

Technical Methodology Note - Flood Defence Asset Condition Survey – Management & Specification

Revision	Comment/Description	Date of Issue
1.0	N/A	May 2019

1. Introduction

This document is to provide guidance for Consultants and Surveyors engaged in Flood Defence Condition and Geometric Survey. The Database referred to herein has been developed by the OPW through the CFRAM Studies. The document uses the term of 'Client', which may refer to either the OPW or a Local Authority; however, it may be assumed that the OPW will support any Local Authority in its role as Client through review of deliverables and provision of advice to that Local Authority.

2. Definition of Flood Defences

Flood Defences (or 'defences') are defined as structures constructed to provide a formal flood defence function ('formal effective flood defences'), including those that may be in poor condition ('formal ineffective flood defences'), and also structures that may have been built for other purposes but that would provide a flood defence function ('informal effective flood defences'). The definition does not include structures that were not constructed to provide a formal flood defence function which in the opinion of the Consultant, would fail to provide a flood defence function due to structural weakness, porosity or other such reasons ('informal ineffective flood defences'), such as garden walls or embankments perforated by uncontrolled culverts.

The decision as to which flood defences are included in any hydraulic modelling will depend on the purpose and context of the work in question, and will be informed by Defence Asset Condition Survey.

3. Scope of Survey

The defences for which the Consultant shall perform the duties set out herein are generally those (1) known to the OPW or relevant Local Authority, (2) identified by the Consultant in their walkover surveys, and (3) identified by the surveyors during the channel topographical survey.

The Consultant shall prepare and agree with the relevant Project/Steering Group in advance of commencing the Defence Asset Condition Survey, a list and location of the assets to be included within the survey. The Consultant should immediately advise the Client should significant additional quantities of flood defence be identified by the Consultant when the Defence Asset Condition Survey is underway.

4. Consultants Duties - Summary

The services and duties of the Consultant under the Defence Asset Condition Survey include:

- A geometric survey of the flood defences (this can be specified by the Consultant for capture by any overall topographical survey contract but remains the responsibility of the Consultant to ensure it is obtained)
- Identification, per asset, of the component structures and elements,
- A visual condition survey of all flood defences, with supporting photographic evidence,

- An assessment of the performance of all flood defences, to be based on predicted design water levels, readily available and derivable structural information, and the condition as obtained from the visual condition survey
- Entry of all data into the Defence Asset Database, including:
 - Geometric data from the geometric survey,
 - Visual condition survey data,
 - Photograph/s for each flood defence – one of the overall asset and one per structure,
 - Entry of flow and level data and the relevant SoP.
- Entry of all GIS data, broken into Asset, Structure and Elements, including:
 - the defence geographic location,
 - a polygon demonstrating the area being protected by each flood defence (the 'defended area'), derived from hydraulic modelling,
 - an economic value of defended risk receptors, derived from the hydraulic modelling and application of the Multi-Coloured Manual (MCM).

A detailed description of the services and duties the Consultant shall deliver under the Defence Asset Condition Survey are set out below.

5. OPW Defence Asset Database

The OPW Defence Asset Database (the 'Database') has been developed using Microsoft Excel. The Client will provide the Consultant with a blank copy for populating; any populated databases from previous Studies shall also be provided, for the Consultant to review, update, and augment with additional data.

Within the Database, flood defences are defined hierarchically as Assets, which comprise one or more Structures, which in turn comprise one or more Elements. A sample list of selected assets, structures and elements used within the Database is provided in Table 1 – this list is only a selection from within the database and is provided only to demonstrate the breakdown of Asset, Structure and Element.

Table 1: Flood Defence Assets, Structures and Elements – selected sample only – list not exhaustive, see Database for the complete list.

Asset Type	Asset Sub-Type	Structure	Element 1	Element 2	Element 3	Element 4	Element 5	Element 6	Element 7	Element 8
Wetland	Turlough									
	Natural									
	Constructed									
Wall	Raised Wall	Wall	Toe / Foundation	Front Face	Crest	Back Face	Back-Fill	Weep Hole	Mechanical Equipment	Electrical Equipment
	Retaining Wall	Culvert	Barrel	U/S Head Wall	U/S Apron	U/S Side Walls	D/S Head Wall	D/S Apron	D/S Side Walls	Flap Valve
	Demountable Wall									
	Floating Wall									
	Mechanical Wall									
	Quay Wall									
Embankment	Embankment	Embankment	Front Face	Crest	Back Face					
		Culvert	Barrel	U/S Head Wall	U/S Apron	U/S Side Walls	D/S Head Wall	D/S Apron	D/S Side Walls	Flap Valve
		Back Drain	Bed	Left Bank	Right Bank	Left Berm	Right Berm	Toe Protection Left		
		Spillway	U/S Face	Crest	D/S Face	Baffle				

6. Defence Asset Geometric Survey

6.1. Consultants Duties

The Consultant shall undertake the Defence Asset Geometric Survey and shall enter such data into the Database at Structure level. As described above, the geometric survey can be specified by the Consultant for capture by any overall topographical survey contract but remains the responsibility of the Consultant to ensure it is obtained and only the Consultant shall populate the Database, and not the surveyor.

The full specification for topographical survey is provided in the OPW survey specification available at <https://www.opw.ie/en/flood-risk-management/mapsdataresourcesandspecifications/technicalspecificationsandguidancenotes/#d.en.39397> but at a minimum the defence asset geometric survey shall be of sufficient resolution to:

- Delineate extent of the defence (for example, the front and rear toe and crest of an embankment, the diameter of a culvert, the volume of a storage area, etc),
- Delineate changes in level and direction of defences.

7. Defence Asset Condition Survey

7.1. Consultants Duties

The Consultant shall undertake a visual inspection and condition survey of the flood defences at Asset and Element level to assess the physical condition of the defence that may be used as a basis to determine its likelihood of failure and need for maintenance, renewal or replacement. Such inspection and condition survey shall be undertaken following a methodology conforming to, or comparable to, the UK Environment Agency T98 condition assessment standard. The Client can provide a digital copy of this manual on request and the application of this can be discussed at the start up meeting. The Consultant shall record specific data as part of the visual condition survey as necessary to complete all fields in the Database for each of the Elements and then assess all this 'Element level' information to decide on an 'overall condition' at asset level with a comment on this 'overall condition' where possible.

Geotechnical analysis, coring, trial pits, or other such physical sampling will not be required as part of the condition assessment – however, the Consultant shall obtain all readily available design information, such as design/construction drawings or previous reports, and use these to support and inform their assessment.

The Consultant shall photograph each Asset, Structure and Element of the defence. Each photograph shall be saved into a digital common picture format (e.g., jpg, tiff, bmp) not exceeding 100kb and shall be saved, with a filename in a manner that will permit easy identification. One photograph should be taken of each asset that captures as much of the asset as possible and entered into the Database linked to the relevant asset. One photograph should also be taken of each structure that captures as much of the structure as possible and entered into the Database linked to the relevant structure.

Note that the photos included are likely to be used in any sample checking by the Client of any interim or final database deliverables so the Consultant should ensure that the photo for any given asset or structure matches the condition that has been assigned in the database.

7.2. Data Entry into the Database

The Consultant shall enter all location, condition, geometric, photographic, an indication of standard of protection, defended area – including properties and economic values of these properties and other relevant data into the Database. The Consultant shall complete all fields in the Database for each Asset, Structure and Element of each defence as far as reasonably possible. Examples of some of the Database data entry fields are provided below, along with a description of the fields and how they should be completed.

There are many fields at the various levels, (asset, structure and element) that are intuitive and are not listed here. It is intended that Consultants will be provided with a template database and also a completed/populated sample database to provide examples of how the more intuitive fields are populated.

Data at ASSET Level - Below are some typical fields for the data entry form at Asset level.

Field: Asset ID - Assigned ID of the Asset, made up of the UoM Code, the ADA Code and the ID (number) for that Asset. This Asset ID becomes an important field as it is carried through to structure and element level and also is added to the GIS layer as an attribute that then links the GIS with the database.

Field: Watercourse – The Consultant shall manually enter the watercourse name in this field. In certain instances there will be watercourses in the study that may not be named or whose name may not be known at the time. Any watercourses that are not named shall be discussed and a name agreed with the Client prior to entry to the database. Clear reference to any new watercourses added throughout the study shall be made in the handover report.

Field: Condition - The “Condition” guidelines/options are listed below.

Option	Description
Very good	In first few years of life, few minor defects and fully serviceable
Good	Only minor defects, affecting < 5% of asset. Fully serviceable
Fair	Minor defects affecting between 5 – 20% of asset
Poor	Giving cause for concern. Defects affect >20% of asset
Very poor	Structurally unsound now or in near future, or failed

The condition entered at Asset level shall be an overall condition of the entire Asset and all its structures and elements based on the professional judgement of the surveyor as outlined in section C4.1. This overall condition should take into account the condition of the various elements of the asset, but also the importance of these elements. For example an asset with a long length of handrail that is structurally not very important but in very poor condition may give an ‘overall condition’ of one type yet an embankment may have a front face that is fair to poor but is structurally important so may warrant consideration in this ‘overall condition’. The ‘overall condition’ should take into consideration all elements, their condition and their importance to the function of the overall asset.

Field: Photo and GIS Hyperlinks – The Consultant shall ensure that Hyperlinks to photos and GIS are functioning within whatever digital format they are delivered.

Field: Flood cell – Where an asset has a defended area identified in GIS, this defended area shall have an attribute name that links it to the asset. This attribute name shall be entered to the GIS properties of the asset. The attribute name for the defended area polygon shall be entered to this ‘flood cell’ field at asset level.

Data at STRUCTURE level - Below are some typical fields for the data entry at structure level.

Field: SoP/Conveyance - Performance Data - The Consultant is required to enter the Design Standard of Protection /Conveyance for the Structure based on Annual Exceedance Probability (AEP). A design flow of one in one hundred years has an AEP of 1%, which would be entered as 0.01 in the database.

Field: Type - The Consultant is required to identify the structure type as either “Primary” or “Secondary” depending on if the structure is central to the function of the asset (primary) or not (secondary).

Field: Level / Flow Dependent - The structure’s performance will either be flow or level related depending on the structure’s characteristics. The Consultant must enter the required data (e.g., for level – Design Level, Actual Level, Freeboard Required).

Field: Geometric - The Consultant is required to enter all surveyed data here for as many fields as the data has been collected.

Data at ELEMENT level - Below are some typical fields for the data entry at element level.

Field: Redundant / Unseen - The Consultant is required to select the appropriate option as described below

Option	Description
Unseen	Unable to visually inspect
Redundant	Not providing any flood defence function

Field: Element Condition - Listed below are details of the options available. As already mentioned, population of this field should be informed by or should be populated as closely as possible to any best practice that already exists such as the UK Environment Agency T98 condition assessment standard.

Option	Description
Very good	In first few years of life, few minor defects and fully serviceable
Good	Only minor defects, affecting < 5% of asset. Fully serviceable
Fair	Minor defects affecting between 5 – 20% of asset
Poor	Giving cause for concern. Defects affect >20% of asset
Very poor	Structurally unsound now or in near future, or failed

Field: Weighting - The Consultant is requested to indicate the contribution the Element or Structure has on the condition of the Asset. These options available range from “Very Important” to “Unimportant”.

8. Quality Assurance

8.1. Personnel

Inspections will be carried out in teams of at least two asset inspectors, one of whom shall have successfully completed either a national or internationally accredited flood defence asset assessment training course, (T98 or similar approved). Consultants shall be required to submit supporting documentation for such training.

8.2. Reconnaissance Survey

In order to identify the flood defences assets that need to be surveyed the asset inspectors shall complete a walkover survey of the study or scheme area.

8.3. On-site Start-up Meeting

The successful Consultant will be required to attend an on-site start-up meeting and walkover with representatives from the OPW and Local Authorities.

8.4. Progress Reporting

During the survey the Consultant shall be required to submit weekly reports on the progress of the survey. The format of these reports shall be agreed at a start-up meeting.

On completion of the first two week's survey (or sooner if agreed), the Consultant shall submit to the Client a sample of the survey data obtained and entered into the database. If required, the survey team shall then attend a meeting with the Client to discuss the data submitted. Details of this initial review meeting can be decided at the start-up meeting.

The Consultant shall alert the Client of any defence assets observed during the survey that they feel should be included in the survey.

8.5. Validation

The Consultant shall undertake validation checks to ensure that all defence asset data has been collected and entered into the database in accordance with these specifications. Consultants shall submit details of their proposed method of quality control to ensure that deliverables of the Defence Asset Condition Survey are in full accordance with this specification.

8.6. Feedback and Report

The Consultant shall submit weekly progress reports to the Client, which will enable accurate monitoring of length complete, and will highlight any issues encountered on site. The format of the weekly feedback report shall be agreed at the project start-up meeting.

9. Access to Private Property/Lands

Obtaining access to land is the responsibility of the Consultant, and the Consultant shall make all reasonable efforts to request permission from landowners, and to inform relevant authorities, in advance of any access to private lands. The Consultants shall assess in advance of any site visit any potentially awkward or hazardous sites and plan for the safe access to these areas in advance.

The asset inspectors shall carry identification at all times while carrying out their work, preferable in a visible location on hi-viz vests.

9.1. Permission from Landowners

The Consultant shall identify the various landowners affected by the survey and obtain permission from the landowners for access to conduct the survey.

9.2. Entering onto Irish Rail Property

The Consultant may be required to enter onto property owned or occupied by Irish Rail. For Health and Safety reasons Irish rail require that all persons entering onto their property to under any works must have completed a two-day training course organised by Irish Rail. They also require that an employee of Irish Rail shall accompany all such persons for the duration of the works. The cost of this employee is charged to the persons/company undertaking the works.

9.3. Livestock Crops & Agriculture

The Consultant should make themselves aware of the presence of livestock, sensitive agricultural (or other) crops, and farming activities underway that may impede their work, and plan mitigating measures to avoid these impacting upon their programme.

9.4. Trimming / Cutting of Vegetation

While it is preferable to avoid it, where cutting or trimming of bank edge vegetation is necessary to gain access or visual contact with a defence, the Consultant shall inform the landowner of the extent of the work prior to it being carried out. All normal protocols for work within private lands shall be followed, including the protection of habitat.

9.5. Letter of Introduction

The Client will provide the Consultant with a letter of introduction for landowners; which will introduce the Consultant, describe the purpose of the survey and request landowners to make access available to the Consultant.

10. Deliverables

10.1. Defence Asset Database & GIS Data

The Consultant shall deliver a completed copy of the Database duly completed for all the Defence Assets (on CD, DVD, external hard drive or other data transfer method that is acceptable to the Client).

The database will include all data that is linked from asset, structure and element level including all digital photos and all GIS information (on CD, DVD, external hard drive or other data transfer method that is acceptable to the Client).

The Consultant shall enter the location of each defence asset into the Database as a point, line or area using the Irish NGR Coordinate system. Each asset shall be given an attribute table that MUST include the asset ID. Any other attribute fields are welcomed.

The Consultant shall enter defended areas into the GIS module of the Database. The defended area for any asset is a polygon that demonstrates any areas benefiting from protection by the flood defences. This should be linked to the asset geographic location using some common attribute field.

The Consultant shall enter an economic value against each defended area in the GIS module of the Database. This economic value shall be based on the Average Annual Damage (AAD) for the receptors within the defended area, assuming no defences are in place. This AAD shall be calculated using the standard OPW Flood Relief Scheme methodology, which in turn is detailed in the OPW *Technical Methodology Note – Cost Benefit Analysis.*

10.2. Handover Report

The Consultant shall prepare a report upon completion of the defence asset work. The report shall give an overview of the processes used during the survey and data entry phases.

The report shall be a record of assets surveyed and entered to the database including a table referencing the AFA codes used to make up the Asset IDs used and what specific geographic areas these AFA codes cover.

It is not intended that Client will require either hardcopy or digital drawings/plans of the locations of the assets as these will be provided in the GIS layer specified herein. However the Consultant shall include for reference, at some convenient location in the handover report, a suite of drawings detailing the location and extents of the Flood Defence Assets that have been surveyed, overlaid on the highest scale of available OSi mapping.

The Consultant shall also supply the handover report in digital format, both in an editable word processing format and also in a print ready PDF format.

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