

FOI 1171

Ken Foxxe, Right to Know

Record No. 6

John Mockler

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Sent: Tuesday 9 March 2021 10:53
To: Caroline Nally
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Subject: FW: Lough Funshinagh
Attachments: NWRM_CCAP_extracts.docx; Draft Brief for Lough Funshinagh Environmental Management Measures -Working Doc_WS.docx

Hi Caroline,
See attached further comments in the attached Draft Brief from FRRM and below.
Regards Miriam

Miriam Mulligan
Western Drainage Maintenance

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From: Wolfram Schluter <Wolfram.Schluter@opw.ie>
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Subject: RE: Lough Funshinagh

Miriam,

Thanks for providing the MW Report and other supporting documents, which I have reviewed and have a number of comments:

- The Conclusion of the MR Report states '*...However, the Benefit to Cost Ratio is far too low to be eligible for funding by the Office of Public Works.*'
- There is no mention of flood history or affected properties, which should be included in the Background Information.
- The target SoP needs to be defined better; currently the Spec states that this needs to be linked to the SAC objectives but gives no explanation what they are or how this could be determined?

- From review of the MW Report, I note that flood risk is associated with the Loughs only (& not the Streams), in which case the 1D2D modelling is not applicable. I suspect that a water balance/ reservoir model would be required and input from GSI should be sought to define the requirements. A 1D only model would suffice to design the proposed outflow.
- The Spec mentions a range of hydrological estimation methods but for a water balance model, rainfall runoff modelling is the only one that I could see being applicable? Again, seek input from GSI on defining this.
- A few sections seem to be out-of-order: Property Impact report should be under Stage III and not Stage I, GSI water balance model should be under Hydrology and not Hydraulics, and should probably also be mentioned under Background Information.
- I have corrected a few typos but Section Numbers are missing and formatting needs to be sorted.

I have also attached extracts from the main Scheme Brief on NWRMs and CC Adaptation, which may be useful.

Regards,
Wolfram

Wolfram Schluter
Flood Risk Assessment and Management

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LOUGH FUNSHINAGH AND LOUGH CUP ENVIRONMENTAL MANAGEMENT MEASURES

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Commented [WS1]: should this be Flood Relief Scheme?

ENGINEERING & ENVIRONMENTAL CONSULTANCY SERVICES

TENDER SPECIFICATION

MARCH 2021

ROSCOMMON COUNTY COUNCIL

Lough Funshinagh and Lough Cup Environmental Management Measures

1

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Lough Funshinagh and Lough Cup Environmental Management Measures

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OTHER SPECIFICATIONS & GUIDANCE

The use of the following specification and guidance advised by OPW is specified within this Tender Specification, and is available at <https://www.opw.ie/en/publication/15dd0-technical-specifications-and-guidance-notes/>. The Consultant shall use the version of the specifications and guidance that is current at the time at which the relevant work is being undertaken: (1) Cost Benefit Analysis (CBA), (2) Option Appraisal and MCA, (3) Engineering Spatial Data Specification (4) Environmental Spatial Data Specification (5) Defence Asset Condition Survey (DACS).

BACKGROUND AND OBJECTIVES

BACKGROUND

In order to advance and implement Environmental Management Measures for Lough Funshinagh and Lough Cup a scheme (hereafter referred to as the 'Scheme') for Lough Funshinagh and Lough Cup, Roscommon County Council (hereafter referred to as 'the Client') intends to commission a Contract, hereafter referred to as the 'Project', to develop and assist with the implementation of the Scheme. This Contract will be procured using one Consulting firm (hereafter referred to as 'the Consultant') to progress both the Engineering and Environmental elements of the Project and resulting Scheme. The Project shall comprise up to five stages, as set out below:

- Stage I: Scheme Assessment, Development, and Design
- Stage II: Planning
- Stage III: Detailed Design and Procurement of Works
- Stage IV: Construction
- Stage V: Handover

PROJECT OBJECTIVES

The objectives of this project are:

1. The identification, appraisal, and design of a Scheme that is technically, socially, environmentally and economically acceptable, and that alleviates the risk of flooding to the community of Lough Funshinagh and Lough Cup, to a determined Standard of Protection;
2. To obtain the necessary planning and environmental consents for the Scheme;
3. To procure, manage, and oversee the construction of the Scheme.

Commented [WS3]: should there be additional environmental aspects be mentioned here (assuming that the title of Brief relates to Environmental Management)?

Further detail on the tasks that form the Consultant's duties in delivering these project objectives are described within this Tender Specification.

PROJECT STRUCTURE

Roscommon County Council is the Contracting Authority and the Client for the purposes of the Project. The Office of Public Works, West Region will assist Roscommon County Council in carrying out technical reviews of the project deliverables at key stages of the Project.

Lough Funshinagh and Lough Cup Environmental Management Measures

Stage I and, if commissioned, Stage II of the Project shall be undertaken on a fixed sum basis by the Consultant. Stages III, IV and V (if commissioned) of the Project will be based on a percentage fee of the works cost.

The progression of this Project beyond Stage I is dependent on a number of factors, and all Stages of the Project may not be required. It is a matter for the Client to decide whether this study proceeds to a subsequent stage, i.e., from Stage I to Stage II, or from Stage II to III, etc. The Client also reserves the right to re-tender for the consultancy services Stages III, IV & V (either for all of the preferred scheme or for later Stages after the implementation of initial Stages).

OUTLINE STUDY AND SCHEME AREAS

The Study Area is the area that contains the:

1. Lough Funshinagh & Lough Cup / Lengths of river channel / watercourse that have hydraulic influence on the area intended to benefit from, and be protected by, any feasible scheme;
2. Full hydrological catchment areas draining to the downstream ends of the river channels / watercourses;
3. Areas that require environmental assessments as part of the development of any such scheme.

The Scheme Area is the area:

1. Within which physical works are proposed to be constructed, accessed and maintained as part of any feasible scheme;
2. That includes those areas that are intended to benefit from, and be protected by, any such scheme;
3. That includes Lough Funshinagh and Lough Cup / the lengths of river channel / watercourse upstream and downstream that are likely to be impacted hydraulically by such scheme.

The focus of the Scheme Area for this Project is the Communities at Lough Funshinagh and Lough Cup; while the Scheme Area shall be as defined by the above criteria, the history of flooding particularly highlights the following locations:

- Ballagh
- Rahara
- Lisfelim
- Lysterfield
- Srahauns
- Kildurney
- Inchiroe and Gortfree
- Carrigan Beg
- Rackans
- Ardmullan

Further information on the community, and on the sources, mechanisms and degree of flood risk in the community, are provided in the attached reports;

Commented [WS4]: again should there be another focus, given the title of the brief and noting that the SoP shall be linked to the SAC?

Lough Funshinagh and Lough Cup Environmental Management Measures

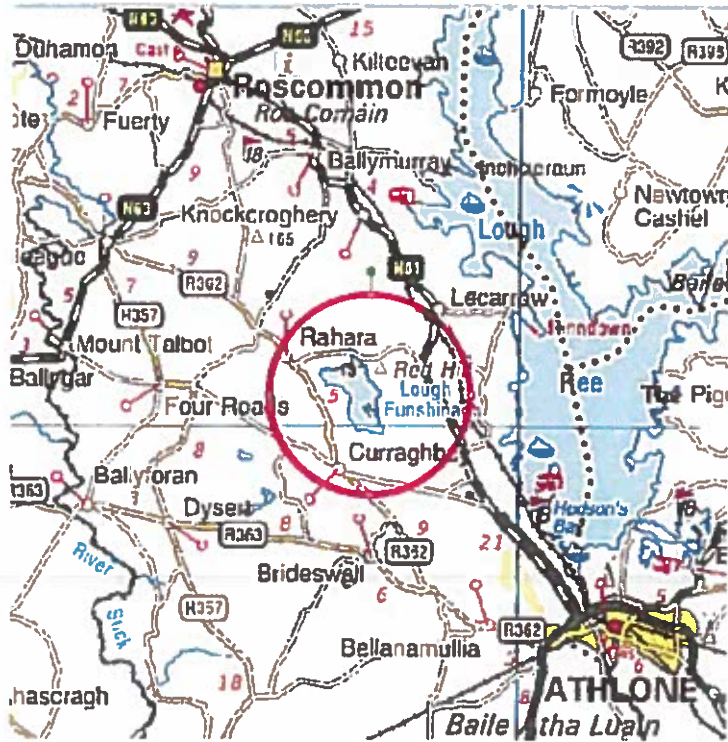
Lough Funshinagh, Athlone, Co. Roscommon Flood Analysis Report – Malachy Walsh and Partners on behalf of Roscommon County Council July 2020 and Ecological Review of Protection Options Lough Funshinagh and Lough Cup – Malachy Walsh and Partners on behalf of Roscommon County Council May 2020.

The Malachy Walsh and Partners Flood Analysis Report concludes that there is a possible viable solution to manage the issues at Lough Funshinagh and Lough Cup, the appointed consultation should progress the appraisal of this solution, while being cognisant as to the technical, social, environmental and economical attributes.

However, noting while the Study Report produced high-level potential options to manage the predicted flood risk to Communities at Lough Funshinagh and Lough Cup, the Consultant shall allow for these options and resulting Study and Scheme areas to be amended by their own analysis and input from the Client if deemed appropriate.

Indicative Study and Scheme Areas for the Project are shown in Figures 1 and 4 respectively.

Figure-1: Outline Study Location



Commented (WSS): Section 8 of the M&V Report (July 2020) states 'However, the Benefit to Cost Ratio is far too low to be eligible for funding by the Office of Public Works' suggesting that there is no viable solution at present.

Lough Funshinagh and Lough Cup Environmental Management Measures

Figure-2: Lough Funshinagh and Lough Cup Location

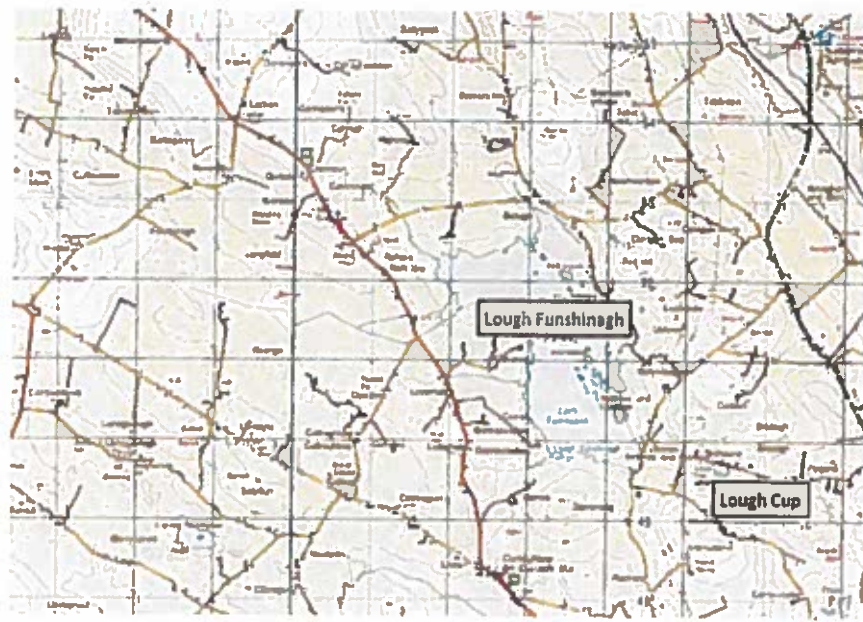


Figure 3: Catchments - Lough Funshinagh (blue) and Lough Cup (red)

Lough Funshinagh and Lough Cup Environmental Management Measures

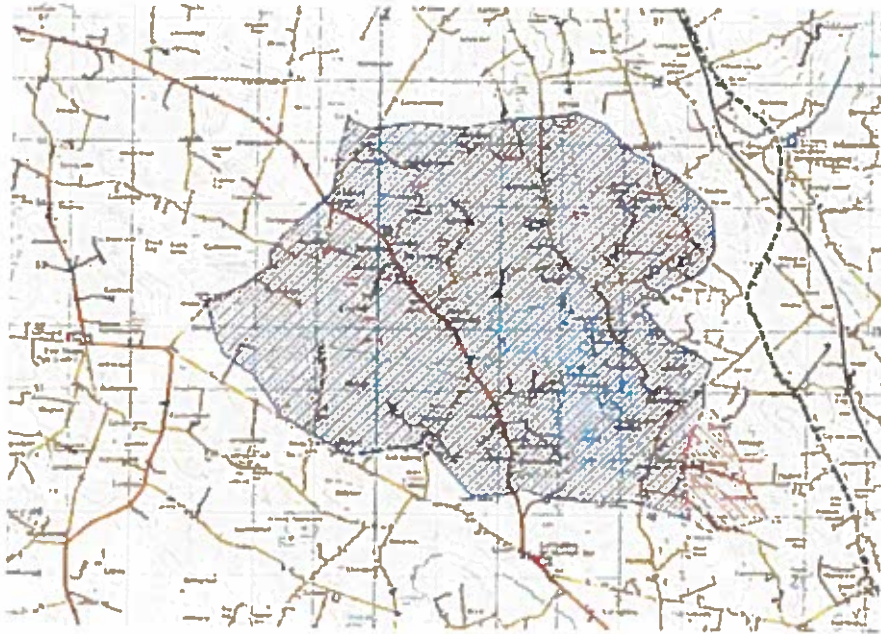
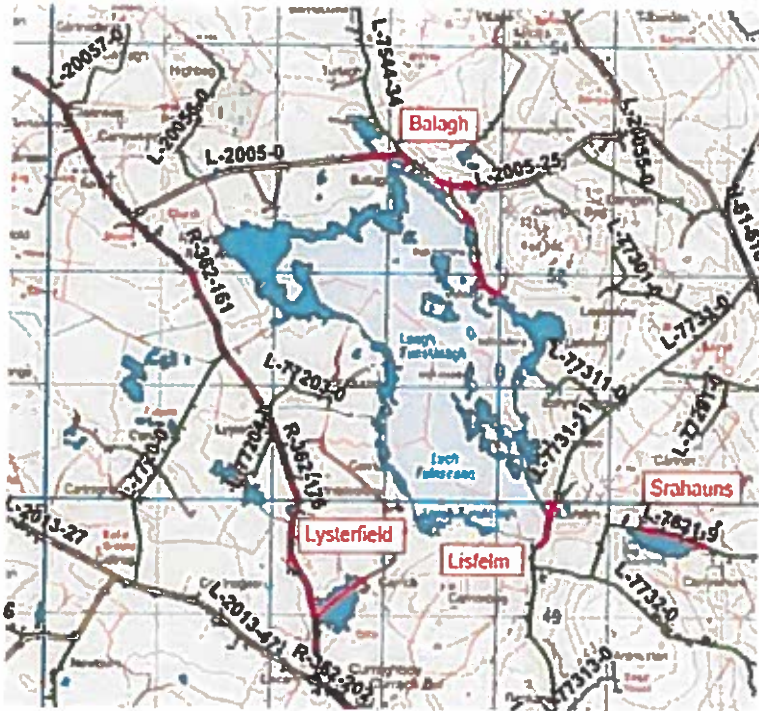


Figure-3: Outline Scheme Area: Townlands affected and roads flooded coloured red.

Lough Funshinagh and Lough Cup Environmental Management Measures



SUMMARY OF FLOOD HISTORY

There is a history of repeat flooding in Lough Funshinagh and Lough Cup, with the Roscommon County Council Area Engineer providing the following information in 2015/2016 Spring 2020 and December 2020/ Spring 2021:

Footage of the flooding can be viewed at:

<https://www.youtube.com/watch?v=99Ha6oWPpFw>

<https://www.youtube.com/watch?v=yXAr5mdznbE>

SCOPE OF SERVICES – GENERAL DUTIES

GENERAL DUTIES

The Consultant shall provide the following Scope of Services throughout all project Stages:

- Project Management services;
- Provision of a project programme,
- Progress and Financial reporting,
- Arrange, minute, and chair monthly Progress Meetings (at the Client's office or online);
- Public & Stakeholder engagement;
- Specification, procurement, and management of external service providers (noting that Roscommon County Council shall act as Client for external service contracts, and the costs of such contracts shall be paid by Roscommon County Council).
- All duties under relevant Health, Safety & Welfare legislation in relation to their own staff; a non-exhaustive list of hazards in relation to site inspections is contained in Appendix A.
- The provision of all deliverables specified herein in draft format, for review by the Client, and the updating of those deliverables in response to comments from the Client,
- Quality Assurance of all deliverables specified herein, in relation to such issues as format, structure, content, accuracy, and fitness for purpose.

DATA COLLECTION

The Consultant shall be provided with the following data following commencement of the Project.

- Malachy Walsh and Partners relevant Datasets provided to Roscommon County Council as part of the Study Commission;
- Existing topographical survey data and LIDAR;
- GSI Groundwater Mapping and Flood Level Data;
- OSI mapping.

All available GSI maps and reports is provided on www.floodinfo.ie and <https://gwlevel.ie/>

The Consultant shall be responsible for the identification, collection, and utilisation of all other datasets required to deliver the project objectives. The cost of the purchase of any such data, or licences, shall be borne by the Client.

DUTIES UNDER HEALTH, SAFETY & WELFARE LEGISLATION

The Consultant shall be appointed as Project Supervisor Design Process (PSDP), and act as the Designer for the Scheme, and shall act in full compliance with the duties as set out in the Safety, Health and Welfare for those roles. The Consultant shall, in fulfilling those roles, provide the following.

- Designer Assessment Records
- Preliminary Safety & Health Plan to include design reference materials, guidance documents and application of the General Principles of Prevention.
- Safety File.

Lough Funshinagh and Lough Cup Environmental Management Measures

- Future maintenance schedules to include recommendation to the client of the statutory powers available to the client for the ongoing maintenance of the built scheme on both public and privately owned lands.

The Client shall carry out a Competency Assessment of the PSDP.

SCOPE OF SERVICES – STAGE I (Scheme Development and Design)

The Consultant shall, within Stage I, undertake the duties set out herein as necessary to meet the project objectives. The Consultant shall also, within Stage I, carry out the general services as set out in Section 2.

SURVEYS

The Consultant shall undertake the following duties to deliver the required surveys. The Consultant shall comply with the requirements of standard public procurement rules in relation to all competitions and the commissioning of external contracts, and shall demonstrate value for money. The Client will cover third party contract costs.

Topographical Survey

1. Review the existing Study data and existing survey data.
2. Identify areas where additional surveys are required in order to fully achieve the project objectives (see Section 1.2), including through walkover surveys by the modeller.
3. Prepare the specification, and other tender and contract documents, for survey services to capture the additional survey data identified necessary to fully achieve the project objectives.
4. Review and evaluate tenders received from tenderers for each survey contract and recommend the preferred tenderer.
5. Manage Survey Contract(s), including contractor liaison, arranging landowner access and dealing with queries and providing quality control of survey results.

Hydrographic Survey

1. Prepare the specification, and other tender and contract documents, for survey services to capture the survey data identified necessary to fully achieve the project objectives.
2. Review and evaluate tenders received from tenderers for each survey contract and recommend the preferred tenderer.
3. Manage Survey Contract(s), including contractor liaison, arranging landowner access and dealing with queries and providing quality control of survey results.

UAV Survey

1. Identify areas where surveys are required in order to fully achieve the project objectives
2. Prepare the specification, and other tender and contract documents, for survey services to capture the survey data identified necessary to fully achieve the project objectives.
3. Review and evaluate tenders received from tenderers for each survey contract and recommend the preferred tenderer.
4. Manage Survey Contract(s), including contractor liaison, arranging landowner access and dealing with queries and providing quality control of survey results.

Ground Investigation Survey

1. Review any existing ground investigation survey data;

Commented [WS6]: Should the OPW Survey Framework be mentioned here? Text from the Scheme BncE

Description of OPW Survey Framework
The OPW has commissioned a framework of survey contractors to provide the survey services listed below –

- Lot 1 – Topographic Surveys, Channel, Structure & Flood Defence Surveys, Post Flood Recording Surveys
- Lot 2 – Hydrographic / Bathymetric Surveys
- Lot 3 – Lidar Surveys
- Lot 4 – Culvert Surveys
- Lot 5 – Site Services Surveys
- Lot 6 – Aerial Photography

A mini-competition will be held for each survey contract, by presenting a Supplementary Request for Tender (SRFT) to the framework. For further details, please refer to the OPW Specification for Surveying Services available at the link below –

<https://www.gov.ie/en/publication/0156dd-technical-specifications-and-guidance-notes/>

Lough Funshinagh and Lough Cup Environmental Management Measures

2. Identify areas where additional surveys are required in order to fully achieve the project objectives (see Section 1.2), including through carrying out walkover surveys;
3. Prepare the specification, and other tender and contract documents, for survey services to capture the additional survey data identified necessary to fully achieve the project objectives
4. Review and evaluate tenders received from tenderers for each survey contract and recommend the preferred tenderer.
5. Manage Survey Contracts, including contractor liaison, arranging landowner access and dealing with queries and providing quality control of survey results.

Property Title Survey

The Consultant shall undertake a Property Title Survey, in accordance with Appendix B, to identify all relevant landowners, and holders of other interests or rights such as tenancies, rights of way, fishing rights, etc, (referred to from hereon as property owners and property) who may be affected by the Scheme and its works, access routes, wayleaves, rights of way and future maintenance requirements.

The Consultant shall create and maintain throughout all Stages of the Project, a register that includes:

- Details of the identified property owners;
- Details of the impact of the Scheme on the property
- Details of any agreements made between Roscommon County Council and the property owner.

The Consultant shall provide the details contained in the register in report format and on a 'per property' basis if requested to do so by the Client; the production of Property Impact Reports shall be paid by the Client in accordance with the requirements of the Instructions to Tenderers.

Commented [WS7]: should this be in the next section?

Structure Condition Surveys

Prior to the commencement of the works, the Consultant shall undertake external and internal condition surveys of any properties within ten metres (or other distance as recommended by the Consultant and agreed with the Client) of any scheme works; the findings for each structure shall be recorded as an entry in a spreadsheet, accompanied by comprehensive photographs in a 'per structure' folder system.

The Consultant shall undertake external and internal condition surveys of any properties during or on completion of the works, and produce a detailed Structure Condition Report, where complaints arise or as requested by the Client.

Each structure condition survey, and the production of Property Impact Reports, shall be paid by the Client in accordance with the requirements of the Instructions to Tenderers.

The Consultant shall recommend to the Client where, in their opinion, monitoring of construction-related impacts on structures is required. The cost of such monitoring shall be borne by the Client as a third party cost.

The Consultant shall undertake condition and safety surveys of all existing bridge structures within the scheme area to determine the effects of high flows on the structural integrity of the bridge and produce a detailed Structure Condition Report.

Lough Funshinagh and Lough Cup Environmental Management Measures

The Consultant shall prepare and lodge Section 50 applications to the OPW for any proposed works to the bridge/culvert structures identified as part of the scheme.

Commented [WS8]: Not part of Stage I, suggest to move to Stage III

Environmental Surveys

The Consultant shall undertake the following environmental baseline surveys to support the Environmental Assessments described in Section 3.5:

- Habitat & species surveys;
- Landscape and visual;
- Ornithological surveys;
- Aquatic & terrestrial invasive species;
- Water quality baseline surveys;
- Hydro-morphology baseline surveys;
- Architectural surveys;
- Other surveys to target project specific sensitivities and features;
- Potentially contaminated ground (using historical and current maps showing locations of industry).

Where specific detailed environmental surveys are required to make a sufficient level of detail available for development and appraisal of the Scheme, these will be specified, procured and managed by the Consultant, with the cost of the approved additional surveys (i.e. the third party fees) borne by the Client.

The following is a non-exhaustive list of specialist surveys:

- Archaeological surveys (terrestrial and underwater);
- Fish, invertebrate & freshwater aquatic species surveys;
- Bat surveys;
- Archaeological geophysical surveys;
- Tree surveys to inform potential for removal of trees to prevent channel and bridge structural blockage going forward
- Noise & vibration surveys;
- Other surveys to facilitate potential Wildlife Act licences, Archaeological licences or consents;
- Contaminated ground surveys;

Water Balance Survey

Previous studies of Lough Funshinagh suggest that it is not technically a turlough because it is not groundwater fed. While various pieces of evidence do point towards this, it is still not certain. In order to have confidence in this theory, and thus provide confidence in the overall conceptual model of the lake, a water balance survey should be carried out to determine how much of the flooding is derived from the rivers feeding it. To do this, the consultant would need to shall collect river flow information from every stream entering the turlough.

Lough Funshinagh and Lough Cup Environmental Management Measures

One stream at Lysterfield is monitored by the EPA (see here - <https://www.epa.ie/hydronet/#26243>) ~~this could be used for information, however~~ and the consultant is required to carry out flow gauging to develop a rating curve. In addition the consultant ~~should~~ shall monitor flows in the other streams to inform the overall water balance. If any of them are as large as the Lysterfield stream, the Consultant shall take the should consider gauging and develop rating curve them, otherwise, if not, regular spot measurements will suffice.

Groundwater Survey

A groundwater survey of the area surrounding the lake to identify the lake's relationship with groundwater shall be carried out.

In 2016 GSI did a quick survey of boreholes around the lake and found that groundwater levels were all approx. 2-3m below the turlough level, suggesting that the lake was perched above the groundwater table.

Repeating this study at different times over a flood season would enhance confidence in the theory and improve the conceptual model of the lake.

It is suggested that this could be done in conjunction with doing spot measurements of the streams as per the water balance survey, a survey sweep of a number of boreholes could be included in the same days' fieldwork.

Data Collection

Typically, 3-4 years of data would provide enough to confidently in calibrating a turlough model. ~~However at Lough Funshinagh's this is different. The turlough appears not to be operating regime as it was suggested it did historically appears to have changed,~~ and as such, effort should be put in to get as much historic data as possible.

It is hoped that ~~we can show that~~ a single model can simulate the 2016-2020 period ~~as well as simulate including~~ previous emptying events to confirm that, then we confirming if the current high water levels are mainly caused can be explained by rainfall, alone (rather than a blocked swallow hole).

Aside from normal data sources such as local knowledge and literature review, the appointed consultant will be required to review satellite imagery, namely Landsat. The Landsat archive should shall be reviewed in order to find notable high and low events at Funshinagh.

The official Landsat viewer is available at <https://landlook.usgs.gov/landlook/viewer.html> under maintenance (<https://landsatlook.usgs.gov/>) but this is a reasonable alternative <https://livingatlas2.arcgis.com/landsatexplorer/>

HYDROLOGICAL AND HYDROGEOLOGICAL ANALYSIS

The Consultant shall undertake a hydrological analysis as necessary to meet the project objectives.

The hydrological analysis shall include the estimation of design and historic event flows and the associated hydrological parameters, at Hydrological Estimation Points (HEPs) along any receiving river reaches, the determination of boundary conditions, and the calibration of the resulting flows and parameters.

The catchment in Lough Funshinagh is believed to be fed by several local streams but there is no overland outflow. The streams are mainly to the north and west of the lake. Reduction in water levels is understood to be by infiltration into the underlying karst system and by evaporation. While infiltration is likely to be diffused there are 2 submerged swallow holes at the southern extremity of the lake that is thought to be the main outlet. Upwelling from this source is not known to occur/reoccur.

Commented [WS9]: The text should specify how many of these surveys are required to be provided. Alternatively, the survey could be done using groundwater level loggers over a certain period, which may be more cost effective, as these could be left in situ for a prolonged period and provide continuous WL data.

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Commented [WS10]: is this relevant for a water balance/ reservoir model? Suggest to seek assistance from GSI to specify requirements of this section.

Lough Funshinagh and Lough Cup Environmental Management Measures

The Consultant shall employ a number of hydrological estimation methodologies, for the purposes of comparison, and shall place particular emphasis on rainfall-runoff methods, and the simulation of historic events in consultation with experts on Groundwater from GSI and the ongoing GSI Groundwater Monitoring Programme.

Commented [WS11]: it is unclear of what these might be?

The Consultant shall, after their review of the available hydrological data and their review of the survey data and survey requirements, provide to the Client a technical note setting out their approach to the hydrological assessment and hydraulic modelling (see Section XX below). The Technical Note shall include the proposed approach to:

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- Flow estimation methods, and determination of associated parameters;
- Determination of other model requirements, such as boundary conditions and sensitivity testing;
- The calibration of the resulting hydrological parameters and the hydraulic model.

The Technical Note shall be discussed with the Client at a technical meeting, and the Consultant shall update the Technical Note as required to reflect the outcomes of that discussion.

The Consultant shall carry out an iterative approach, between the hydrological assessment and the hydraulic modelling (Section 3.3), to ensure the hydrological flows are consistent with the hydraulic flows, making any amendments as appropriate where significant divergences occur.

Commented [WS12]: Section Number missing.

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Design Flood Parameters (NEEDS TO BE REWRITTEN TO REFLECT TURLOUGH AND GROUNDWATER FLOWS)

The Consultant shall derive the current scenario design flows and parameters for events with an annual exceedance probability (AEP) of 50%, 20%, 10%, 5%, 2%, 1%, 0.5% and 0.1%.

Commented [WS13]: full range of event AEP required for Cost Benefit Analysis, suggest to include

The Consultant shall also derive the flows and parameters for calibration/validation events.

The Consultant shall assess the uncertainty and statistical error associated with the design flows, and shall use this assessment to guide their design of the Scheme.

The calculation of Annual Exceedance Probability (AEP) extents and flows at Funshinagh is understood to be complex. AEP's represent the probability of a flood occurring in a given year in isolation from other years. However, the long term flood pattern at Funshinagh means that the floods in any given year are not isolated from other years. As such, the AEP's for certain flood levels at Funshinagh ~~should technically~~ **are expected to** change from one year to the next, based on its initial conditions. Therefore the appointed consultant will be required to use static AEP levels with possibly very large uncertainty bounds. The design of the scheme shall account for these uncertainties.

Climate Change

The Consultant shall calculate design flows and parameters of the proposed flood relief channel with appropriate allowances.

Commented [WS14]: first time that this is mentioned here. It needs a reference for more information.

The Consultant shall calculate design flows and parameters with appropriate allowances for two possible future scenarios, namely the Mid-Range Future Scenario (MRFS) and the High End Future Scenario (HEFS) that take account of climate change, in accordance with the requirements set out in **Table -1** ~~Table -1~~.

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Table -1: Allowances for Future Scenarios

Lough Funshinagh and Lough Cup Environmental Management Measures

	MRFS	HEFS
Extreme Rainfall Depths	+ 20%	+ 30%
Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 500 mm	+ 1000 mm
Land Movement	- 0.5 mm / year ¹	- 0.5 mm / year ¹

Note 1. Applicable to the southern part of the country only (Dublin – Galway and south of this)

HYDRAULIC ANALYSIS AND MODELLING

The Consultant shall undertake the hydraulic analysis and modelling as necessary to meet the project objectives.

Hydraulic Modelling Software

The hydraulic models shall be developed in consultation with ~~GSI-GSI~~ using either Flood Modeller Pro, ~~ISIS-Tuflow~~, Mike Flood (Mike 11/ Mike 21), Innovyze ICM, or HEC-RAS software. Other software packages may not be used, unless it can be demonstrated to be of an equivalent standard.

Hydraulic Analysis

The Consultant shall develop a dynamic 1D-2D hydraulic model for the specified watercourses and estuary, and their associated floodplains, and using that hydraulic model shall:

- Calibrate the model, and establish and map the current scenario pre-scheme condition;
- Assess sensitivity;
- Assess and appraise flood risk management options and identify a preferred option ('the Scheme');
- Map the Benefitting and Defended Areas for the Scheme;
- Carry out detailed design of the Scheme;

The Consultant shall run the models for the full range of probabilities specified in Section 3.2.1 for the current scenario and for the MRFS, and for the 10%, 1% and 0.1% AEP events for the HEFS. Deviations from these requirements may be permitted pending agreement with RCC.

Through the GWFlood Project (2016-2019), Geological Survey Ireland (GSI) have been monitoring and modelling groundwater flooding at priority sites including Lough Funshinagh. As part of this project, the GSI funded a research fellowship with The Institute of Technology Carlow (ITC) whereby hydrological models of turloughs, including Funshinagh, were developed and used to calculate Annual Exceedance Probability flood maps. In April 2020, a further 2 year research project was awarded to ITC which aimed at enhancing the groundwater models and utilising them for flood forecasting and climate change prediction applications. Through this ongoing research project, GSI and ITC are available to engage with the consultant and contribute the model and analysis to the scheme.

The Funshinagh model is a rainfall-runoff model (or reservoir model). It can simulate water levels in the turlough based on rainfall and evapotranspiration inputs. The model does not directly simulate flow or flood extents. The consultant is required to assess the suitability of the Funshinagh model for integration into the scheme. The consultant will liaise with GSI and ITC to inform themselves of the limitations of the flood modelling and the assumptions which have been made during the

Commented [WS15]: alternative packages may need to be considered assuming that a water balance model is required, such as Mike NAM, IIEC, HIMS

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Commented [WS16]: Would a 1D model suffice, given the uncertainty associated with the Lough? Tuflow and Mike 21 would only be required if the 2D aspect is needed

Commented [WS17]: relevant section has been removed and we are only looking for 3 AEP here. Recommend that all 3 AEP events are assessed

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Lough Funshinagh and Lough Cup Environmental Management Measures

research project. If the model is deemed appropriate, then ITC will be available to provide analysis and products from the hydrological model. The outputs of the model will consist of reconstructed flood levels at Lough Funshinagh as well as derived datasets such as flood volume, flood area and net input/output. GSI and ITC will not be responsible for the design of engineered flood alleviation measures.

Input from ITC is available for up to 15 working days up until the 1st of October 2022. Any input from ITC needed beyond this allowance will **require** approval by the RCC.

SCHEME ANALYSIS AND DEVELOPMENT

The Consultant shall assess all potential flood risk management measures in order to identify potential options and shall, subsequently, identify a preferred option ('the Scheme') that achieves the required Standard of Protection within the Scheme Area, in a technically, socially, environmentally, and economically, viable manner.

The Consultant shall develop and design the Scheme as the Designer, and to a level of detail such that Roscommon County Council may have confidence in taking forward the Scheme through the planning process in Stage II of the Project and that it will progress with limited variation that may arise through the Planning and Detailed Design processes.

Target Standard of Protection

The Target Standard of Protection (SoP) of the Scheme shall be to ensure that maximum level of flooding of Lough Funshinagh is not in excess of the objectives of Special Area of Conservation (SAC) and below that of the public road network in the vicinity thus protecting the properties and assets within the Scheme Area.

Natural Water Retention Measures

The Consultant shall investigate the potential for natural water retention measures (NWRMs), to compliment the Scheme. The Consultant shall, based on this investigation, develop proposals for NWRMs, which are both effective technically but also practical to implement.

Climate Change Adaptation

The Consultant shall consider and assess the potential impacts of climate change in the assessment and selection of the options for the Scheme, and in design of the Scheme, to ensure that the Scheme accounts for, or can be adapted to, the potential future scenarios set out in Section 3.2.2, in maintaining the defined Standard of Protection over time in a technically, socially, environmentally, and economically viable manner.

Multi-Criteria Analysis

The Consultant shall support the selection of the Scheme utilising the Multi-Criteria Analysis (MCA) set out in the document 'Technical Methodology Note - Option Appraisal and the Multi-Criteria Analysis (MCA) Framework' (OPW, September 2018).

Cost Benefit Analysis

The Consultant shall calculate the economic flood damages, and the economic benefits of the Scheme, and produce a Cost Benefit Analysis as set out in the document 'Technical Methodology Note - Cost Benefit Analysis (CBA)' (OPW, September 2018).

The Consultant shall calculate the costs of the Scheme in accordance with the general guidelines contained in Appendix G; the construction costs shall be based on a detailed assessment of the Scheme by the Consultant.

Commented [WS18]: Suggest that a summary of this is included at the start of the Spec. as it is important in understanding of what the Project is about. Rainfall runoff modelling relates to hydrology and this maybe better placed under that section.

Commented [WS19]: This is the first time the SAC is mentioned. More information on this is required. How is the SoP intended to be defined?

Commented [WS20]: suggest to use text from the large brief, if NWRM is to be assessed

Commented [WS21]: suggest to use text from the large brief if CC adaptation is required

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Lough Funshinagh and Lough Cup Environmental Management Measures

The Consultant shall calculate the economic flood damages, and the economic benefits of the Scheme, and produce a Cost Benefit Analysis. The Cost Benefit Analysis should be carried in accordance with the principals of the 'Multi Coloured Manual' of 2013.

Lough Funshinagh and Lough Cup Environmental Management Measures shall consider social, environmental and economic impacts.

Commented [W522]: this typically requires the full range of return periods (see earlier comment).

ENVIRONMENTAL ASSESSMENT

The Consultant's engineering and environmental teams shall work in collaboration with each other, have a two way flow of information and take into account the requirements of the EIAR, NIS, other statutory environmental requirements, and national policy, in the assessment of the flood risk management options, and in the identification, development and design of a preferred option (the 'Scheme'), for:

Ballagh
Rahara
Lisfelim
Lysterfield
Srahauns
Kildurney
Inchiroe and Gortfree
Carrigan Beg
Rackans
Ardmullan

Commented [W523]: This needs to link to the Sub' and define how this should be determined.

The Consultant shall fully integrate the information and knowledge gained from the environmental assessments, and the outcomes of the statutory environmental consent processes, with the technical assessments, in particular in the selection and development of the preferred option, and the design of the Scheme.

The Consultant shall, in line with the Aarhus convention, accurately record the integration of the SEA / EIA / AA / national legislation and good practice with the decision making process. Within that process, the Consultant shall take full account of the principal of the Dresden Declaration on Flood Protection for Historic Sites 2014 and integrate this principal similarly.

Environmental Surveys

The Consultant shall undertake all baseline environmental surveys at the earliest possible opportunity, particularly where the information shall be necessary to inform future monitoring of specific sensitivities. The Consultant shall provide to the Steering Group details of the methodology proposed for undertaking all environmental surveys. The Consultant shall, for all applicable environmental aspects, carry out the following tasks using competent experts in the relevant disciplines:

- All associated desk studies and consultations with all relevant stakeholders,
- Habitat and species walkover surveys, including invasive species,
- Field Investigations and ground truthing.

The following is a non-exhaustive list of typical baseline surveys/assessments

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- habitat & species surveys
- landscape and visual
- ornithological surveys
- aquatic & terrestrial invasive species
- water quality baseline surveys
- hydromorphology baseline surveys
- architectural surveys
- archaeological surveys (terrestrial and underwater)
- other surveys to target project specific sensitivities and features
- other surveys to facilitate potential Wildlife Act licences, Archaeological licences or consents etc.
- review and identify potential contaminated ground using historical and current maps showing locations of industry.

Where specific detailed environmental surveys are required to make a sufficient level of detail available for development and appraisal of the Scheme, these will be specified, procured and managed by the Consultant in accordance with **Sections 3.2 and 3.3**; the cost of the approved additional surveys (i.e. the third party fees) will be paid for by the Client.

The following is a non-exhaustive list of specialist surveys:

- fish, invertebrate & freshwater aquatic species surveys
- bat surveys
- benthic surveys for tidal mudflat works
- archaeological geophysical surveys
- ~~• Underwater Archaeological Impact Assessment (UAI, including dive survey where appropriate)~~
- tree surveys
- noise & vibration surveys
- contaminated ground surveys

The Consultant shall be responsible for obtaining any licences or other authorisations required to undertake the surveys and the associated cost shall be included in the Fee.

Invasive Species Surveys

Following the completion of the invasive species survey, the Consultant shall develop biosecurity requirements for the Scheme Area and prepare an Invasive Species Management Plan for the Project including, but not limited to, the following:

- Details of the location and extent of invasive species within the Scheme Area, including maps,
- Consideration of both aquatic and terrestrial invasive species,
- An assessment detailing the risk posed by invasive species to the Project including, but not limited to, cost and programme risks,
- Treatment options for all invasive species identified including a cost estimate for each treatment option,
- A recommendation on the treatment option for each invasive species identified.

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Treatment of invasive species shall commence immediately after the commencement of the Project, to avoid posing risk to the progression of the Project. The Consultant shall prepare, specify, procure and manage any contracts for the treatment of invasive species, based on the recommendations of their environmental team

It is important to note that although the baseline survey shall be undertaken during Stage I, the treatment of invasive species, and therefore the preparation, procurement and management of any invasive species treatment contracts shall also be required during Stages II and III. The Consultant shall carry out ongoing monitoring of invasive species during the duration of the Contract, and shall review and update the Invasive Species Management Plan on an annual basis. The review shall include, but is not limited to, updating the maps, risk assessment, treatment options and recommendations of the management plan. The review shall also provide details of the effectiveness of any treatment carried out in the previous period.

Constraints Study

The Consultant shall identify the key environmental issues associated with the development of the Scheme within the Scheme Area which may be impacted upon by possible flood alleviation measures and/or which may impose constraints on the viability and/or design of these measures. The scope of the issues considered shall at a minimum reflect the scope of an Environmental Impact Assessment (EIA), in accordance with the requirements of the EIA Directive 2014/52/EU:

- a) Population & Human Health
- b) Biodiversity
- c) Land, Soil, Water, Air and Climate
- d) Material Assets, Cultural Heritage and the Landscape
- e) The interaction between the factors referred to in points a) to d).

The Consultant shall undertake a series of desk studies, consultations with all relevant stakeholders, and organise preliminary field investigations by their competent experts in the relevant disciplines to identify issues that might be relevant to, or impose constraints on, the design and construction of the scheme. A number of the potential environmental issues are detailed below:

- In terms of Population and human health, flood-related social or socio-economic issues, the Consultant shall include such aspects as tourism, recreational use, amenity and connectivity to the waterway.
- In relation to Biodiversity, the Consultant shall identify the key species, the location of relevant habitats, and the aspects of the species or habitat that could potentially be impacted upon, or constrain, the design and construction of a flood alleviation scheme. Biodiversity enhancement measures shall be identified and due consideration be given to the National Biodiversity Plan 2017-2021 particularly to Action 4.3.1 Ensure that Flood Risk Management (FRM) planning and associated SEA, EIA and AA, minimises loss of biodiversity and ecosystem services through policies to promote more catchment-wide and non-structural flood risk management measures.
- In terms of Land & Soils, the Consultant shall have regard to the areas where the scheme design may require disturbance or excavation that overlap with suspected contaminated

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ground, and include any such areas in the procurement of site investigation contractors for further investigation.

- In relation to Water, the Consultant shall identify water quality elements and hydromorphological quality elements that could be impacted upon or act as a constraint to the scheme design.
- The Consultant shall identify archaeological, architectural and cultural heritage aspects, such as known sites and features and areas of archaeological and / or heritage importance and potential. For known sites, the Consultant shall identify a zone of avoidance around the site, if relevant.
- For potential archaeological sites/locations, including underwater cultural heritage, the Consultant shall carry out UAIA's at the earliest opportunity to inform the design and/or preferred option (the 'Scheme').
- The landscape study shall include identifying the significant features in the landscape, which determine its character, with particular reference to the river and the adjacent banks.

The Consultant shall organise an opening Public Consultation Day (PCD) within the timeframe as specified in [Section 3.5.3](#). The Consultant shall invite the relevant consultees to attend the PCD or to make any views known by way of a questionnaire and by general correspondence.

Constraints Report

The output from the Constraints Study shall be a report, including graphics, which shall identify the constraints and issues arising and provide a full account of the findings of the study and Opening PCD, the topics and geographic areas covered, the documents referred to and the organisations and people consulted. The Consultant shall brief the Steering Group on the findings of the study and be available to answer further queries, if necessary. This briefing shall include the feedback from the Opening Public Consultation Day.

Environmental Assessment of Viable Options

The range of flood alleviation measures/options typically considered as part of the Scheme Analysis and Development, and which would need to be considered in relation to possible impacts or constraints are listed in [Section 3.6.1](#).

Following completion of the Constraints study, the Consultant shall assess in detail and report on the potential environmental impacts associated with each measure/option assessed in the optioneering process. This assessment shall be included in the selection of the preferred option (the 'Scheme'), the development and design of the Scheme and to identify mitigation measures. The potential impacts, both positive and negative, shall be described in terms of quality, significance, duration and type, as defined in the Descriptions of Effects in the Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017). The Consultant shall use the assessment to supply the environmental information for the Multi-Criteria Analysis used in identifying the preferred scheme (see [Section 3.6.4](#)), and shall record the assessment in the Option Development Report ([Section 3.6.1.4](#)).

Hydromorphological Assessment

The Consultant shall carry out hydromorphological assessments for the Do-Nothing scenario (i.e. the existing conditions) and all viable options for the Scheme. The assessment of the Do-Nothing

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scenario will be conducted as part of the Hydromorphology Survey in the baseline surveys. The River Hydromorphology Assessment Technique (RHAT) shall be used to complete the same and shall be in accordance with the following guidance or the latest version of the same, as guidance is periodically updated:

- River Hydromorphology Assessment Technique (RHAT), Training guide, Version 2. (Environment Agency Northern Ireland, 2014).

Hydromorphological assessments are to be carried out by competent experts with an appropriate background and sufficient skills in fluvial geomorphology. RHAT scores give insight to physical habitat quality/condition, are carried out at a site scale and the findings of the assessments shall be used to more fully understand the potential positive and negative hydromorphological impacts posed by the viable options to the hydro-geomorphological regime within the Study Area, and develop the design in a manner to minimise impacts.

The consultant shall identify existing EPA monitoring stations relevant to the study area and liaise with EPA to gather all existing RHAT scores and other morphological information such as Morphological Quality Index (MQI) scores where available. The findings of these assessments are to form part of the considerations in the preferred option selection process and be integrated into the hydromorphological assessment of the preferred option within the EIAR as appropriate.

Natura Impact Statement

The Consultant shall prepare a Screening Statement for a NIS. This shall be done in line with 'Appropriate Assessment of Plans and Projects in Ireland – Guidance from Planning Authorities' (DoEHLG 2010) and the 'Appropriate Assessment Screening Methodology for the Maintenance of Arterial Drainage Schemes' (OPW 2014) or an equivalent methodology approved by the Steering Group. The NIS Screening shall consider the likely impacts of the preferred Scheme on relevant Natura Sites and conclude with a recommendation on whether a full NIS is required, with the completion of the NIS in Stage I.

Subject to the results of the Screening for an NIS and instruction from the Client to proceed, the Consultant shall undertake a NIS, based on best scientific knowledge, to assess the potential impacts of the preferred flood relief scheme measures on identified Natura 2000 sites in the context of the conservation objectives of those sites. A competent expert, employed by the Consultant, is required to undertake all stages of the NIS. The NIS shall be produced in line with relevant components of the current environmental guidelines. A non-exhaustive list of current guidelines is as follows and the NIS shall be in accordance with the same or the latest version of the same, as guidance is periodically updated:

- National Guidance such as: Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities (DEHLG, 2010),
- General Commission Guidance such as: 'Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC' (European Commission 2019 (in draft)),
- Relevant Specific Sector Guidance such as: 'Implementation of the Birds and Habitats Directives in estuaries and coastal zones' (European Commission 2011) and 'Inland waterway transport and Natura 2000' (European Commission 2012),

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- Relevant Commission Notices and Case Studies such as: 'Commission Notice - Managing Natura 2000 sites - The provisions of Article 6 of the Habitats Directive 92/43/EEC' (European Commission 2018).

The Consultant shall engage and consult with the National Parks and Wildlife Service (NPWS), Inland Fisheries Ireland (IFI) and other relevant stakeholders at an early stage and during the process as required.

The Consultant shall be required to produce the NIS, which assesses the preferred scheme and prescribes mitigation and environmental improvement measures, and bring the preferred flood relief scheme to the conclusion that the Project shall not adversely affect the integrity of any Natura 2000 site, either alone or in combination with any other plans or projects.

The Consultant shall reflect the latest understanding stemming from case law in the NIS, including that which has interpreted that mitigation cannot be considered in the NIS screening decision, its methodology and conclusions.

While there is no explicit requirement for environmental monitoring for the implementation of projects on Natura 2000 sites under the Habitats Directive, where monitoring is proposed as part of the NIS process, the Consultant shall devise the monitoring programme to allow for the assessment of the impact of the preferred engineering flood relief scheme option on identified Natura 2000 sites. The Consultant shall integrate any such monitoring programme into both the monitoring requirements set out in the EIA and the Stage I Construction Environment Management Plan (CEMP) (see [Section 3.2.2](#)).

Environmental Impact Assessment

The Consultant shall prepare an Environmental Impact Assessment (EIA) Screening Statement to assess if the preferred Scheme has likely significant effects on the environment. This shall be done in line with the following and other relevant guidance i.e. 'Environmental Impact Assessment of Projects Guidance on Screening' (European Commission 2017) and 'Environmental Impact Assessment (EIA) Guidance for Consent Authorities regarding Sub-threshold Development' (DoEHLG 2003).

The Scoping and EIA shall be in line with relevant components of the current guidelines. A non-exhaustive list of current EIA related guidelines is as follows and the process shall be in accordance with the same or the latest version of the same, as guidance is periodically updated:

National Guidance such as:

- 'Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, 2017).
- 'Draft Advice Notes for preparing Environmental Impact Statements' (EPA 2015).
- 'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment' (DoCLG 2013)

General Commission Guidance such as:

- 'Environmental Impact Assessment of Projects Guidance on Screening' (European Commission 2017).
- 'Environmental Impact Assessment of Projects Guidance on Scoping' (European Commission 2017)
- 'Guidance on the preparation of the Environmental Impact Assessment Report' (European Commission 2017)

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Relevant Specific Sector Guidance such as:

- 'Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment' (European Commission 2013)

The Consultant also shall take full account of the principal of the Dresden Declaration on Flood Protection for Historic Sites 2014 and integrate this principal into the development of any flood risk management options.

EIA Scoping and Consultation

The Consultant shall consult the relevant statutory and non-Governmental Organisations (NGOs) with interest in the specific aspects of the environment likely to be affected by the Scheme (refer to table below). The EIA Scoping shall be in line with relevant components of the current guidelines. The Consultant shall prepare an EIA Scoping Report. The Scoping Report shall set out the key characteristics of the project, the sensitivities likely to be present in the receiving environment and the key potential environmental aspects of the project.

The Consultant shall also organise a second PCD (refer to **Section 8.7**). The purpose of this PCD shall be to provide information to the local community on the emerging preferred Scheme. The comments and queries raised at the PCD shall be considered in the scheme design and during the preparation of the Environmental Impact Assessment Report (EIAR).

Listed below is a non-exhaustive list of possible organisational stakeholders. The Consultant shall identify any further relevant stakeholders.

1. Most relevant Government Departments
Department of Agriculture, Food and the Marine
Department of Communications, Climate Action & Environment
Department of Culture, Heritage and the Gaeltacht
Department of Public Expenditure and Reform
Department of the Housing, Planning & Local Government
Department of Transport, Tourism and Sport
2. Primary Stakeholders
Local Authorities
Environmental Protection Agency
Office of Public Works
3. Secondary Stakeholders
An Taisce
Angling Clubs
Birdwatch Ireland
Boating Clubs or Associations
Bord Gais

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Bord Na Móna
Chambers of Commerce
Coastal Marine Resources Centre
Forest Service
ESB
Fálte Ireland
Geological Survey Ireland
Heritage Council
Iamróid Éireann
Inland Fisheries Ireland
Irish Creamery Milk Suppliers Association (ICMSA)
Irish Environmental Network
Irish Farmers Association
Irish Water
Landscape Alliance Ireland
Local Authority Waters Programme
Marine Institute
Regional Assemblies
River Trust or other River Community Group
Sustainable Water Network Ireland (SWAN)
Teagasc
Transport Infrastructure Ireland
The National Water Forum (An Forám Uisce)
Water Policy Advisory Committee
Climate Action Regional Office

The Consultant shall prepare photomontages, which are representative of the proposed scheme and illustrate the impact of the preferred option post-implementation. The Steering Group shall determine the number and location of the photomontages to be prepared. The Consultant shall utilise the photomontages at the Public Consultation Days, the workshops, and within the Option Development Report, and EIAR.

Environmental Impact Assessment Report

The Consultant shall prepare an Environmental Impact Assessment Report (EIAR), including a Non-Technical Summary, for the preferred scheme. The EIAR shall be prepared to meet the requirements of the EIA Directive 2014/52/EU.

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While the EIAR and Non-Technical Summary shall be produced to meet the statutory requirements, these publications shall also be an important source of information on the preferred scheme for the general public and shall therefore be prepared with particular attention given to ease of use, clarity, and high quality graphics.

In accordance with the EPA Draft Advice Notes 2015, the Project shall be type 12A. The Consultant shall have regard to the advice notes, relevant guidance and the EIA Directive 2014/52/EU, in determining the topics to be addressed in the preparation of the EIAR. The EIAR shall be tailored to the specific circumstances of the Project and focussed on the likely significant environmental impacts. As part of the EIA process, the following aspects shall be assessed and integrated with the EIAR as follows:

- In terms of the environmental effects in relation to Water, the Consultant shall consider and support the Water Framework Directive (WFD) objectives in the EIAR. The Consultant shall utilise the hydromorphological assessment of the Scheme (see [Section 3.7](#)) and assess the impact on the relevant water body and any resultant potential change in water quality elements and ecological status and may include sediment modelling etc. The assessment should include, but not necessarily be limited to, any available information, historical records or evidence on erosion or deposition, an analysis of the topography, sub-surface materials, site visits and modelled reach velocity profiling for the range of events and for drought and dry flow conditions.
The assessment shall also identify potential hydromorphological enhancement opportunities such as river continuity improvements and have regard to potential for synergies as described in the 'Links between the Floods Directive and Water Framework Directive' (European Commission 2014). The assessment shall make judgement if the Scheme could prevent a water body achieving good status or lead to a deterioration of quality elements. In the case where a derogation is identified, under Article 4(7) of the WFD for new modifications to the physical characteristics of a body of surface water, the Consultant shall integrate within the EIAR, how the Project satisfies the prescribed conditions for the application of Article 4(7).
- In terms of the environmental effects in relation to Climate, the Consultant shall utilise assessment and findings of the Flood Risk Management Climate Change Adaptation Plan ([Section 3.6.1](#)), when assessing the impacts of climate change on the Scheme.

The EIAR is to be prepared by competent experts and the introduction to the EIAR should include a list of the experts who have contributed to the EIAR, showing which parts of the EIAR they have worked on, their qualifications, experience and any other relevant credentials. Experts are required to be suitably qualified and have sufficient expertise in the relevant field that upon examination by the competent authority, shall show that the information provided in the EIAR is complete and of a high quality.

Where the Client appoints Project Specialists to advise on and oversee particular elements of the Project (for example, Project Archaeologist, Project Ecologist, etc), the Consultant shall collaborate with same during the Environmental Assessments, the production of the NIS and EIAR, and in the development and design of the Scheme.

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Monitoring

In accordance with statutory EIA monitoring requirements, the Consultant shall devise the monitoring programme for the monitoring of significant adverse effects on the environment, having regard to the nature, location and size of the scheme, the significance of its effect on the environment and the use of existing monitoring being conducted under other requirements. It may be appropriate, where relevant, to propose monitoring to take place post-construction, in order to demonstrate that the Project in practice conforms to the predictions made during the EIAR. The monitoring programme shall be presented by the Consultant including the relevant indicators, the type of monitoring, the methodology, the frequency, thresholds, and the lifespan of the monitoring.

Mitigation

Mitigation measures are to follow the established EIA mitigation strategies of avoidance, prevention, reduction and offsetting. The principle of Best Available Techniques Not Entailing Excessive Costs (BATNEEC) shall apply to proposed mitigation measures and the Consultant shall propose mitigation measures that are practical, buildable and meet industry best standards. The Consultant will take a proactive approach to the identification of practicable environmental enhancement opportunities, e.g. fisheries instream river enhancement practises, removal of weirs or fish passage improvement works, species enhancement such as artificial otter holt, bat boxes, kingfisher nest cliffs, through to terrestrial enhancement with wildflower seed mixes and native tree riparian planting. With regard to cultural heritage, all proposed mitigation should be to professional standards, and the Consultant shall identify opportunities for public awareness of the archaeological and architectural importance of the scheme, including public talks, publication of results, potential for public realm presentation of elements of discoveries, etc. The Consultant shall produce a schedule of environmental commitments for inclusion in the EIAR.

Construction Environment Management Plan

The Consultant shall prepare and produce a Construction Environment Management Plan (CEMP), in accordance with the guidance contained in the handbook published by the Construction Industry Research and Information Association (CIRIA), Environmental Good Practice on Site Guide, 4th Edition (CIRIA, 2014), or a similar approved document.

The Consultant shall produce the CEMP on a preliminary basis in Stage I (the 'Preliminary CEMP'), and develop it in Stage III (the 'Developed CEMP') to reflect the outcomes of the Planning Conditions/Development Consent Conditions and Detailed Design process which includes considering the buildability/ constructability of the scheme and foreseeable temporary works. The CEMP shall capture all environmental requirements in one document.

The Preliminary and Developed CEMPs shall include, but not be limited to, the following, according to the relevant Project Stage:

- All foreseeable environmental requirements for both the construction stage and permanent works.
- Details of all mitigation measures stemming from all environmental sources such as: NIS, EIAR, and any addendums, Bord Pleanála Further Information responses, Planning

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Conditions/Development Consent Conditions, Wildlife Licences, Archaeological Licences or Consents.

- Environmental requirements resulting from foreseeable activities such as, likely borrow pits, potential site compound locations, expected attenuation ponds etc.
- Foreseeable construction stage requirements such as Waste Permit application by the Contractor.
- Threshold limits for all mitigation measures proposed.
- Details of all monitoring required during the construction of the works and any ongoing long-term monitoring required.
- Agreements with statutory environmental stakeholders e.g. NPWS, IFI, etc.
- Identify any requirements for construction stage environmental liaison with other parties e.g. IFI, community groups etc.
- Define the various Client, Consultant and Contractor responsibilities'.

The Consultant shall prepare spatial data relating to Potential Access Routes and Indicative Extent of Work Areas in accordance with the OPW FRS Engineering Spatial Data Specification (available on <https://www.gov.ie/en/publication/b15dd0-technical-specifications-and-guidance-notes/>).

The Developed CEMP shall become part of the Works Requirements Documents for the Construction Works procurement process in Stage III.

Licences

The Consultant shall carry out the following duties:

- Identify the need for other environmental assessments and requirements, such as Wildlife Act Licence consents, archaeological licences/consents, waste management consents, or other assessments on specific sensitivities or features. The Consultant shall immediately progress the requirement for a Wildlife Licence, to minimise potential programming related issues and delays in project delivery.
- Obtain all environmental licences or other statutory requirements required for submission of the Planning documents.

It is important to note that all environmental licences acquired for Stage I, shall also be required during all other Stages.

Additional Work

Additional work may be required during Stages I to III, subject to approval of the Steering Group. Such work, which cannot foreseeably be identified in advance of commencement of the Project, which would be necessary for the progress and completeness of either the Scheme Analysis and Development, Planning, or Detailed Construction Design and Tender Stages, might include detailed species surveys, underwater ecological or archaeological surveys, archaeological geophysical surveys, test excavations, exploratory excavations, etc which should be carried out at the earliest possible stage so as to inform design, identify and reduce risk. The Consultant shall identify, with appropriate justification, any such work during each Stage of the Project and will be based on the rates set out in the Form of Tender and Schedule. The Consultant shall comply with the requirements of standard public procurement rules in relation to additional works and shall demonstrate value for money.

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Delivery of GIS data

Environmental Management Measures environmental information shall be collated in a series of GIS layers as follows:

- Invasive Species Flora (e.g. American skunk-cabbage, a red alga, etc.),
- Invasive Species Fauna (e.g. American oyster drill, Asian oyster drill, etc.),
- Habitat Maps (area),
- Habitat Maps (line),
- Key Environmental Data (e.g. badger sett, bat roost, common club-rush, etc.),
- Supplementary Environmental Data (e.g. amphibian – any, badger – any, bat – any, etc.).

These GIS layers shall be produced and provided in accordance with OPW FRS Environmental Spatial Data Specification (available on <https://www.gov.ie/en/publication/b15dd0-technical-specifications-and-guidance-notes/>).

The Consultant shall update the National Biodiversity Data Centre with any relevant environmental data gathered while undertaking surveys or during other work at any stage of the Project. The Consultant shall seek the approval of the OPW Environment Section prior to updating, in order to facilitate national consistency.

The Consultant shall ensure the environmental assessment and engineering design are fully integrated, with the environmental assessment detailed in this section to be carried out in such a manner as to inform the selection of the Scheme from the options, the design of the Scheme (and the accompanying MCA), and to support the planning consent process in Stage II (Section 4).

The Consultant shall, in line with the Aarhus convention, record in detail the integration of the environmental assessment into the decision-making and Design processes, in the Environmental and Final Reports.

STAKEHOLDER ENGAGEMENT

The Consultant shall arrange and manage two Public Information Days (PIDs) to collect the views of stakeholders, including the public, and to disseminate information on the Project. The timing of the two PIDs shall be agreed with the Client.

The Consultant's duties shall include arranging a venue, advertising, providing suitable print-ready material on the project, collecting the views of stakeholders, reporting, and incorporation of the received views into the project as appropriate.

The Consultant shall provide responses to the Client in response to queries received during the Project from Stakeholders.

The Consultant shall also provide two presentations on the Project to the relevant elected members.

FINAL REPORT

The Consultant shall submit to the Client a comprehensive Final Report detailing the work undertaken within Stage I of the Project. The Final Report shall be accompanied by the material detailed in Table 3.1 in digital format.

Table Error! No text of specified style in document - 23 - Reporting Requirement and Deliverables (AMEND DELIVERABLES RCC)

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Lough Funshinagh and Lough Cup Environmental Management Measures

Item	Deliverable
Hydrology	GIS layer of catchments and sub-catchments
	Detailed hydrological calculation spreadsheets
	GIS layer of HEPs
	Hydrological Model files (where such models have been developed)
Hydraulics	All hydraulic model digital files in a ready-to-run condition, for all model runs specified within Stage I
	GIS layers of flood extents for pre-Scheme conditions, for the specified current, MRFS and HEFS events
	GIS layer of hydraulic model nodes for pre-Scheme conditions, with flows and levels for the specified current, MRFS and HEFS events
Scheme Development	GIS layer of Property Damage Assessment
	GIS layers of flood extents for post-Scheme conditions, for the specified current, MRFS and HEFS events
	GIS layers of Benefitting & Defended Areas
	Drawings (including line and level) of the Scheme, suitable for submission as part of the planning documentation
As agreed with RCC all GIS layers shall be produced and in accordance with OPW FRS Engineering Spatial Data Specification available on www.opw.ie/en/flood-risik-management/mappedataresourcesandspecifications/technicalspecificationsandguidancenotes	

SCOPE OF SERVICES – STAGE II (Planning)

The Consultant shall, within Stage II, undertake the duties set out herein as necessary to meet the project objectives. The Consultant shall also, within Stage II, carry out the relevant general services as set out in Section 2.

CONSULTANT'S RECOMMENDATION

The Consultant shall, following the identification of the Scheme in Stage I, provide a written recommendation to the Client which confirms or amends the preferred statutory delivery route. This recommendation shall take account of the Consultant's work undertaken in Stage I of the Project. The Client shall confirm or otherwise the statutory delivery route that will be followed, having regard to the Consultant's recommendation.

PLANNING DOCUMENTATION

The Consultant shall produce the planning documentation as detailed in the sections below, in a format and condition suitable for direct submission to An Bord Pleanála.

Lough Funshinagh and Lough Cup Environmental Management Measures

Engineering Services Report

The Consultant shall produce an Engineering Services Report for the Scheme, which shall form part of the Planning Documentation, based on their work undertaken in Stage I and on the Final Report. The report shall identify the existing services in the scheme area and identify conflicts and or potential conflicts and propose mitigation measures, where possible.

Planning Report

The Consultant shall produce a Planning Report to support the application for approval under the Planning and Development Act 2000 (as amended) in respect of the Scheme; the report shall include:

- The context, purpose, and background to the Scheme;
- Description of the Scheme;
- Legislative & Policy context;
- Summary of consultation process;
- Planning review;
- Conclusions.

Summary of Planning Documentation

The planning documents required for submission are summarised as follows:

- Planning Report (likely to be Part X submission) (Section 4.2.3)
- Environmental Impact Assessment Screening Statement (Section 3.5.2)
- Appropriate Assessment Screening and NIS Reports (Section 3.5.2)
- Environment Impact Assessment Report
- Construction Environmental Management Plan (Section 3.5.4)
- Newspaper and Site Notices
- Letters and Planning Documents to Prescribed Bodies
- List of Prescribed Bodies to which notice was issued
- Cover letter to An Bord Pleanála, with list of enclosures
- Engineering Services Report (Section 4.2.3)
- Drawings (Section 4.2.3)

PLANNING PROCESS

Presentation of the Scheme

Upon completing the production of the planning documents (Section 4.2.3), the Consultant shall present the Scheme in detail to Roscommon County Council prior to the submission of the planning documents to An Bord Pleanála.

Oral Hearings

The Consultant shall provide any additional documentation as may be required for any Oral Hearing, should an oral hearing be required. The Consultant shall attend any such Oral Hearings with Roscommon County Council, and provide such expert advice as required to Roscommon County Council.

Lough Funshinagh and Lough Cup Environmental Management Measures

The cost of the duties set out herein for Oral Hearings shall be borne by the Client in accordance with the requirements of the Instructions to Tenderers.

Post-planning

The Consultant shall update the outputs of Stage I as required to take account of any planning/development consent conditions and observations received. This shall generally be done through addendums to the reporting and update of drawings.

The Consultant shall summarise all requirements relevant to the construction of the Scheme, arising from planning/development consent conditions and observations received, in a form suitable for inclusion in the Works Requirement Documents (Section 2.4).

SCOPE OF SERVICES – STAGE III (Detailed Design and Procurement of Works)

The Consultant shall, within Stage III, undertake the duties set out herein as necessary to meet the project objectives. The Consultant shall also, within Stage III, carry out the relevant general services as set out in Section 2.

DETAILED DESIGN

Taking account of any conditions required under the planning consent, and as detailed in the Post-Planning Summary Report, the Consultant shall carry out the detailed design of the Scheme. This detailed design shall include the following:

- Structural design of all structural elements;
- Design of any mechanical and electrical components, in accordance with Appendix D);
- Specification of finishes;
- Production of all detailed design/construction drawings;
- Assessment of any existing structures that are to be incorporated into the Scheme, and the design of any works required to these structures to ensure the Standard of Protection is maintained throughout;
- Identification of any utilities or services requiring temporary or permanent diversion, and mitigation measures, building upon the work undertaken in preparing the Engineering Services Report (Section 2.2.4);
- Cooperation with other work areas within Roscommon County Council (Heritage/Conservation/Architecture/Engineers etc), and any Project Specialists appointed by Roscommon County Council to advise on the Scheme,
- Production of a detailed works programme for the Scheme;
- Production of Method Statements for the construction phase, demonstrating the buildability of the Scheme, and including any demolition required, proposed sequencing of the measures, diversion of utilities, etc.

The Consultant shall facilitate a technical workshop in order to advise and inform, and receive input from, Roscommon County Council and other relevant interested parties on the following aspects:

- The detailed design;
- the effective buildability of the Scheme;
- Potential construction constraints;

Lough Funshinagh and Lough Cup Environmental Management Measures

- The maintenance of the Scheme to include the statutory route for ongoing maintenance post-handover.
- Potential collaboration opportunities or other benefits of the Scheme.

PROCUREMENT OF WORKS

The Consultant shall prepare all Contract Documents that are required for Roscommon County Council to procure a works contractor to construct the Scheme. The Contract Documents shall include:

- Works Requirements Documents (WRD), including detail of any planning / development consent conditions and the Construction Environment Management Plan (Section 2.1.1);
- Bills of Quantities;
- Estimate of costs for the proposed works;
- Provide estimated Programmes

The procurement process shall be carried out by Roscommon County Council. The Consultant shall carry out the following duties within that procurement process:

- Provide assistance to Roscommon County Council in responding to tender queries;
- Carry out the tender assessment and provide a report recommending the preferred tenderer;
- Attend a meeting with Roscommon County Council and the preferred tenderer.

The Consultant shall also:

- Update the Cost Benefit Analysis Report in light of the tendered sum
- Provide a recommendation to the Client on the required site supervision (Resident Engineer) team, including projected costs for the expected duration of the contract

SCOPE OF SERVICES – STAGE IV (Construction)

The Consultant shall, within Stage IV, undertake the duties set out herein as necessary to meet the project objectives. The Consultant shall also, within Stage IV, carry out the relevant general services as set out in Section 2.

MANAGEMENT OF CONTRACTOR

Upon appointment of the Contractor, the Consultant shall arrange and attend a workshop with the Contractor and Roscommon County Council to fully brief the Contractor on the Scheme, and to review the proposed construction methodologies.

The Consultant shall undertake the following duties during the construction of the Scheme.

- Supervision of the works contract, including acting as the Employer's Representative (ER),
- Site supervision of the works;
- Monitoring of the Contractor's programme for the works;
- Facilitation of monthly progress meetings with the main Contractor;
- Monthly reports on Progress against Programme, spend to date and claims (including recommendations on claims);

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- Review all Mechanical and Electrical proposals by the Contractor and confirm that they are in accordance with the requirements in Appendix D and the requirements of Roscommon County Council;
- Certification for Payment of Contractor's Invoices within 14 days of receipt of invoice,

TEMPORARY WORKS

The Consultant shall provide the design for required temporary works during the construction phase; the cost of duties relating to the design of temporary works shall be borne by the Client in accordance with the requirements of the Instructions to Tenderers.

CONCILIATION/ARBITRATION

The Consultant shall undertake the following duties in relation to any conciliation/arbitration processes between Roscommon County Council and the Contractor:

- Attendance at meetings with Standing Conciliator/Arbitrator(s) and taking the lead role in the meetings and the provision of all required information to Roscommon County Council in preparation for the meetings with the Project Board;
- As Employer's Representative, undertake the lead role in the management of all conciliation/arbitration processes carried out in accordance with the provisions of the works contract.

The cost of the duties in relation to conciliation/arbitration processes between Roscommon County Council and the Contractor shall be borne by the Client in accordance with the requirements of the Instructions to Tenderers.

The Consultant shall undertake the following duties in relation to conciliation/arbitration between Roscommon County Council and property owners:

- Production of a Property Impact Report (Section 11.1) where a compensation claim has been lodged by a third party;
- Attendance at property arbitration hearings;
- Provision of advice to the Client in relation to property arbitration hearings.

The cost of the duties in relation to conciliation/arbitration processes between Roscommon County Council and property owners shall be borne by the Client in accordance with the requirements of the Instructions to Tenderers.

SCOPE OF SERVICES – STAGE V (Handover)

The Consultant shall, within Stage V, undertake the duties set out herein as necessary to meet the project objectives. The Consultant shall also, within Stage V, carry out the relevant general services as set out in Section 2.

COMMISSIONING OF THE SCHEME

The Consultant shall undertake the following duties during the commissioning of the Scheme:

- Oversight and management of the commissioning of the completed works including any testing of the Scheme or its components;
- Preparation of a detailed financial analysis report; the report shall record all aspects of the expenditure on the project, including a comparison and record of the change in costs, and reasoning for the changes, between project estimates, tender submissions, and final account;
- Preparation of a report setting out the long term operational and maintenance requirements of the Scheme; the report shall be accompanied by drawings of the completed flood defence structures and assets, and shall be submitted as part of the Safety File (Section 2.1);

Lough Funshinagh and Lough Cup Environmental Management Measures

APPENDIX A

**LIST OF POTENTIAL HAZARDS AND RISKS FOR SITE
INSPECTIONS**

Lough Funshinagh and Lough Cup Environmental Management Measures

Set out below is a *preliminary, non-exhaustive* list of the potential health, safety and welfare hazards and risks for site inspections, survey supervision and other on-site activities that may be encountered in undertaking the Project.

Hazard	Risk(s)
Working in a changing environment:	<ul style="list-style-type: none"> - Engulfment in swampland / mud / soft sand - Drowning - Hypothermia - Vehicle Impact - Open / dislodged manhole / drain covers - Sudden peak flow / water release / tidal - Slips, trips and falls - Personal Injury
Driving for work:	<ul style="list-style-type: none"> - Tiredness / fatigue - Speeding, lack of awareness - Use of mobile phones - Failure to wear seatbelts - Carrying equipment - Influence of intoxicants - Non roadworthy vehicles - Weather conditions: Flooding / frost / heavy rain / glare from the sun / heavy winds - Medically unfit to drive - Road side break down - Traffic collision - Weather conditions: Flooding / frost / heavy rain / glare from the sun / heavy winds - Medically unfit to drive - Road side break down - Traffic collision
Working on or near water	<ul style="list-style-type: none"> - Drowning - Hypothermia - Entrapment - Personal injury from debris / submerged objects.
Exposure to plants and insects	<ul style="list-style-type: none"> - Hogweed burns - Stings - Allergic reactions - Anaphylactic shock - Cuts - Personal injury
Biological hazards	<ul style="list-style-type: none"> - Leptospirosis (Weils Disease) - Tetanus - Hepatitis A - Lyme disease
Lone working	<ul style="list-style-type: none"> - Inability to raise the alarm in the event of an emergency - Person injury
Weather condkions	<ul style="list-style-type: none"> - Exposure to weather conditions. - Poor visibility. - Hypothermia. - Sun burn. - Slips, trips and falls

Lough Funshinagh and Lough Cup Environmental Management Measures

Aggressive animals.	<ul style="list-style-type: none"> - Infection - Bites - Cuts - Scrapes
Needle stick Injuries	<ul style="list-style-type: none"> - Blood borne pathogens - Personal injury / illness - Cuts and lacerations.
Over head / fallen power lines	<ul style="list-style-type: none"> - Electrocutation
Manual Handling.	<ul style="list-style-type: none"> - Musculoskeletal injuries. - Foot / hand injuries. - Cuts / bruises / abrasions. - Trips and falls
Confined spaces.	<ul style="list-style-type: none"> - Serious or fatal injuries. - Entrapment. - Crush injuries.
Working from boats.	<ul style="list-style-type: none"> - Drowning - Hypothermia - Impact injuries - Cuts / bruises / scrapes - Entanglement
Use of hand tools; portable equipment; survey equipment	<ul style="list-style-type: none"> - Obstruction - Injury to others - Property damage
Trains, rail crossings.	<ul style="list-style-type: none"> - Serious or fatal injury. - Property damage.
Release of contaminants	<ul style="list-style-type: none"> - Damage to aquatic environment and water quality - Personal injury
Working at heights.	<ul style="list-style-type: none"> - Falls from heights - Slips, trips and falls - Personal injury - Property damage
Unstable structures.	<ul style="list-style-type: none"> - Falling material. - Loose or unstable ground.
Child protection.	<ul style="list-style-type: none"> - Inadequate training / knowledge / vetting. - Allegations by young / venerable persons
Violence and aggression.	<ul style="list-style-type: none"> - Physical violence / aggression - Verbal violence / aggression - Personal injury - Property damage

APPENDIX B

**GUIDE TO PROCEDURES AND OFFICES FOR TITLE
RESEARCH**

LAND REGISTRY

Ability to abstract relevant information from maps and folios, and in particular, from the primary folios. Maps on 6" are to be regarded as Primary maps since they were registered from the Estate Map. On-line maps are helpful but boundaries are not available for all counties yet, and on-line folios do not provide the history of the property. At public counter only.

VALUATION OFFICE

Invaluable for research into Unregistered lands. Research back to Griffith's Valuation should be completed for all lands, registered or unregistered. Maps and last occupier/ratepayer are on-line, but only commercial property gives more recent occupiers since rates are no longer paid by the general public so research should then take place in the Registry of Deeds for sales. At public counter and self-search in Archive room.

LAND COMMISSION

Contains original Estate Papers with maps, vesting orders, agreements, schedules of area and original title documents with history of estate. Information on Turbary rights. Public counter usually.

REGISTRY OF DEEDS

Registers deeds by two methods. By Baronies and Townlands in Location Books from 1708 to 1949 and by Grantors Surname from 1708 to 1960 in Grantor's Books. From the 1960's the information is available on-line with the exception of a couple of years in the early 1970's. Grantors names can usually be got from the Valuation Office archives. Titled grantors must also be checked under Family name, i.e.: Earl of Portarlington/Dawson. Transfers and Sales of property may be registered here but no maps are available. Public counter and self-search.

NATIONAL ARCHIVES

Contains information on Crown Grants, Lodge's Record of the Rolls, Books of Survey and Distribution, Quit Rents, Lec. Conveyances, Calendar of Wills and Testamentary Indices. Many of these are available on Micro-Fiche. Registration of Wills is available in book form up to 1983 in Archives. Those that did not survive the 1922 fire are indexed by name. Self-search usually but help is available from staff.

PROBATE OFFICE

Registers Wills from 1983 onwards on-line. Approximate date of death and address is needed. Public Counter.

COMPANIES OFFICE

Gives names of Directors, company Secretaries and Articles of Association. Files available but most information are now on-line. Public counter.

NATIONAL LIBRARY

Useful for Death notices of Family Histories in newspapers. Thom's Directory and Burke's Peerage and Burke's Irish Landed Gentry are also available here. Micro-fiche and self-search.

Copies of most of the above research can be ordered from the relevant office.

FIELD INVESTIGATIONS

Field investigations will be carried out to:

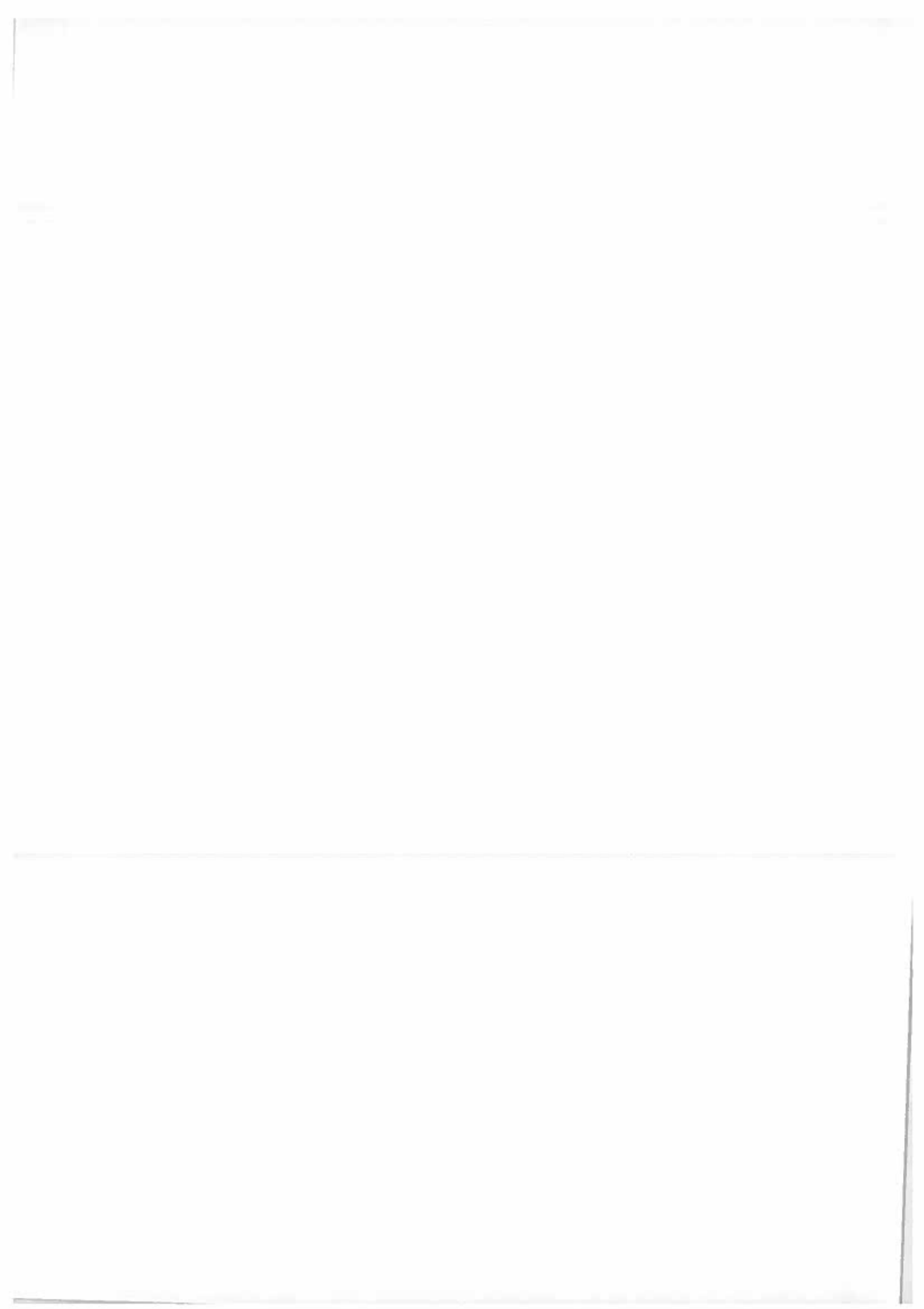
- (i) Confirm that the boundaries as shown on the drawings correspond with that on the ground. This will consist of a visual survey only – no instruments will be used. Photographs will be taken where deemed necessary.

Confirm that ownership / occupancy details sourced through searched are correct and up to date or where searches did not yield any result to seek assistance in tracing title to the property.

Agree a suitable address for service of Statutory Notices.

Advance notification of field investigations should be issued by letter where possible to do so. A record of all field investigations along with all correspondence relating to each property holding should be kept on file and be made available to the Client in due course. Individual files should be kept for each property holding.

APPENDIX C
PROJECT BUDGET CALCULATION – GUIDELINES



APPENDIX D

**POLICY -
REQUIREMENTS FOR FIXED MECHANICAL
INSTALLATIONS AND EQUIPMENT**

This policy is with regard to Pumps, Penstocks, Sluices and any other Mechanical Installation with a moving part including all vehicles and equipment required for the operation of Flood Relief Schemes. Particularly it is with respect to Pumps and Penstocks, but in order to cover all areas the word equipment or facility is used in the Policy. It is expected that the Policy should be implemented at design stage by the PSDP and at Construction Stage by the PSCS in Consultation with OPW Mechanical Engineering Field Services (MEFS).

Accessibility

The core issue with respect to this is that ergonomic access to the equipment is most important with regard to safe access and egress for persons inspecting and maintaining the facility. This should mean that consideration should be taken as to the location of the facility from the point of view of entry and exit (preferably where traffic and persons are easily excluded). Depending on the use of equipment and the requirements for maintenance and inspection of the equipment an ergonomic assessment should be made at design stage.

Redundancy

This is where back up is required. Risk analysis should be completed on all critical equipment to determine the likelihood of failure occurrence and the need for back-up. This should be completed at design stage and mitigation put in place accordingly. Examples are extra pumps for the facility, space for the mobile equipment to be brought in and the electricity back up available in the event of failure.

Interoperability

Consideration must be taken of schemes where operations interact with other systems. For example sewage pumping, fresh water pumping, normal storm water systems etc.

Connectivity

Where telemetry is required with equipment the connection with the OPW Telemetry systems must be considered and planned accordingly at design stage.

Electrical Capacity

The correct design for the input capacity of transformers must fit the installation. This may require soft starts being fitted or upgrading of transformers.

Generators / Tariffs

The use of Electricity is a significant cost to the operation of equipment and design considerations need to take account of the future methods of supply. The CO2 usage of the facility also needs to be assessed and reduced if possible.

Maintainability

Whether the equipment is maintained in-house or externally by an SLA there is a huge need for this to be considered at design stage. In particular, any information provided by the manufacturer must be kept both on site and in electronic format for future reference and to design the maintenance plan for the facility. This electronic information needs to be sent to the OPW's Mechanical Engineering Field Services (MEFS) for retaining on record.

Life Cycle

Like any properly designed engineering project a life cycle cost needs to be put on all equipment. In particular, the life cycle needs to include an expected life along with disposal, recycling and replacement cycle of the equipment and facility being designed.

3.6.10 Natural Water Retention Measures

The Consultant shall produce Potential for Natural Water Retention Measures (NWRM) Maps covering the Study Area by adapting the methodology applied by the Scottish Environment Protection Agency (SEPA (2013), Identifying Opportunities for Natural Flood Management, SEPA Corporate Office, Stirling; https://www.sepa.org.uk/media/163410/nfm_summary.pdf), using comparable available or derivable Irish datasets.

The Consultant shall propose datasets to use in the production of the Potential for NWRM Maps at the Hydrological Assessment Technical Workshop.

The Potential for NWRM Maps shall map areas that have the potential for the following categories of NWRM:

- runoff reduction;
- floodplain storage;
- sediment management;
- estuarine surge attenuation and wave energy dissipation;

Building upon the Potential for NWRM Maps, the Consultant shall carry out a NWRM Feasibility Assessment to assess the feasibility of implementing specific types of NWRM, as listed in Table 3.5, to provide some degree of flood risk reduction within the Study Area.

The NWRM Feasibility Assessment shall include an assessment of their costs, delivery routes, and the potential for NWRM:

- to reduce flood risk within the Study Area,
- to reduce flood risk within the Scheme Area,
- to mitigate the flood risk impacts of Climate Change,
- to mitigate the environmental impacts of options for a preferred Scheme, and,
- to meet objectives other than flood risk management, including water quality, habitat creation, climate regulation, and the provision of amenity.

In assessing the potential of NWRM to meet objectives other than flood risk management, the Consultant shall liaise with relevant bodies in other Sectors, including the EPA, Local Authority Water Programme (LAWPRO), relevant Local Authorities, NPWS, Department of Communications, Climate Action & Environment, to determine the benefits to their respective areas of responsibility.

The Consultant shall report the findings of the feasibility assessment, in an appendix to the Options Report, in a NWRM Feasibility Report.

Where it is feasible for NWRM to contribute to flood reduction in the Scheme Area, or to contribute to the mitigation of the environmental impacts of the Scheme, the Consultants shall develop these measures as part for the Scheme.

The Scheme may include NWRM that do not provide protection to the full required SoP of the Scheme, but that may reduce the scale of structural protection works required as part of the Scheme.

Table 3.5: Natural Water Retention Measures¹

Measure Group	Specific NWRM	Main Action
Woodland creation	Catchment woodlands	Runoff reduction

¹ SEPA (2015), Natural flood management handbook

	Floodplain woodlands	Runoff reduction/floodplain storage
	Riparian woodlands	Runoff reduction/floodplain storage
Land management	Land and soil management practices	Runoff reduction
	Agricultural and upland drainage modifications	Runoff reduction
	Non-floodplain wetlands	Runoff reduction
	Overland sediment traps	Runoff reduction/sediment management
River and floodplain restoration	River bank restoration	Sediment management
	River morphology and floodplain restoration	Floodplain storage/sediment management
	Instream structures (e.g. large woody debris)	Floodplain storage
	Washlands and offline storage ponds	Floodplain storage
Coastal measures	Managed realignment	Estuarine surge attenuation
	Saltmarsh and mudflat restoration	Estuarine surge attenuation/ wave energy dissipation
	Sand dune restoration	Wave energy dissipation
	Shingle restoration	Wave energy dissipation
	Recharge (beach or intertidal)	Wave energy dissipation

3.6.11 Climate Change Adaptation

The Consultant shall assess and consider the potential impacts of climate change in the development and design of the options for a preferred Scheme. This shall include the consideration of Potential Future Schemes (flood relief schemes) as may be necessary to provide the required SoP under the future scenarios (see [Section 3.4.5](#)), or that in other ways mitigate potential future risk. It shall also include the identification of the potential amendments or additions to the options for a preferred Scheme under current conditions (referred to as Adaptation Options) that might be necessary over time to maintain the defined SoP, or in other ways mitigate potential future risk, in a cost-efficient and locally acceptable manner under potential future scenarios. Adaptation Options may include non-structural measures and 'soft' physical interventions (such as NWRMs) as well as structural flood protection measures.

The assessment and consideration is necessary at this design stage to fully embed the need for adaptation in the delivery of the Scheme through an early identification of adaptive options and their full appraisal. The Consultant shall take into account the options for Potential Future Schemes when considering the options for a preferred Scheme under current conditions.

The assessment shall include:

- The identification of options for Potential Future Schemes that would provide the required SoP under the MRFS and separately under the HEFS
- The identification of the Adaptation Options that may be required, and/or whether additional design allowances might be incorporated now (i.e., upon initial construction) into the options for a preferred Scheme
- The determination of the benefits and impacts of the Potential Future Schemes and the costs of the Adaptation Options and/or for incorporating additional design allowances now in the construction of the Scheme
- The development of a costed decision tree to identify a range of Potential Adaptation Pathways for the Adaptation Options and/or additional design allowances made now as necessary for the adaptation from the options for a preferred Scheme under the current scenario to the Potential Future Schemes under both the MRFS and then the HEFS.

The Consultant shall determine the non-monetary benefits and impacts of the Potential Future Schemes, using a simplified Multi-Criteria Analysis (MCA) taking into account technical, social, economic and environmental criteria. This will not require assessment against the full list of sub-criteria as detailed in the full MCA (see [Section 3.6.8](#)) but should be sufficiently detailed to inform a comparative assessment of each adaptation option at a strategic level. Details of the criteria are to be agreed with the Steering Group.

The costs and economic benefit appraisal of the Potential Future Schemes and the potential future Adaptation Options and/or additional design allowances made now shall be undertaken on a whole life basis, using discounting to calculate the present values when considering costs and benefits of these options (see [Section 3.6.9](#)) and using the detailed hydraulic model as necessary as the basis for the decision-making.

The Consultant shall assess the performance for each Potential Adaptation Pathway, to evaluate quantitatively how well each branch of a decision tree will perform under future uncertainty according to the following criteria:

- The MCA of the Potential Future Schemes
- The costs and economic benefits of the Potential Adaptation Pathways
- The robustness of investment made now under uncertainty, taking into account the flexibility of each Potential Adaptation Pathway (i.e., the number of future options that remain open following any investment choice made now), and the costs, benefits and impacts of the Potential Future Schemes that remain open given that investment.

The Consultant shall identify potential trigger points for when Adaptation Actions may be required and associated monitoring requirements. The type of trigger points can vary depending on:

- **Monitoring data, e.g., the number of times extreme water levels being reached**
- **Performance of existing infrastructure, e.g., number of times flood barrier installed or the number of times existing defences being surcharged or overtopped**
- **New information becoming available regarding climate change impacts and projections.**

This is necessary so that appropriate action will be taken at the right time and to raise awareness of trigger points being reached or approached. The Consultant shall liaise with the Climate Action Regional offices in this work.

In parallel with the preparation of the Options Development Report, the Consultant shall prepare a draft Scheme Climate Change Adaptation Plan (SCCAP). This Plan shall detail the analysis carried out and justification for the preferred Scheme and Adaptation Pathways including the decision making process. It shall also detail the trigger points and monitoring that should inform future Adaptation Actions to be taken and how it may be necessary to adapt and amend the Scheme to maintain the defined SoP as the potential impacts of climate change may be realised over time.

The draft SCCAP shall be kept as a live document that is to be reviewed and amended during the course of the project, as required.