon , Sea Trout and Brown Trout.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-3 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	May obstruct current vistas.	-2 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	Not likely to impact on features of known cultural Heritage	0 (1)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-999 (-100 to +100)

Weighting mechanism

5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

Scoring mechanism

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6

← minimum requirement not met achieves minimum requirement aspirational requirement met →

Table 4.5.4

APSR - Dundrum Road Upper & Lower

				Option 1 - Hard Defences (Drawing 405_201)				
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance.	3 (2)	1 (-72 to +72)	0.07 (-5 to +5)
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Flood walls and earth embankments are technically straightforward although ground conditions may dictate sheet piles. Logistically difficult to construct in built up area	3 (5)		
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	The difference in flood levels between present day and future scenario floods is high. Flood walls and embankments would not be easily adapted.	-4 (5)		
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €2,235,825 Benefit = €369,860 BCR = 0.17	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	-1 (4)	-1 (-66 to +66)	-0.45 (-30 to +30)
		b	Protect key infrastructure	Roads at risk in the Dodder area are regional roads	Flood risk to regional roads; Dundrum Bypass and Wyckham Way. Option 1 will protect the roads and reduce risk to an acceptable level.	3 (3)		
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible	-2 (2)		
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	Construction would have to be carried out in consultation with the ERFB and during the specified months. Heights of flood walls and embankments may effect access	-1 (2)		
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No known contaminated land or WWTPs and landfills/waste sites in Assessment Unit	0 (3)	-36 (-96 to +96)	-11.25 (-30 to +30)
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-3 (3)		
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Proposed National Heritage Area and Annex I & II species found namely Bat, Otter and King Fisher.	Negative impacts on bankside ecology. Further investigations would be needed at project stage/EIA stage.	-3 (2)		
		d	Protect, and where possible enhance, fisheries within the catchment	Important Atlantic Salmon , Sea Trout and Brown Trout.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Has the potential to impact on fisheries. In stream works would need to be carried out in consultation	-3 (5)		
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	May obstruct current vistas.	-2 (2)		
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	There are a number of protected monuments of national importance. There is also the possibility of damage to underwater archaeology.	Not likely to impact on features of known cultural Heritage	0 (1)		
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)
								-999 (-100 to +100)

Weighting mechanism

5 = International importance
4 = National importance
3 = Regional importance
2 = Local importance
1 = Negligible importance

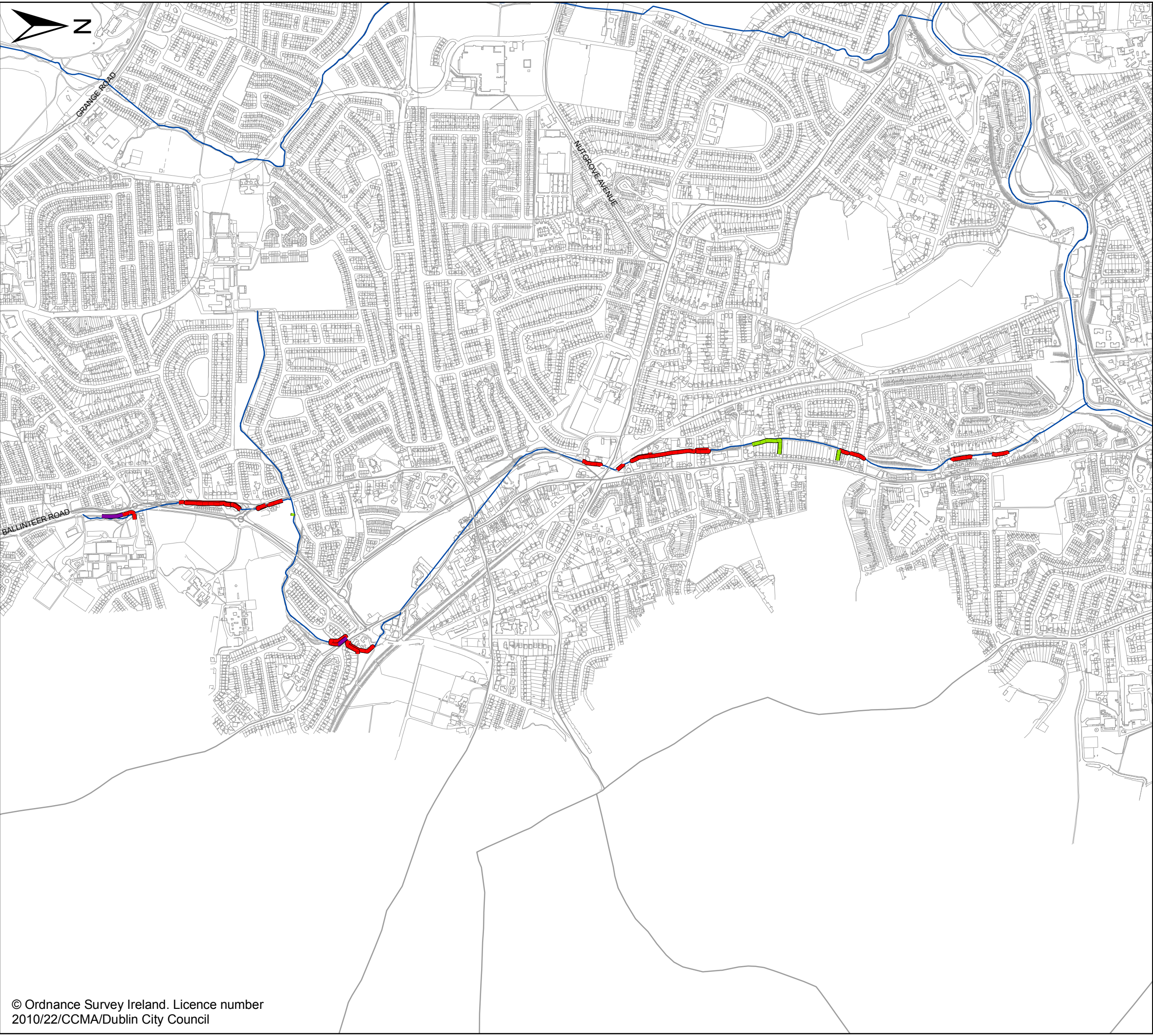
Scoring mechanism

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← minimum requirement not met

achieves minimum requirement

aspirational requirement met →



Legend

- River Channel
- Earth Embankment
- Flood Wall
- Incidental Defences

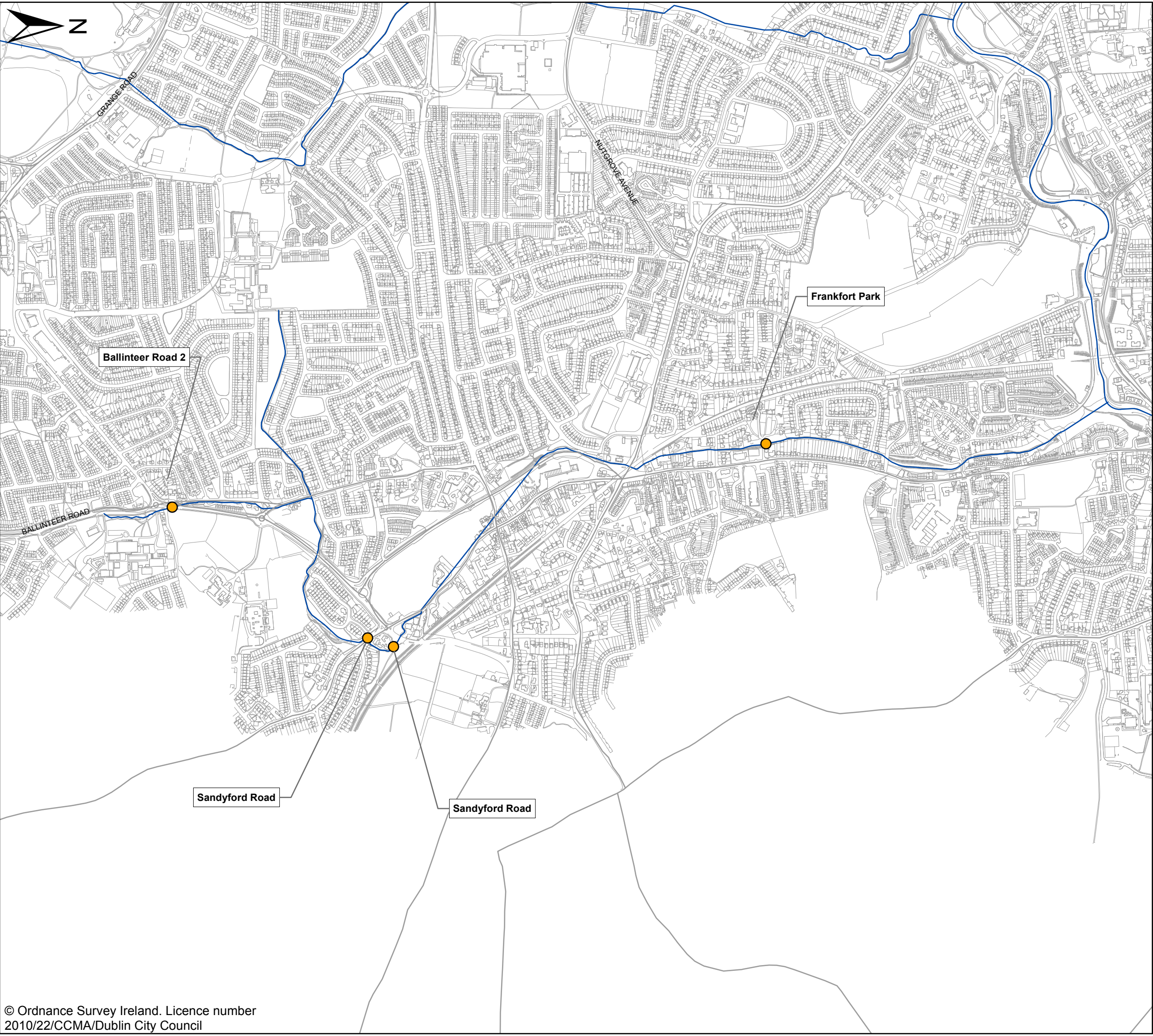
CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dundrum Slang
Option 1 - Hard Defences

RPS Elmwood House T: 028 9066 7914
74 Boucher Road F: 028 9066 8286
Belfast W: www.rpsgroup.com/Ireland
BT12 6RZ E: Ireland@rpsgroup.com

Drawing No.: IBE0064_405_001
Drawn By: R.C.
Checked By: M.W.
Approved By: A.J.
Date: 06/08/09
SCALE: 1:12,500



- Legend**
- River Channel
 - Channel Conveyance to be upgraded

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
Dundrum Slang
Option 2 - Improvement Of Channel Conveyance



Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

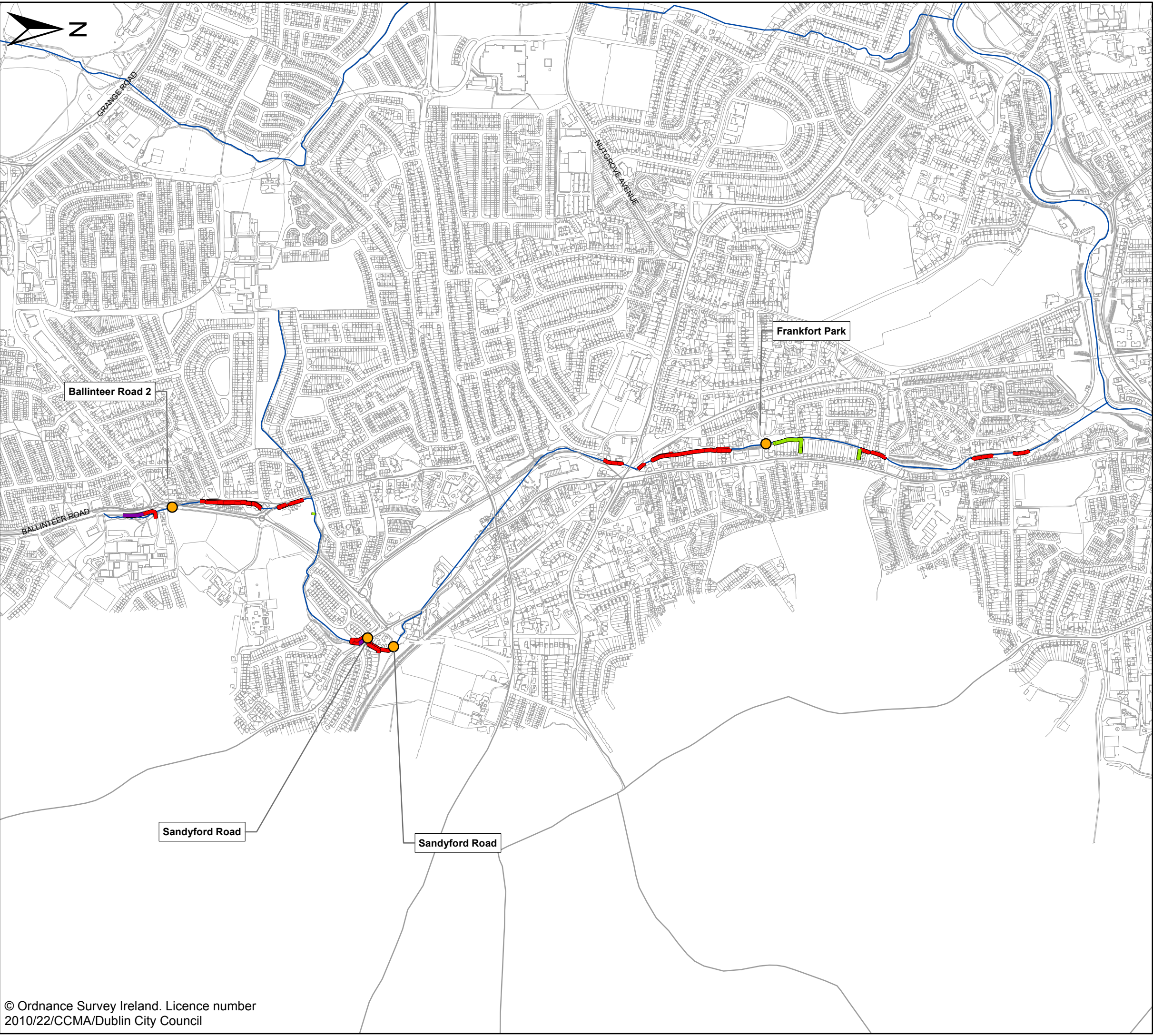
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F: 028 9066 8286
W: www.rpsgroup.com/Ireland
E: Ireland@rpsgroup.com

Drawing No. :
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Checked By : M.W.
Approved By : A.J.
Date : 06/08/09

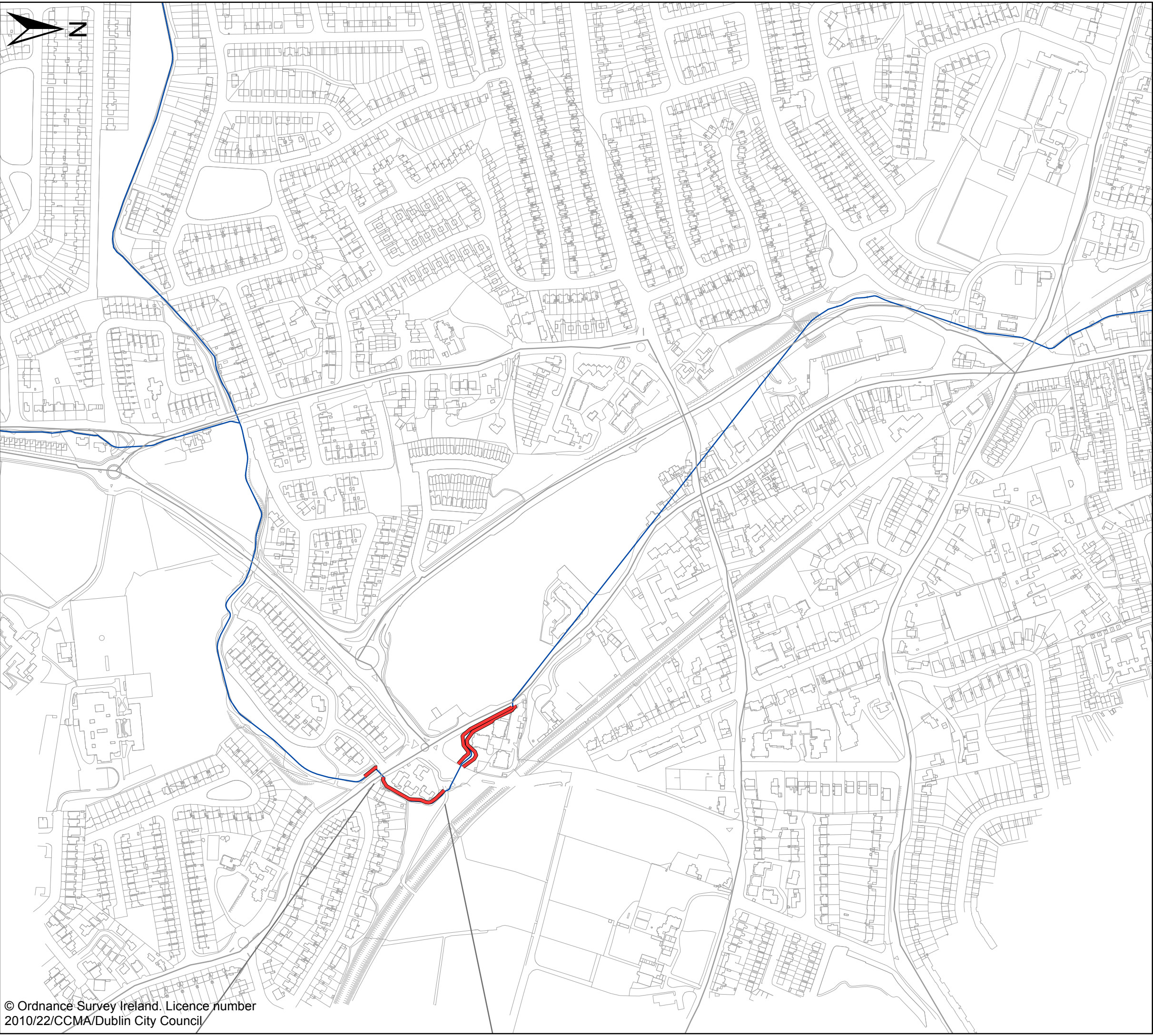
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Legend

- River Channel
- Earth Embankment
- Flood Wall
- Incidental Defences
- Channel Conveyance to be upgraded

CLIENT	Dublin City Council		
PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Dundrum Slang Option 3 - Hard Defences And Improvement Of Channel Conveyance		
<div><div></div><div><div>Elmwood House 74 Boucher Road Belfast BT12 6RZ</div><div>T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com</div></div></div>			
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Legend

- River Channel
- Flood Wall

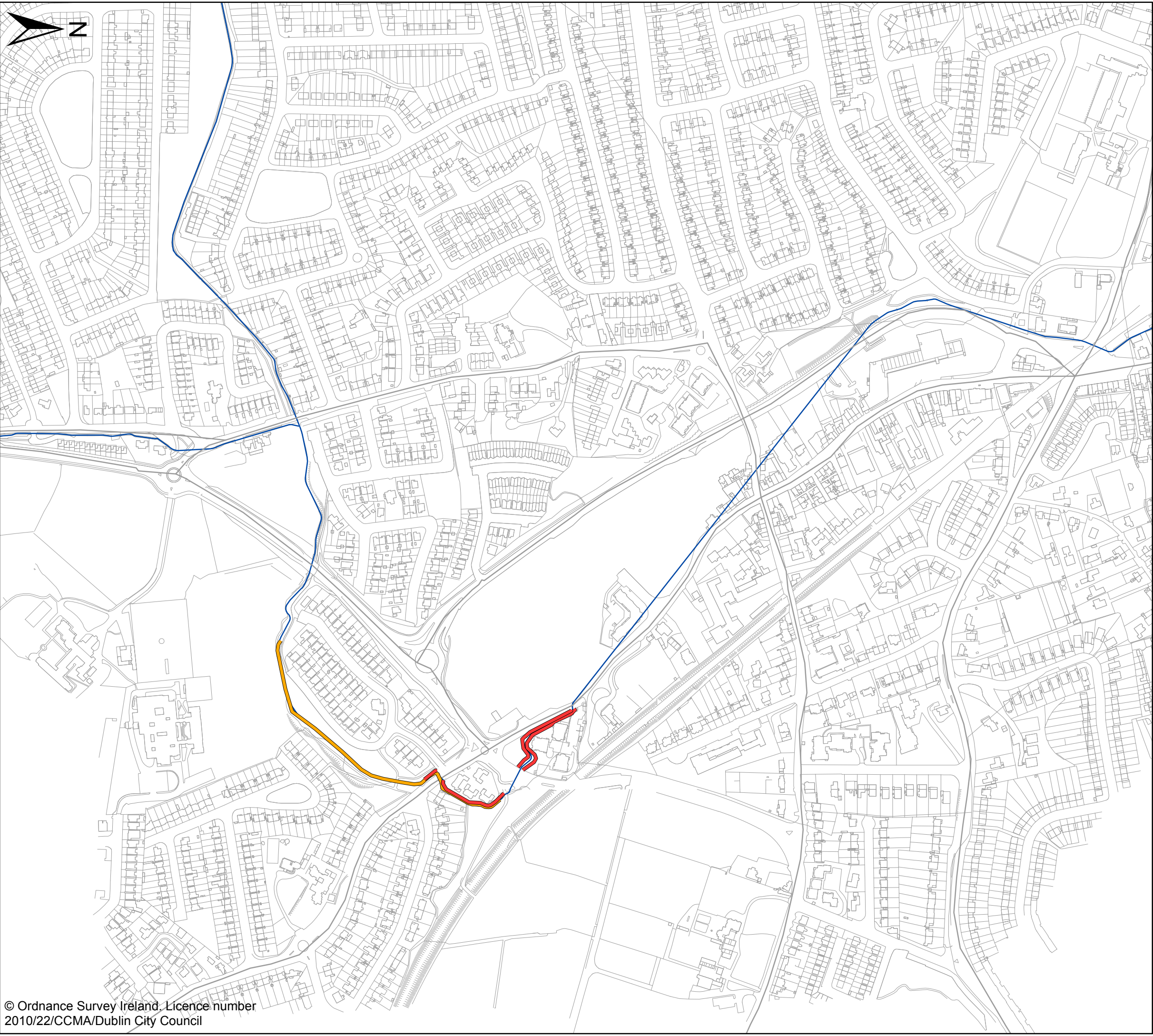
CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
APSR Dundrum and Sandyford Bypass
Option 1 - Hard Defences

RPS Elmwood House T: 028 9066 7914
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Belfast W: www.rpsgroup.com/Ireland
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Drawing No.: IBE0064_405_101
Drawn By: R.C.
Checked By: M.W.
Approved By: A.J.
Date: 06/08/09
SCALE: 1:5,000



Legend

- River Channel
- Flood Wall
- Improvement of Channel Conveyance

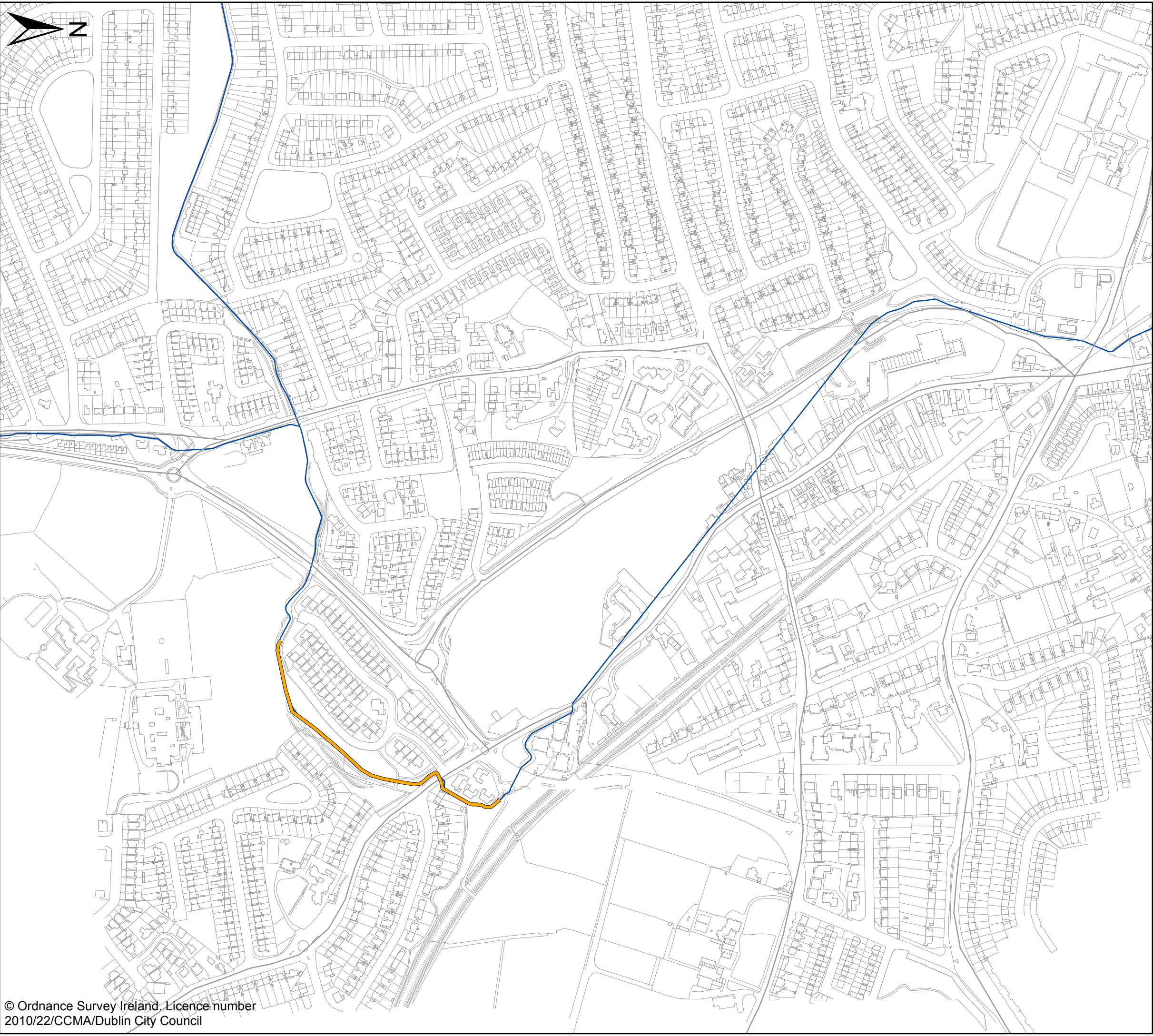
CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
APSR Dundrum and Sandyford Bypass
Option 2 - Hard Defences and
Improvement of Channel Conveyance

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Drawing No.: **IBE0064_405_102**
Drawn By: R.C.
Checked By: M.W.
Approved By: A.J.
Date: 06/08/09
SCALE: 1:5,000
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Kilometers



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Legend

- River Channel
- Improvement of Channel Conveyance

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PROJECT
Dodder Catchment Flood Risk
Management Study

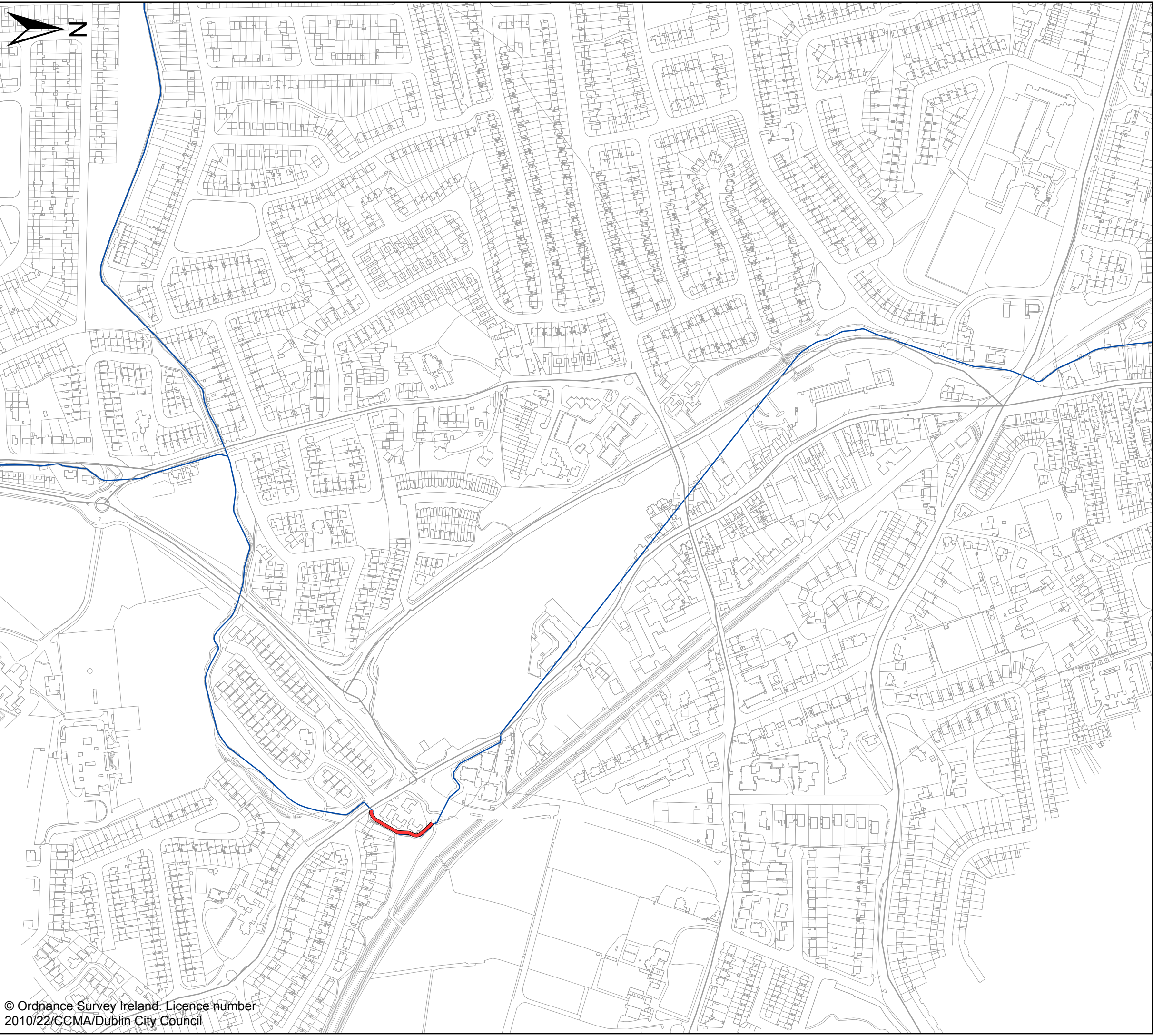
TITLE
Option Development Stage 4
APSR Dundrum and Sandyford Bypass
Option 3 - Hard Defences and
Improvement of Channel Conveyance

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	74 Boucher Road	F: 028 9066 8286
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Drawing No. :	Drawn By :	R.C.
IBE0064_405_103	Checked By :	M.W.
	Approved By :	A.J.
	Date :	06/08/09

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Kilometers

SCALE : 1:5,000



Legend

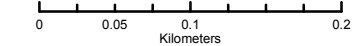
- River Channel
- Flood Walls

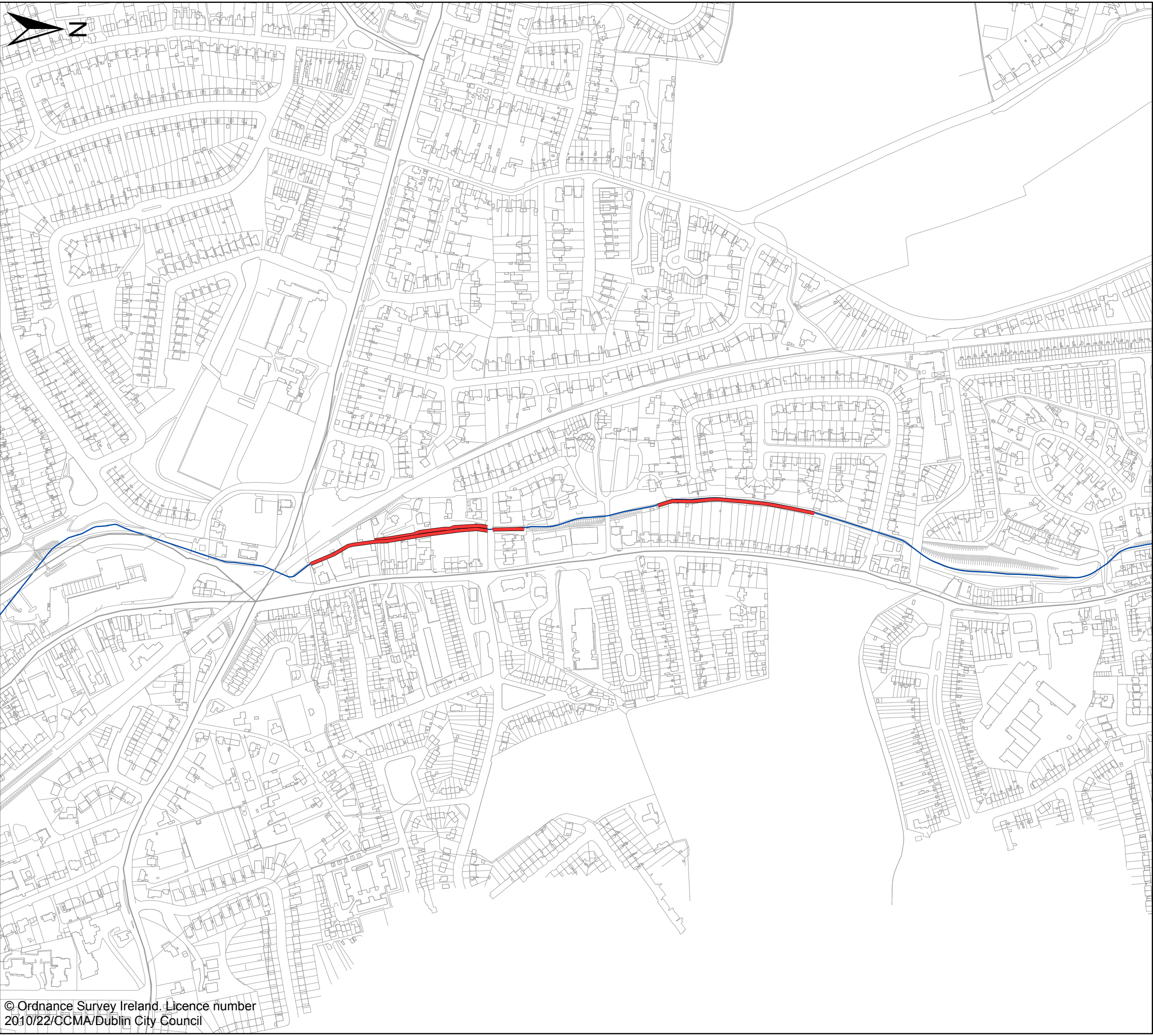
CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
APSR Dundrum and Sandyford Bypass
Option 4 - Hard Defences 2%AEP

	Elmwood House	T: 028 9066 7914
	74 Boucher Road	F: 028 9066 8286
	Belfast	W: www.rpsgroup.com/Ireland
	BT12 6RZ	E: Ireland@rpsgroup.com

Drawing No. :	Drawn By : R.C.
IBE0064_405_104	Checked By : M.W.
	Approved By : A.J.
	Date : 06/08/09
	SCALE : 1:5,000



Legend

- Flood Walls
- River Channel

CLIENT
Dublin City Council

PROJECT
Dodder Catchment Flood Risk Management Study

TITLE
Option Development Stage 4
APSR Dundrum Upper and Lower
Option 1 - Hard Defences

RPS	Elmwood House	T: 028 9066 7914
	74 Boucher Road	F: 028 9066 8286
	Belfast	W: www.rpsgroup.com/Ireland
	BT12 6RZ	E: Ireland@rpsgroup.com

Drawing No. :	Drawn By :	R.C.
IBE0064_405_201	Checked By :	M.W
	Approved By :	A.J
	Date :	06/08/09

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Kilometers

SCALE : 1:5,000

4.6 OPTIONS FOR TALLAGHT STREAM

The following options have been considered for the Tallaght Stream;

Option 1 Hard Defences

Option 2 Improvement of Channel Conveyance

Secondary options which are considered with all of the above include;

Option 1 Proactive and Reactive Maintenance Regime

Table 4.6

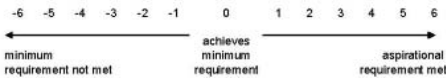
Assessment Unit - Tallaght

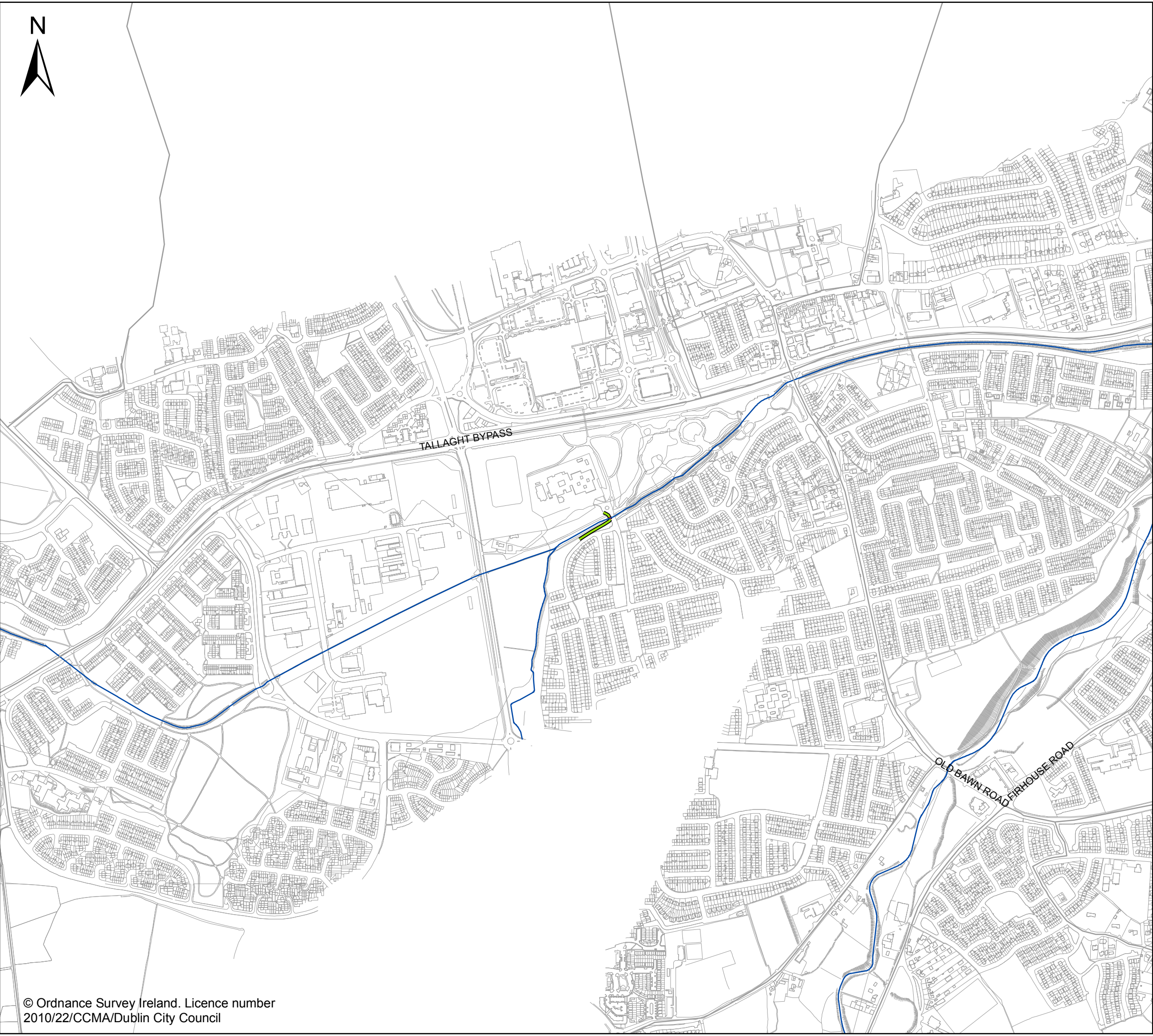
Assessment Unit - Tallaght					Option 1 - Hard Defences (Drawing 406_001)				Option 2 - Improvement of channel conveyance (Drawing 406_002)				
Core criteria		Objective		Weighting comment	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	Scoring comment	Score & (weighting)*	Total weighted Score & (weighted score range)	Factored weighted score & (factored weighted score range)	
1	Technical (5%)	a	Ensure flood risk management options are operationally viable and to minimise maintenance required.	Operation and maintenance carried out by local authority.	Flood walls and embankments are technically low maintenance. Current maintenance on culverts will become technically more difficult to carry out with added access restrictions.	-1 (2)	28 (-72 to +72)	1.93 (-5 to +5)	Upgrading the culvert at Dun An Oir Street will reduce the likelihood of blockages.	2 (2)	-6 (-72 to +72)	-0.41 (-5 to +5)	
		b	Ensure flood risk management options are technically and logistically viable	Technically difficult to construct, options will inadvertently increase cost not considered in cost benefit. Public money is of international importance	Earth embankments are technically straightforward although ground conditions may dictate sheet piles.	4 (5)			May be logistically difficult to manage as road is only access to school	-1 (5)			
		c	Ensure flood risk managed effectively into the future	Future flood risk impacts on all infrastructure the environment economically, socially and environmentally. Future costs are of international importance	Earth embankments can be adapted for future scenarios	2 (5)			Future scenarios will need to be design into the culvert as it cannot be readily adapted.	-1 (5)			
2	Economic (30%)	a	Ensure flood risk management expenditure is risk based	Option cost and resulting benefit attained is of international importance.	Cost = €62,964 Benefit = €0 BCR = 0	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	Cost = €56,151 Benefit = €0 BCR = 0	-999 (5)	-999 (-30 to +30)	-999 (-30 to +30)	
3	Social (30%)	a	Minimise health and safety risk of flood risk management options	Health and safety issues are of national importance	Hard defences require minimal maintenance but does restrict access the WC to carry out other maintenance.	0 (4)	-15 (-66 to +66)	-6.82 (-30 to +30)	Less likely to block reducing the need for maintenance	2 (4)	-7 (-66 to +66)	-3.18 (-30 to +30)	
		b	Protect key infrastructure	Roads at risk in the Whitechurch and Owendoher area are local roads	Hard defences will protect Dun An Oir Street. Kiltipper Way will be allowed to flood.	-3 (3)			Upgrading the culvert will protect Dun An Oir Street. Kiltipper Way will be allowed to flood.	-3 (3)			
		c	Protect existing, and where possible create new waterside access and recreational and community facilities	Recreational and community amenities are of local importance.	Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible. No new green space or recreational facilities will be created.	-3 (2)			Unless it is necessary green space will be allowed to flood to retain as much of the floodplain as possible. No new green space or recreational facilities will be created.	-3 (2)			
		d	Maintain, and where possible increase, existing waterside access for fishing	Waterside access and fishing are of local importance	No fishing interest where earth embankments are proposed.	0 (2)			No fishing interest where earth embankments are proposed.	0 (2)			
4	Environmental (30%)	a	Safeguard and promote sustainable land use in keeping with WFD	Harmful substances entering the Dodder will impact on a national level as substances may travel into the Liffey and Dublin Bay. Site of international importance are also present in the Dodder area	No impact anticipated	0 (3)	-6 (-78 to +78)	-2.31 (-30 to +30)	No impact anticipated	0 (3)	0 (-78 to +78)	0.00 (-30 to +30)	
		b	Support the achievement of good ecological status/ potential (GES/GEP) under the WFD. Particularly morphology as a supporting element to ecological status	The Water Framework Directive set by the EU is governed at an international level.	Construction of walls and embankments will disconnect river from the floodplain and increase peak flow during flood events which disturbs natural regime.	-2 (3)			Watercourse is canalised. Upgrading of culverts will not impact on morphology.	0 (3)			
		c	Protect the flora and fauna of the catchment and, where possible, enhance biodiversity	Locally important are for flora and fauna. May also have otters	Impacts perceived to be minimal due to the heavily modified nature of the tributary	0 (2)			Impacts perceived to be minimal due to the heavily modified nature of the tributary	0 (2)			
		d	Protect, and where possible enhance, fisheries within the catchment	The Owendoher is regarded as the best wild brown trout nursery fisheries in Ireland (Dodder Anglers). All tributaries are salmonid and provide spawning and nursery grounds.	There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Is there a fisheries concern in this WC?	0 (2)			There will be no intrusive structures to the WC and there will be no additional barriers. No new habitat will be created or access improved upstream. Is there a fisheries concern in this WC?	0 (2)			
		e	Protect, and where possible enhance, landscape character and visual amenity	There are no Landscape Protection Zones within the area.	No protected views so no impacts	0 (2)			No anticipated impact; stream already heavily canalised and culverted.	0 (2)			
		f	Protect and where possible enhance known features of cultural heritage importance and their settings	No known features of cultural heritage importance	No known features of cultural heritage importance	0 (1)			No known features of cultural heritage importance	0 (1)			
5	Other (5%)	a	No increase in flood risk to other areas	Potential flood damage to properties will impact on the economy	Option 1 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	Option 2 will not affect any other area	0 (5)	0 (-30 to +30)	0.00 (-5 to +5)	
								-999 (-100 to +100)				-999 (-100 to +100)	
*Weighting mechanism		*Scoring mechanism										*Weighting mechanism	

*Weighting mechanism

- 5 = International importance
- 4 = National importance
- 3 = Regional importance
- 2 = Local importance
- 1 = Negligible importance

*Scoring mechanism





Legend

- River Channel
- Earth Embankments
- Flood Walls

CLIENT

Dublin City Council

PROJECT

Dodder Catchment Flood Risk Management Study

TITLE

Option Development Stage
Tallaght Stream
Option 1 - Hard Defences

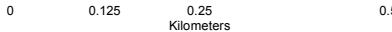


Elmwood House T: 028 9066 7914
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Belfast W: www.rpsgroup.com/Ireland
BT12 6RZ E: Ireland@rpsgroup.com

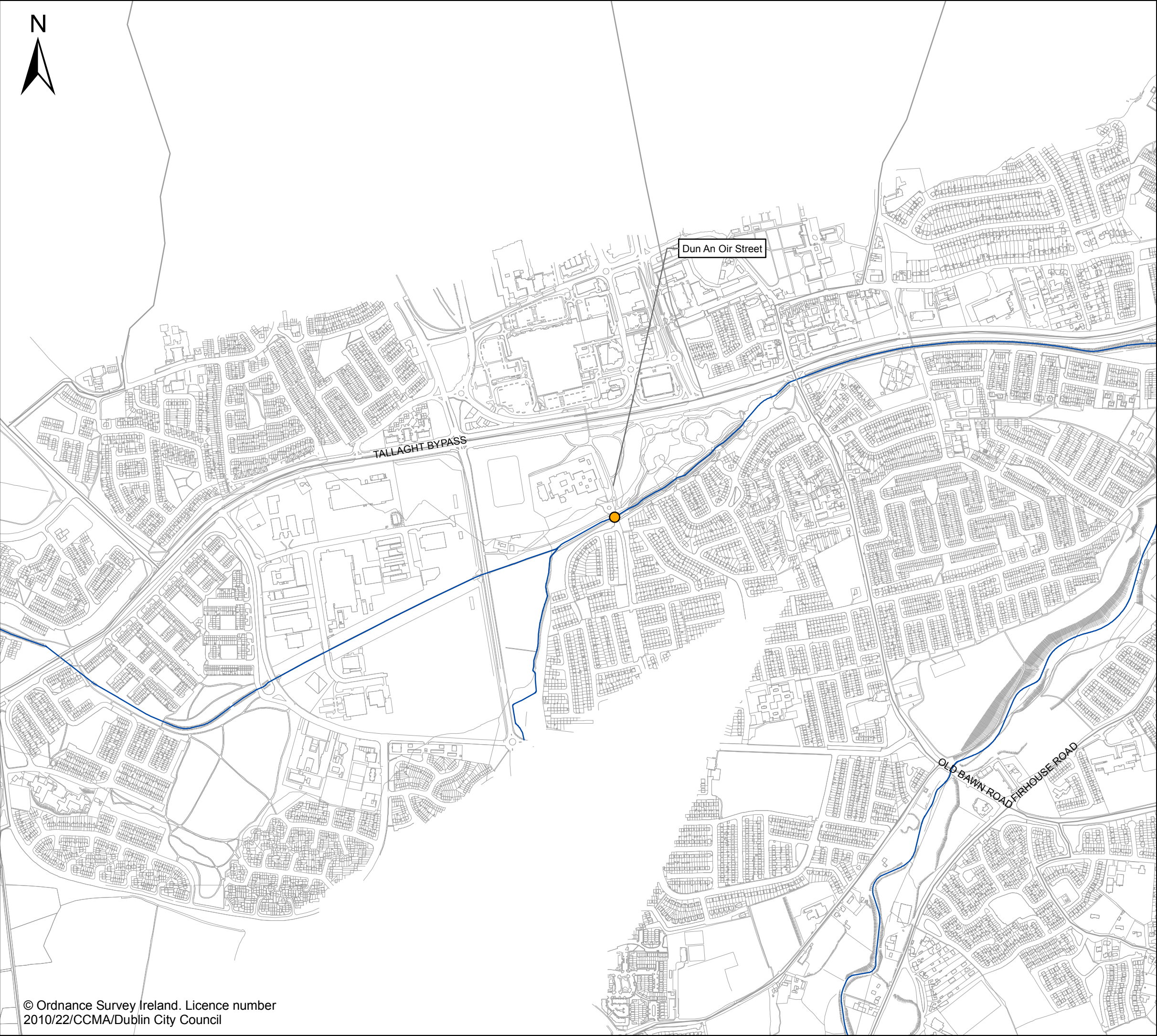
Drawing No. :

IBE0064_406_001



Drawn By : R.C.
Checked By : M.W
Approved By : A.J
Date : 10/08/09


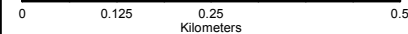


SCALE : 1:10.000



Legend

-  River Channel
-  Channel Conveyance to be upgraded

CLIENT	Dublin City Council		
PROJECT	Dodder Catchment Flood Risk Management Study		
TITLE	Option Development Stage 4 Tallaght Option 2 - Improvement of Channel Conveyance		
	Elmwood House 74 Boucher Road Belfast BT12 6RZ		T: 028 9066 7914 F: 028 9066 8286 W: www.rpsgroup.com/Ireland E: Ireland@rpsgroup.com
	Drawing No.: IBE0064_406_002		
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		SCALE : 1:10,000	

APPENDIX A

NPV Damage Assessment and Economic Costings

Overall Damage

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 14,258.00	€ 7,129.00	0.1	€ 712.90	€ 712.90	€ 16,027.55	10
25	0.04	€ 1,435,909.00	€ 725,083.50	0.06	€ 43,505.01	€ 44,217.91	€ 994,115.22	25
50	0.02	€ 19,700,056.00	€ 10,567,982.50	0.02	€ 211,359.65	€ 255,577.56	€ 5,745,941.89	50
100	0.01	€ 82,395,482.00	€ 51,047,769.00	0.01	€ 510,477.69	€ 766,055.25	€ 17,222,595.56	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Dodder damage

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 2,508.00	€ 1,254.00	0.1	€ 125.40	€ 125.40	€ 2,819.27	10
25	0.04	€ 44,719.00	€ 23,613.50	0.06	€ 1,416.81	€ 1,542.21	€ 34,672.25	25
50	0.02	€ 17,237,367.00	€ 8,641,043.00	0.02	€ 172,820.86	€ 174,363.07	€ 3,920,062.73	50
100	0.01	€ 76,798,154.00	€ 47,017,760.50	0.01	€ 470,177.61	€ 644,540.68	€ 14,490,682.45	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Dodder DS of Donnybrook damage

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 0.00	€ 0.00	0.06	€ 0.00	€ 0.00	€ 0.00	25
50	0.02	€ 8,785,536.00	€ 4,392,768.00	0.02	€ 87,855.36	€ 87,855.36	€ 1,975,180.42	50
100	0.01	€ 61,987,965.00	€ 35,386,750.50	0.01	€ 353,867.51	€ 441,722.87	€ 9,930,895.00	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Orwell Gardens APSR

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 0.00	€ 0.00	0.06	€ 0.00	€ 0.00	€ 0.00	25
50	0.02	€ 64,475.00	€ 32,237.50	0.02	€ 644.75	€ 644.75	€ 14,495.39	50
100	0.01	€ 2,425,869.00	€ 1,245,172.00	0.01	€ 12,451.72	€ 13,096.47	€ 294,437.26	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Owendoher and Whitechurch damage

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 1,356,595.00	€ 678,297.50	0.06	€ 40,697.85	€ 40,697.85	€ 914,976.58	25
50	0.02	€ 1,797,647.00	€ 1,577,121.00	0.02	€ 31,542.42	€ 72,240.27	€ 1,624,119.09	50
100	0.01	€ 2,208,448.00	€ 2,003,047.50	0.01	€ 20,030.48	€ 92,270.75	€ 2,074,447.92	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Tara Hill & St Enda's APSRs

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 1,279,843.00	€ 639,921.50	0.06	€ 38,395.29	€ 38,395.29	€ 863,210.00	25
50	0.02	€ 1,720,895.00	€ 1,500,369.00	0.02	€ 30,007.38	€ 68,402.67	€ 1,537,841.46	50
100	0.01	€ 2,131,696.00	€ 1,926,295.50	0.01	€ 19,262.96	€ 87,665.63	€ 1,970,914.77	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Little Dargle

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 0.00	€ 0.00	0.06	€ 0.00	€ 0.00	€ 0.00	25
50	0.02	€ 0.00	€ 0.00	0.02	€ 0.00	€ 0.00	€ 0.00	50
100	0.01	€ 677,553.00	€ 338,776.50	0.01	€ 3,387.77	€ 3,387.77	€ 76,164.36	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Dundrum Slang

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	0						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 11,750.00	€ 5,875.00	0.1	€ 587.50	€ 587.50	€ 13,208.28	10
25	0.04	€ 34,595.00	€ 23,172.50	0.06	€ 1,390.35	€ 1,977.85	€ 44,466.39	25
50	0.02	€ 665,042.00	€ 349,818.50	0.02	€ 6,996.37	€ 8,974.22	€ 201,760.07	50
100	0.01	€ 2,711,327.00	€ 1,688,184.50	0.01	€ 16,881.85	€ 25,856.07	€ 581,300.83	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Dundrum and S Bypass APSR

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 0.00	€ 0.00	0.06	€ 0.00	€ 0.00	€ 0.00	25
50	0.02	€ 13,811.00	€ 6,905.50	0.02	€ 138.11	€ 138.11	€ 3,105.01	50
100	0.01	€ 1,839,530.00	€ 926,670.50	0.01	€ 9,266.71	€ 9,404.82	€ 211,440.79	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Dundrum and Sandyford Bypass APSR (Option 3))

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 0.00	€ 0.00	0.06	€ 0.00	€ 0.00	€ 0.00	25
50	0.02	€ 14,407.60	€ 7,203.80	0.02	€ 144.08	€ 144.08	€ 3,239.14	50
100	0.01	€ 884,910.18	€ 449,658.89	0.01	€ 4,496.59	€ 4,640.66	€ 104,332.29	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Dundrum and Sandyford Bypass APSR (2%AEP)

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
			€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
2	0.5	€ 0.00						
			€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
5	0.2	€ 0.00						
			€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
10	0.1	€ 0.00						
			€ 0.00	0.06	€ 0.00	€ 0.00	€ 0.00	25
25	0.04	€ 0.00						
			€ 6,905.50	0.02	€ 138.11	€ 138.11	€ 3,105.01	50
50	0.02	€ 13,811.00						

Net Present Value

$$= \frac{x}{r} \left((1 + r)^n - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04

n - 50

(Irish Treasury's Test Discount Rate)

(the projected life of the scheme – 50 years)

Tallaght damage

Design Return Period Years	Exceeding Probability	Damage (€)	Average Damage for Interval	Probability of flood in Interval	Annual damage for interval (€)	Cumulative Average Damage (€)	Discounted Value of 50 year scheme (€)	Design Return Period (Years)
1	1	€ 0.00						
2	0.5	€ 0.00	€ 0.00	0.5	€ 0.00	€ 0.00	€ 0.00	2
5	0.2	€ 0.00	€ 0.00	0.3	€ 0.00	€ 0.00	€ 0.00	5
10	0.1	€ 0.00	€ 0.00	0.1	€ 0.00	€ 0.00	€ 0.00	10
25	0.04	€ 0.00	€ 0.00	0.06	€ 0.00	€ 0.00	€ 0.00	25
50	0.02	€ 0.00	€ 0.00	0.02	€ 0.00	€ 0.00	€ 0.00	50
100	0.01	€ 0.00	€ 0.00	0.01	€ 0.00	€ 0.00	€ 0.00	100

$$\text{Net Present Value} = \frac{x}{r} \left((1 + r) - \left(\frac{1}{1 + r} \right)^n \right)$$

x - cumulative average damage

r - 0.04 (Irish Treasury's Test Discount Rate)

n - 50 (the projected life of the scheme – 50 years)

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£7,139,775.14</u>
Contingency allowance 20%		<u>£1,427,955.03</u>
Construction Cost Excl VAT	Sub-Total :	<u>£8,567,730.17</u>
Detailed design (design fees - 6%)		<u>£428,386.51</u>
Construction supervision		<u>£356,988.76</u>
Allowance for archaeology		<u>£1,070,966.27</u>
Allowance for environmental mitigating measures		<u>£428,386.51</u>
Allowance for compensation and land aquisition		<u>£892,471.89</u>
Allowance for art		<u>£71,397.75</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£2,407,766.14</u>
Cost for construction scheme	Total :	<u>£14,224,094.00</u>
Conversion from £ to € using PPP of 1.41		€ 20,055,972.54

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 2 Hard defences + Improvement of channel conveyance

Basic Construction cost including preliminaries	Hard Defences	£7,635,337.18
	Improvement of	£735,600.00
	channel Conveyance	Sub Total £8,370,937.18
Contingency allowance 20%		£1,674,187.44
Construction Cost Excl VAT	Sub-Total :	£10,045,124.62
Detailed design (design fees - 6%)		£502,256.23
Construction supervision		£418,546.86
Allowance for archaeology		£1,255,640.58
Allowance for environmental mitigating measures		£502,256.23
Allowance for compensation and land aquisition		£1,046,367.15
Allowance for art		£83,709.37
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£2,822,954.33
Cost for construction scheme	Total :	£16,676,855.36
Conversion from £ to € using PPP of 1.41		€ 23,514,366.06

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 3 Hard defences with upstream storage

Basic Construction cost including preliminaries -	Hard Defences	£6,376,197.28
	Upstream Storage	£1,636,721.45
	Sub-Total :	£8,012,918.73
Contingency allowance 20%		£1,602,583.75
Construction Cost Excl VAT	Sub-Total :	£9,615,502.48
Detailed design (design fees - 6%)		£480,775.12
Construction supervision		£400,645.94
Allowance for archaeology		£1,201,937.81
Allowance for environmental mitigating measures		£480,775.12
Allowance for compensation and land aquisition		£1,001,614.84
Allowance for art		£80,129.19
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£2,702,218.77
Cost for construction scheme	Total :	£15,963,599.27
Conversion from £ to € using PPP of 1.41		€ 22,508,674.98

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 4 Hard defences with channel diversion

Basic Construction cost including preliminaries -	Hard Defences	£7,105,414.14
	Channel Diversion	£25,200,000.00
	Sub-Total :	£32,305,414.14
Contingency allowance 20%		£6,461,082.83
Construction Cost Excl VAT	Sub-Total :	£38,766,496.97
Detailed design (design fees - 6%)		£1,938,324.85
Construction supervision		£1,615,270.71
Allowance for archaeology		£4,845,812.12
Allowance for environmental mitigating measures		£1,938,324.85
Allowance for compensation and land aquisition		£4,038,176.77
Allowance for art		£323,054.14
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£10,894,444.27
Cost for construction scheme	Total :	£64,359,904.67
Conversion from £ to € using PPP of 1.41		€ 90,747,465.59

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 5 Hard defences with tidal barrage

Basic Construction cost including preliminaries -	Hard Defences	£7,139,775.14
	Tidal Barrage	<u>£2,444,000.00</u>
	Sub-Total :	<u>£9,583,775.14</u>
Contingency allowance 20%		<u>£1,916,755.03</u>
Construction Cost Excl VAT	Sub-Total :	<u>£11,500,530.17</u>
Detailed design (design fees - 6%)		<u>£575,026.51</u>
Construction supervision		<u>£479,188.76</u>
Allowance for archaeology		<u>£1,437,566.27</u>
Allowance for environmental mitigating measures		<u>£575,026.51</u>
Allowance for compensation and land aquisition		<u>£1,197,971.89</u>
Allowance for art		<u>£95,837.75</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£3,231,963.03</u>
Cost for construction scheme	Total :	<u>£19,093,110.89</u>
Conversion from £ to € using PPP of 1.41		€ 26,921,286.35

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 6 Hard defences with improvement of channel conveyance and upstream storage

Basic Construction cost including preliminaries -	Hard Defences	<u>£6,406,740.41</u>
	Improvement of channel conveyance	<u>£735,600.00</u>
	Upstream storage	<u>£1,636,721.45</u>
	Sub-Total :	<u>£8,779,061.86</u>
Contingency allowance 20%		<u>£1,755,812.37</u>
Construction Cost Excl VAT	Sub-Total :	<u>£10,534,874.23</u>
Detailed design (design fees - 6%)		<u>£526,743.71</u>
Construction supervision		<u>£438,953.09</u>
Allowance for archaeology		<u>£1,316,859.28</u>
Allowance for environmental mitigating measures		<u>£526,743.71</u>
Allowance for compensation and land aquisition		<u>£1,097,382.73</u>
Allowance for art		<u>£87,790.62</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£2,960,587.34</u>
Cost for construction scheme	Total :	<u>£17,489,934.72</u>
Conversion from £ to € using PPP of 1.41		€ 24,660,807.96

Dodder CFRAM

Calculation of option cost

Assessment Unit	<u>Dodder</u>		
Option 7	<u>Hard defences with improvement of channel conveyance and upstream storage and tidal barrage</u>		
Basic Construction cost including preliminaries -	Hard Defences	£6,406,740.41	
	Improvement of channel conveyance	£735,600.00	
	Upstream storage	£1,636,721.45	
	Tidal Barrage	£2,444,000.00	
	Sub-Total :	£11,223,061.86	
Contingency allowance 20%		£2,244,612.37	
Construction Cost Excl VAT	Sub-Total :	£13,467,674.23	
Detailed design (design fees - 6%)		£673,383.71	
Construction supervision		£561,153.09	
Allowance for archaeology		£1,683,459.28	
Allowance for environmental mitigating measures		£673,383.71	
Allowance for compensation and land aquisition		£1,402,882.73	
Allowance for art		£112,230.62	
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£3,784,784.23	
Cost for construction scheme	Total :	£22,358,951.61	
Conversion from £ to € using PPP of 1.41		€ 31,526,121.77	

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 8 Hard defences with improvement of channel conveyance and channel diversion

Basic Construction cost including preliminaries -	Hard Defences	<u>£7,062,653.78</u>
	Improvement of channel conveyance	<u>£735,600.00</u>
	Channel Diversion	<u>£25,200,000.00</u>
	Sub-Total :	<u>£32,998,253.78</u>
Contingency allowance 20%		<u>£6,599,650.76</u>
Construction Cost Excl VAT	Sub-Total :	<u>£39,597,904.54</u>
Detailed design (design fees - 6%)		<u>£1,979,895.23</u>
Construction supervision		<u>£1,649,912.69</u>
Allowance for archaeology		<u>£4,949,738.07</u>
Allowance for environmental mitigating measures		<u>£1,979,895.23</u>
Allowance for compensation and land aquisition		<u>£4,124,781.72</u>
Allowance for art		<u>£329,982.54</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£11,128,092.50</u>
Cost for construction scheme	Total :	<u>£65,740,202.51</u>
Conversion from £ to € using PPP of 1.41		€ 92,693,685.54

Dodder CFRAM

Calculation of option cost

Assessment Unit	<u>Dodder</u>		
Option 9	<u>Hard defences with improvement of channel conveyance and channel diversion and tidal barrage</u>		
Basic Construction cost including preliminaries -	Hard Defences		£7,062,653.78
	Improvement of channel conveyance		£735,600.00
	Channel Diversion		£25,200,000.00
	Tidal Barrage		£2,444,000.00
	Sub-Total :		£35,442,253.78
Contingency allowance 20%			£7,088,450.76
Construction Cost Excl VAT	Sub-Total :		£42,530,704.54
Detailed design (design fees - 6%)			£2,126,535.23
Construction supervision			£1,772,112.69
Allowance for archaeology			£5,316,338.07
Allowance for environmental mitigating measures			£2,126,535.23
Allowance for compensation and land aquisition			£4,430,281.72
Allowance for art			£354,422.54
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)			£11,952,289.39
Cost for construction scheme	Total :		£70,609,219.40
Conversion from £ to € using PPP of 1.41			€ 99,558,999.35

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 10 Hard defences with upstream storage and channel diversion

Basic Construction cost including preliminaries -	Hard Defences	<u>£6,345,654.18</u>
	Channel Diversion	<u>£25,200,000.00</u>
	Upstream Storage	<u>£1,636,721.45</u>
	Sub-Total :	<u>£33,182,375.63</u>
Contingency allowance 20%		<u>£6,636,475.13</u>
Construction Cost Excl VAT	Sub-Total :	<u>£39,818,850.76</u>
Detailed design (design fees - 6%)		<u>£1,990,942.54</u>
Construction supervision		<u>£1,659,118.78</u>
Allowance for archaeology		<u>£4,977,356.34</u>
Allowance for environmental mitigating measures		<u>£1,990,942.54</u>
Allowance for compensation and land aquisition		<u>£4,147,796.95</u>
Allowance for art		<u>£331,823.76</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£11,190,184.42</u>
Cost for construction scheme	Total :	<u>£66,107,016.10</u>
Conversion from £ to € using PPP of 1.41		€ 93,210,892.69

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 11 Hard defences with upstream storage and channel diversion and tidal barrage

Basic Construction cost including preliminaries -	Hard Defences	£6,345,654.18
	Channel Diversion	£25,200,000.00
	Upstream Storage	£1,636,721.45
	Tidal barrage	£2,444,000.00
	Sub-Total :	£35,626,375.63
Contingency allowance 20%		£7,125,275.13
Construction Cost Excl VAT	Sub-Total :	£42,751,650.76
Detailed design (design fees - 6%)		£2,137,582.54
Construction supervision		£1,781,318.78
Allowance for archaeology		£5,343,956.34
Allowance for environmental mitigating measures		£2,137,582.54
Allowance for compensation and land aquisition		£4,453,296.95
Allowance for art		£356,263.76
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£12,014,381.31
Cost for construction scheme	Total :	£70,976,032.98
Conversion from £ to € using PPP of 1.41		€ 100,076,206.51

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 12 Hard defences with improvement of channel conveyance and upstream storage and channel

Basic Construction cost including preliminaries -	Hard Defences	£6,841,979.78
	Improvement of channel conveyance	£735,600.00
	Upstream Storage	£1,636,721.45
	Channel Diversion	£25,200,000.00
	Sub-Total :	£34,414,301.23
Contingency allowance 20%		£6,882,860.25
Construction Cost Excl VAT	Sub-Total :	£41,297,161.48
Detailed design (design fees - 6%)		£2,064,858.07
Construction supervision		£1,720,715.06
Allowance for archaeology		£5,162,145.18
Allowance for environmental mitigating measures		£2,064,858.07
Allowance for compensation and land acquisition		£4,301,787.65
Allowance for art		£344,143.01
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£11,605,630.11
Cost for construction scheme	Total :	£68,561,298.64
Conversion from £ to € using PPP of 1.41		€ 96,671,431.09

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder
Option 13 Hard defences with improvement of channel conveyance and upstream storage and channel

Basic Construction cost including preliminaries -	Hard Defences	£6,841,979.78
	Improvement of channel conveyance	£735,600.00
	Upstream Storage	£1,636,721.45
	Channel Diversion	£25,200,000.00
	Tidal barrage	£2,444,000.00
	Sub-Total :	£36,858,301.23
Contingency allowance 20%		£7,371,660.25
Construction Cost Excl VAT	Sub-Total :	£44,229,961.48
Detailed design (design fees - 6%)		£2,211,498.07
Construction supervision		£1,842,915.06
Allowance for archaeology		£5,528,745.18
Allowance for environmental mitigating measures		£2,211,498.07
Allowance for compensation and land aquisition		£4,607,287.65
Allowance for art		£368,583.01
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£12,429,826.99
Cost for construction scheme	Total :	£73,430,315.53
Conversion from £ to € using PPP of 1.41		€ 103,536,744.90

Dodder CFRAM

Calculation of option cost

Assessment Unit Dodder DS of Donnybrook with existing walls included
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£3,212,974.50</u>
Contingency allowance 20%		<u>£642,594.90</u>
Construction Cost Excl VAT	Sub-Total :	<u>£3,855,569.40</u>
Detailed design (design fees - 6%)		<u>£192,778.47</u>
Construction supervision		<u>£160,648.73</u>
Allowance for archaeology		<u>£481,946.18</u>
Allowance for environmental mitigating measures		<u>£192,778.47</u>
Allowance for compensation and land aquisition		<u>£401,621.81</u>
Allowance for art		<u>£32,129.75</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£1,083,520.29</u>
Cost for construction scheme	Total :	<u>£6,400,993.09</u>
Conversion from £ to € using PPP of 1.41		€ 9,025,400.25

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Orwell Gardens APSR
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£86,531.09</u>
Contingency allowance 20%		<u>£17,306.22</u>
Construction Cost Excl VAT	Sub-Total :	<u>£103,837.31</u>
Detailed design (design fees - 6%)		<u>£5,191.87</u>
Construction supervision		<u>£4,326.55</u>
Allowance for archaeology		<u>£12,979.66</u>
Allowance for environmental mitigating measures		<u>£5,191.87</u>
Allowance for compensation and land aquisition		<u>£10,816.39</u>
Allowance for art		<u>£865.31</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£29,181.12</u>
Cost for construction scheme	Total :	<u>£172,390.08</u>
Conversion from £ to € using PPP of 1.41		<u>€ 243,070.01</u>

**Dodder CFRAM
Shanagarry Apt & Smurfit Site APSRs**

Calculation of option cost

Assessment Unit Shanagarry Apt & Smurfit Site APSRs
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£1,279,019.06</u>
Contingency allowance 20%		<u>£255,803.81</u>
Construction Cost Excl VAT	Sub-Total :	<u>£1,534,822.87</u>
Detailed design (design fees - 6%)		<u>£76,741.14</u>
Construction supervision		<u>£63,950.95</u>
Allowance for archaeology		<u>£191,852.86</u>
Allowance for environmental mitigating measures		<u>£76,741.14</u>
Allowance for compensation and land aquisition		<u>£159,877.38</u>
Allowance for art		<u>£12,790.19</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£431,327.14</u>
Cost for construction scheme	Total :	<u>£2,548,103.68</u>
Conversion from £ to € using PPP of 1.41		<u>€ 3,592,826.19</u>

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£2,755,116.48</u>
Contingency allowance 20%		<u>£551,023.30</u>
Construction Cost Excl VAT	Sub-Total :	<u>£3,306,139.78</u>
Detailed design (design fees - 6%)		<u>£165,306.99</u>
Construction supervision		<u>£137,755.82</u>
Allowance for archaeology		<u>£413,267.47</u>
Allowance for environmental mitigating measures		<u>£165,306.99</u>
Allowance for compensation and land aquisition		<u>£344,389.56</u>
Allowance for art		<u>£27,551.16</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£929,115.56</u>
Cost for construction scheme	Total :	<u>£5,488,833.33</u>
Conversion from £ to € using PPP of 1.41		€ 7,739,255.00

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 2 Hard defences and Improvement of channel conveyance

Basic Construction cost including preliminaries -	Hard Defences	<u>£2,667,960.14</u>
	Improvement of channel conveyance	<u>£483,000.00</u>
	Sub-Total:	<u>£3,150,960.14</u>
Contingency allowance 20%		<u>£630,192.03</u>
Construction Cost Excl VAT	Sub-Total:	<u>£3,781,152.17</u>
Detailed design (design fees - 6%)		<u>£189,057.61</u>
Construction supervision		<u>£157,548.01</u>
Allowance for archaeology		<u>£472,644.02</u>
Allowance for environmental mitigating measures		<u>£189,057.61</u>
Allowance for compensation and land aquisition		<u>£393,870.02</u>
Allowance for art		<u>£31,509.60</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£1,062,607.02</u>
Cost for construction scheme	Total :	<u>£6,277,446.05</u>
Conversion from £ to € using PPP of 1.41		€ 8,851,198.94

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 3 Hard defences with upstream storage

Basic Construction cost including preliminaries -	Hard Defences	£2,959,446.76
	Upstream Storage	£668,173.32
	Sub-Total :	£3,627,620.08
Contingency allowance 20%		£725,524.02
Construction Cost Excl VAT	Sub-Total :	£4,353,144.09
Detailed design (design fees - 6%)		£217,657.20
Construction supervision		£181,381.00
Allowance for archaeology		£544,143.01
Allowance for environmental mitigating measures		£217,657.20
Allowance for compensation and land aquisition		£453,452.51
Allowance for art		£36,276.20
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£1,223,352.36
Cost for construction scheme	Total :	£7,227,063.59
Conversion from £ to € using PPP of 1.41		€ 10,190,159.66

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 4 Hard defences with channel diversion

Basic Construction cost including preliminaries -	Hard Defences	£1,233,849.51
	Channel Diversion	£381,875.00
	Sub-Total :	£1,615,724.51
Contingency allowance 20%		£323,144.90
Construction Cost Excl VAT	Sub-Total :	£1,938,869.41
Detailed design (design fees - 6%)		£96,943.47
Construction supervision		£80,786.23
Allowance for archaeology		£242,358.68
Allowance for environmental mitigating measures		£96,943.47
Allowance for compensation and land aquisition		£201,965.56
Allowance for art		£16,157.25
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£544,875.25
Cost for construction scheme	Total :	£3,218,899.31
Conversion from £ to € using PPP of 1.41		€ 4,538,648.03

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 5 Hard defences with improvement of channel conveyance and upstream storage

Basic Construction cost including preliminaries -	Hard Defences	£2,437,611.93
	Improvement of channel conveyance	£483,000.00
	Upstream storage	£668,173.32
	Sub-Total :	£3,588,785.25
Contingency allowance 20%		£717,757.05
Construction Cost Excl VAT	Sub-Total :	£4,306,542.30
Detailed design (design fees - 6%)		£215,327.12
Construction supervision		£179,439.26
Allowance for archaeology		£538,317.79
Allowance for environmental mitigating measures		£215,327.12
Allowance for compensation and land aquisition		£448,598.16
Allowance for art		£35,887.85
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£1,210,255.99
Cost for construction scheme	Total :	£7,149,695.58
Conversion from £ to € using PPP of 1.41		€ 10,081,070.76

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 6 Hard defences with improvement of channel conveyance and diversion of watercourses

Basic Construction cost including preliminaries -	Hard Defences	<u>£2,248,241.58</u>
	Improvement of channel conveyance	<u>£483,000.00</u>
	Channel Diversion	<u>£381,875.00</u>
	Sub-Total :	<u>£3,113,116.58</u>
Contingency allowance 20%		<u>£622,623.32</u>
Construction Cost Excl VAT	Sub-Total :	<u>£3,735,739.89</u>
Detailed design (design fees - 6%)		<u>£186,786.99</u>
Construction supervision		<u>£155,655.83</u>
Allowance for archaeology		<u>£466,967.49</u>
Allowance for environmental mitigating measures		<u>£186,786.99</u>
Allowance for compensation and land aquisition		<u>£389,139.57</u>
Allowance for art		<u>£31,131.17</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£1,049,844.92</u>
Cost for construction scheme	Total :	<u>£6,202,052.86</u>
Conversion from £ to € using PPP of 1.41		€ 8,744,894.53

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 7 Hard defences with upstream storage and Diversion of watercourses

Basic Construction cost including preliminaries -	Hard defences	£2,424,693.80
	Upstream Storage	£668,173.32
	Diversion of Watercourses	£381,875.00
	Sub-Total :	£3,474,742.12
Contingency allowance 20%		£694,948.42
Construction Cost Excl VAT	Sub-Total :	£4,169,690.54
Detailed design (design fees - 6%)		£208,484.53
Construction supervision		£173,737.11
Allowance for archaeology		£521,211.32
Allowance for environmental mitigating measures		£208,484.53
Allowance for compensation and land aquisition		£434,342.77
Allowance for art		£34,747.42
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£1,171,796.91
Cost for construction scheme	Total :	£6,922,495.12
Conversion from £ to € using PPP of 1.41		€ 9,760,718.12

Dodder CFRAM

Calculation of option cost

Assessment Unit Whitechurch
Option 8 Hard defences, improvement of channel conveyance, upstream storage and diversion of watercourses

Basic Construction cost including preliminaries	Hard defences	£1,888,846.11
	Improvement of Channel	£483,000.00
	Upstream Storage	£668,173.32
	Diversion of Watercourses	£381,875.00
	Sub Total:	£3,421,894.43
Contingency allowance 20%		£684,378.89
Construction Cost Excl VAT	Sub-Total :	£4,106,273.32
Detailed design (design fees - 6%)		£205,313.67
Construction supervision		£171,094.72
Allowance for archaeology		£513,284.17
Allowance for environmental mitigating measures		£205,313.67
Allowance for compensation and land aquisition		£427,736.80
Allowance for art		£34,218.94
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		£1,153,974.94
Cost for construction scheme	Total :	£6,817,210.22
Conversion from £ to € using PPP of 1.41		€ 9,612,266.42

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Tara Hill & St Endas
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£888,958.16</u>
Contingency allowance 20%		<u>£177,791.63</u>
Construction Cost Excl VAT	Sub-Total :	<u>£1,066,749.79</u>
Detailed design (design fees - 6%)		<u>£53,337.49</u>
Construction supervision		<u>£44,447.91</u>
Allowance for archaeology		<u>£133,343.72</u>
Allowance for environmental mitigating measures		<u>£53,337.49</u>
Allowance for compensation and land aquisition		<u>£111,119.77</u>
Allowance for art		<u>£8,889.58</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£299,785.82</u>
Cost for construction scheme	Total :	<u>£1,771,011.57</u>
Conversion from £ to € using PPP of 1.41		<u>€ 2,497,126.32</u>

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Tara Hill & St Endas
Option 2 Hard defences and Dredging

Basic Construction cost including preliminaries		
Hard Defences		<u>£512,999.82</u>
Dredging		<u>£131,159.00</u>
Weir Removal		<u>£14,000.00</u>
Contingency allowance 20%		<u>£131,631.76</u>
Construction Cost Excl VAT	Sub-Total :	<u>£789,790.59</u>
Detailed design (design fees - 6%)		<u>£39,489.53</u>
Construction supervision		<u>£32,907.94</u>
Allowance for archaeology		<u>£98,723.82</u>
Allowance for environmental mitigating measures		<u>£39,489.53</u>
Allowance for compensation and land aquisition		<u>£82,269.85</u>
Allowance for art		<u>£6,581.59</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£221,952.72</u>
Cost for construction scheme	Total :	<u>£1,311,205.57</u>
Conversion from £ to € using PPP of 1.41		<u>€ 1,848,799.86</u>

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Tara Hill & St Endas
Option 3 Hard defences and Dredging

Basic Construction cost including preliminaries		
Hard Defences		<u>£689,397.35</u>
Dredging		<u>£26,344.44</u>
Contingency allowance 20%		<u>£143,148.36</u>
Construction Cost Excl VAT	Sub-Total :	<u>£858,890.15</u>
Detailed design (design fees - 6%)		<u>£42,944.51</u>
Construction supervision		<u>£35,787.09</u>
Allowance for archaeology		<u>£107,361.27</u>
Allowance for environmental mitigating measures		<u>£42,944.51</u>
Allowance for compensation and land aquisition		<u>£89,467.72</u>
Allowance for art		<u>£7,157.42</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£241,371.59</u>
Cost for construction scheme	Total :	<u>£1,425,924.25</u>
Conversion from £ to € using PPP of 1.41		<u>€ 2,010,553.20</u>

Dodder CFRAM

Calculation of option cost

Assessment Unit Little Dargle
Option 1 Hard defences

Basic Construction cost including preliminaries	Hard defences	<u>£5,160.49</u>
Contingency allowance 20%		<u>£1,032.10</u>
Construction Cost Excl VAT	Sub-Total :	<u>£6,192.59</u>
Detailed design (design fees - 6%)		<u>£309.63</u>
Construction supervision		<u>£516.05</u>
Allowance for archaeology		<u>£774.07</u>
Allowance for environmental mitigating measures		<u>£309.63</u>
Allowance for compensation and land aquisition		<u>£645.06</u>
Allowance for art		<u>£51.60</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£1,740.29</u>
Cost for construction scheme	Total :	<u>£10,538.92</u>
Conversion from £ to € using PPP of 1.41		€ 14,859.88
Flood damage		€ 76,164.36
BCR		5.13

Dodder CFRAM

Calculation of option cost

Assessment Unit Little Dargle
Option 2 Diversion of Watercourses

Basic Construction cost including preliminaries -	Diversion of Watercourses	<u>£383,736.40</u>
Contingency allowance 20%		<u>£76,747.28</u>
Construction Cost Excl VAT	Sub-Total :	<u>£460,483.68</u>
Detailed design (design fees - 6%)		<u>£23,024.18</u>
Construction supervision		<u>£38,373.64</u>
Allowance for archaeology		<u>£57,560.46</u>
Allowance for environmental mitigating measures		<u>£23,024.18</u>
Allowance for compensation and land aquisition		<u>£47,967.05</u>
Allowance for art		<u>£3,837.36</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£129,408.49</u>
Cost for construction scheme	Total :	<u>£783,679.05</u>
Conversion from £ to € using PPP of 1.41		€ 1,104,987.46
Flood damage		€ 76,164.36
BCR		0.07

Dodder CFRAM

Calculation of option cost

Assessment Unit Little Dargle
Option 3 Upstream Storage

Basic Construction cost including preliminaries	Upstream Storage	<u>£432,007.66</u>
Contingency allowance 20%		<u>£86,401.53</u>
Construction Cost Excl VAT	Sub-Total :	<u>£518,409.19</u>
Detailed design (design fees - 6%)		<u>£25,920.46</u>
Construction supervision		<u>£43,200.77</u>
Allowance for archaeology		<u>£64,801.15</u>
Allowance for environmental mitigating measures		<u>£25,920.46</u>
Allowance for compensation and land aquisition		<u>£54,000.96</u>
Allowance for art		<u>£4,320.08</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£145,687.14</u>
Cost for construction scheme	Total :	<u>£882,260.20</u>
Conversion from £ to € using PPP of 1.41		€ 1,243,986.88
Flood damage		€ 76,164.36
BCR		0.06

Dodder CFRAM

Calculation of option cost

Assessment Unit Little Dargle
Option 4 Improvement of Channel Conveyance

Basic Construction cost including preliminaries	Improvement of Channel Conveyance	<u>£187,500.00</u>
Contingency allowance 20%		<u>£37,500.00</u>
Construction Cost Excl VAT	Sub-Total :	<u>£225,000.00</u>
Detailed design (design fees - 6%)		<u>£11,250.00</u>
Construction supervision		<u>£18,750.00</u>
Allowance for archaeology		<u>£28,125.00</u>
Allowance for environmental mitigating measures		<u>£11,250.00</u>
Allowance for compensation and land aquisition		<u>£23,437.50</u>
Allowance for art		<u>£1,875.00</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£63,231.14</u>
Cost for construction scheme	Total :	<u>£382,918.64</u>
Conversion from £ to € using PPP of 1.41		€ 539,915.29
Flood damage		€ 76,164.36
BCR		0.14

Dodder CFRAM

Calculation of option cost

Assessment Unit Little Dargle

Option 5 Diversion of watercourses and upstream storage

Basic Construction cost including preliminaries	Diversion of watercourses	<u>£383,736.40</u>
	Upstream storage	<u>£432,007.66</u>
	Sub-Total:	<u>£815,744.06</u>
Contingency allowance 20%		<u>£163,148.81</u>
Construction Cost Excl VAT	Sub-Total :	<u>£978,892.87</u>
Detailed design (design fees - 6%)		<u>£48,944.64</u>
Construction supervision		<u>£81,574.41</u>
Allowance for archaeology		<u>£122,361.61</u>
Allowance for environmental mitigating measures		<u>£48,944.64</u>
Allowance for compensation and land aquisition		<u>£101,968.01</u>
Allowance for art		<u>£8,157.44</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£275,095.63</u>
Cost for construction scheme	Total :	<u>£1,665,939.25</u>
Conversion from £ to € using PPP of 1.41		€ 2,348,974.34
Flood damage		€ 76,164.36
BCR		0.03

Dodder CFRAM

Calculation of option cost

Assessment Unit Dundrum Slang
Option 1 Hard defences

Basic Construction cost including preliminaries	Hard Defences	<u>£3,043,206.48</u>
Contingency allowance 20%		<u>£608,641.30</u>
Construction Cost Excl VAT	Sub-Total :	<u>£3,651,847.78</u>
Detailed design (design fees - 6%)		<u>£182,592.39</u>
Construction supervision		<u>£152,160.32</u>
Allowance for archaeology		<u>£456,480.97</u>
Allowance for environmental mitigating measures		<u>£182,592.39</u>
Allowance for compensation and land aquisition		<u>£380,400.81</u>
Allowance for art		<u>£30,432.06</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£1,026,268.95</u>
Cost for construction scheme	Total :	<u>£6,062,775.68</u>
Conversion from £ to € using PPP of 1.41		€ 8,548,513.70

Dodder CFRAM

Calculation of option cost

Assessment Unit Dundrum Slang
Option 2 Improvement of channel conveyance

Basic Construction cost including preliminaries -	Improvement of channel conveyance	<u>£1,346,707.50</u>
Contingency allowance 20%		<u>£269,341.50</u>
Construction Cost Excl VAT	Sub-Total :	<u>£1,616,049.00</u>
Detailed design (design fees - 6%)		<u>£80,802.45</u>
Construction supervision		<u>£67,335.38</u>
Allowance for archaeology		<u>£202,006.13</u>
Allowance for environmental mitigating measures		<u>£80,802.45</u>
Allowance for compensation and land aquisition		<u>£168,338.44</u>
Allowance for art		<u>£13,467.08</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£454,153.90</u>
Cost for construction scheme	Total :	<u>£2,682,954.81</u>
Conversion from £ to € using PPP of 1.41		€ 3,782,966.29

Dodder CFRAM

Calculation of option cost

Assessment Unit Dundrum Slang
Option 3 Hard defences and Improvement of channel conveyance

Basic Construction cost including preliminaries -	Hard Defences	<u>£2,340,928.06</u>
	Improvement of Channel	<u>£1,346,707.50</u>
	Conveyance	
	Sub-Total :	<u>£3,687,635.56</u>
Contingency allowance 20%		<u>£737,527.11</u>
Construction Cost Excl VAT	Sub-Total :	<u>£4,425,162.67</u>
Detailed design (design fees - 6%)		<u>£221,258.13</u>
Construction supervision		<u>£184,381.78</u>
Allowance for archaeology		<u>£553,145.33</u>
Allowance for environmental mitigating measures		<u>£221,258.13</u>
Allowance for compensation and land aquisition		<u>£460,954.45</u>
Allowance for art		<u>£36,876.36</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£1,243,591.55</u>
Cost for construction scheme	Total :	<u>£7,346,628.40</u>
Conversion from £ to € using PPP of 1.41		€ 10,358,746.05

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Dundrum and Sandyford Bypass
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£667,750.45</u>
Contingency allowance 20%		<u>£133,550.09</u>
Construction Cost Excl VAT	Sub-Total :	<u>£801,300.54</u>
Detailed design (design fees - 6%)		<u>£40,065.03</u>
Construction supervision		<u>£33,387.52</u>
Allowance for archaeology		<u>£100,162.57</u>
Allowance for environmental mitigating measures		<u>£40,065.03</u>
Allowance for compensation and land aquisition		<u>£83,468.81</u>
Allowance for art		<u>£6,677.50</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£225,187.33</u>
Cost for construction scheme	Total :	<u>£1,330,314.33</u>
Conversion from £ to € using PPP of 1.41		<u>€ 1,875,743.20</u>

Dodder CFRAM
Additional Flood Cells

Calculation of option cost

Assessment Unit Dundrum and Sandyford Bypass
Option 2 Hard defences and Dredging

Basic Construction cost including preliminaries

Hard Defences £679,405.48

Dredging £73,568.25

Contingency allowance 20% £150,594.75

Construction Cost Excl VAT Sub-Total : **£903,568.47**

Detailed design (design fees - 6%) £45,178.42

Construction supervision £37,648.69

Allowance for archaeology £112,946.06

Allowance for environmental mitigating measures £45,178.42

Allowance for compensation and land aquisition £94,121.72

Allowance for art £7,529.74

Maintenance costs (discounted NPV of costs throughout project lifespan of 50years) £253,927.42

Cost for construction scheme Total : **£1,500,098.93**

Conversion from £ to € using PPP of 1.41 **€ 2,115,139.50**

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Dundrum and Sandyford Bypass
Option 3 Dredging

Basic Construction cost including preliminaries Dredging		<u>£196,182.00</u>
Contingency allowance 20%		<u>£39,236.40</u>
Construction Cost Excl VAT	Sub-Total :	<u>£235,418.40</u>
Detailed design (design fees - 6%)		<u>£11,770.92</u>
Construction supervision		<u>£9,809.10</u>
Allowance for archaeology		<u>£29,427.30</u>
Allowance for environmental mitigating measures		<u>£11,770.92</u>
Allowance for compensation and land aquisition		<u>£24,522.75</u>
Allowance for art		<u>£1,961.82</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£66,159.00</u>
Cost for construction scheme	Total :	<u>£390,840.21</u>
Conversion from £ to € using PPP of 1.41		<u>€ 551,084.69</u>

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Dundrum and Sandyford Bypass
Option 4 Hard defences at 2%AEP

Basic Construction cost including preliminaries		<u>£474,832.76</u>
Contingency allowance 20%		<u>£94,966.55</u>
Construction Cost Excl VAT	Sub-Total :	<u>£569,799.31</u>
Detailed design (design fees - 6%)		<u>£28,489.97</u>
Construction supervision		<u>£23,741.64</u>
Allowance for archaeology		<u>£71,224.91</u>
Allowance for environmental mitigating measures		<u>£28,489.97</u>
Allowance for compensation and land aquisition		<u>£59,354.09</u>
Allowance for art		<u>£4,748.33</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£160,129.17</u>
Cost for construction scheme	Total :	<u>£945,977.38</u>
Conversion from £ to € using PPP of 1.41		<u>€ 1,333,828.10</u>

**Dodder CFRAM
Additional Flood Cells**

Calculation of option cost

Assessment Unit Cell 8&9
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£795,936.85</u>
Contingency allowance 20%		<u>£159,187.37</u>
Construction Cost Excl VAT	Sub-Total :	<u>£955,124.22</u>
Detailed design (design fees - 6%)		<u>£47,756.21</u>
Construction supervision		<u>£39,796.84</u>
Allowance for archaeology		<u>£119,390.53</u>
Allowance for environmental mitigating measures		<u>£47,756.21</u>
Allowance for compensation and land aquisition		<u>£99,492.11</u>
Allowance for art		<u>£7,959.37</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£268,415.99</u>
Cost for construction scheme	Total :	<u>£1,585,691.48</u>
Conversion from £ to € using PPP of 1.41		<u>€ 2,235,824.98</u>

Dodder CFRAM

Calculation of option cost

Assessment Unit Tallaght Stream
Option 1 Hard defences

Basic Construction cost including preliminaries		<u>£21,865.86</u>
Contingency allowance 20%		<u>£4,373.17</u>
Construction Cost Excl VAT	Sub-Total :	<u>£26,239.03</u>
Detailed design (design fees - 6%)		<u>£1,311.95</u>
Construction supervision		<u>£2,186.59</u>
Allowance for archaeology		<u>£3,279.88</u>
Allowance for environmental mitigating measures		<u>£1,311.95</u>
Allowance for compensation and land aquisition		<u>£2,733.23</u>
Allowance for art		<u>£218.66</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£7,373.88</u>
Cost for construction scheme	Total :	<u>£44,655.17</u>
Conversion from £ to € using PPP of 1.41		€ 62,963.80

Dodder CFRAM

Calculation of option cost

Assessment Unit Tallaght
Option 2 Improvement of Channel

Basic Construction cost including preliminaries		<u>£19,500.00</u>
Contingency allowance 20%		<u>£3,900.00</u>
Construction Cost Excl VAT	Sub-Total :	<u>£23,400.00</u>
Detailed design (design fees - 6%)		<u>£1,170.00</u>
Construction supervision		<u>£1,950.00</u>
Allowance for archaeology		<u>£2,925.00</u>
Allowance for environmental mitigating measures		<u>£1,170.00</u>
Allowance for compensation and land aquisition		<u>£2,437.50</u>
Allowance for art		<u>£195.00</u>
Maintenance costs (discounted NPV of costs throughout project lifespan of 50years)		<u>£6,576.04</u>
Cost for construction scheme	Total :	<u>£39,823.54</u>
Conversion from £ to € using PPP of 1.41		€ 56,151.19