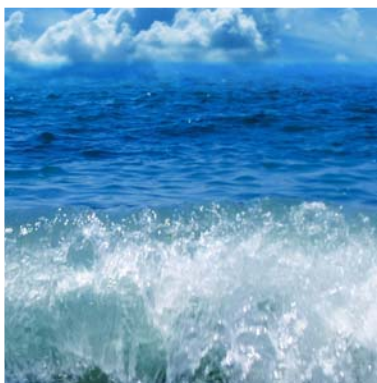


Irish Coastal Protection Strategy Study Phase 4 - South West Coast

Work Package 9A - Appendix 1A - Flood Mapping for Mid Range Future Scenario

IBE0388/November 2013





Office of Public Works

Irish Coastal Protection Strategy Study - Phase 4

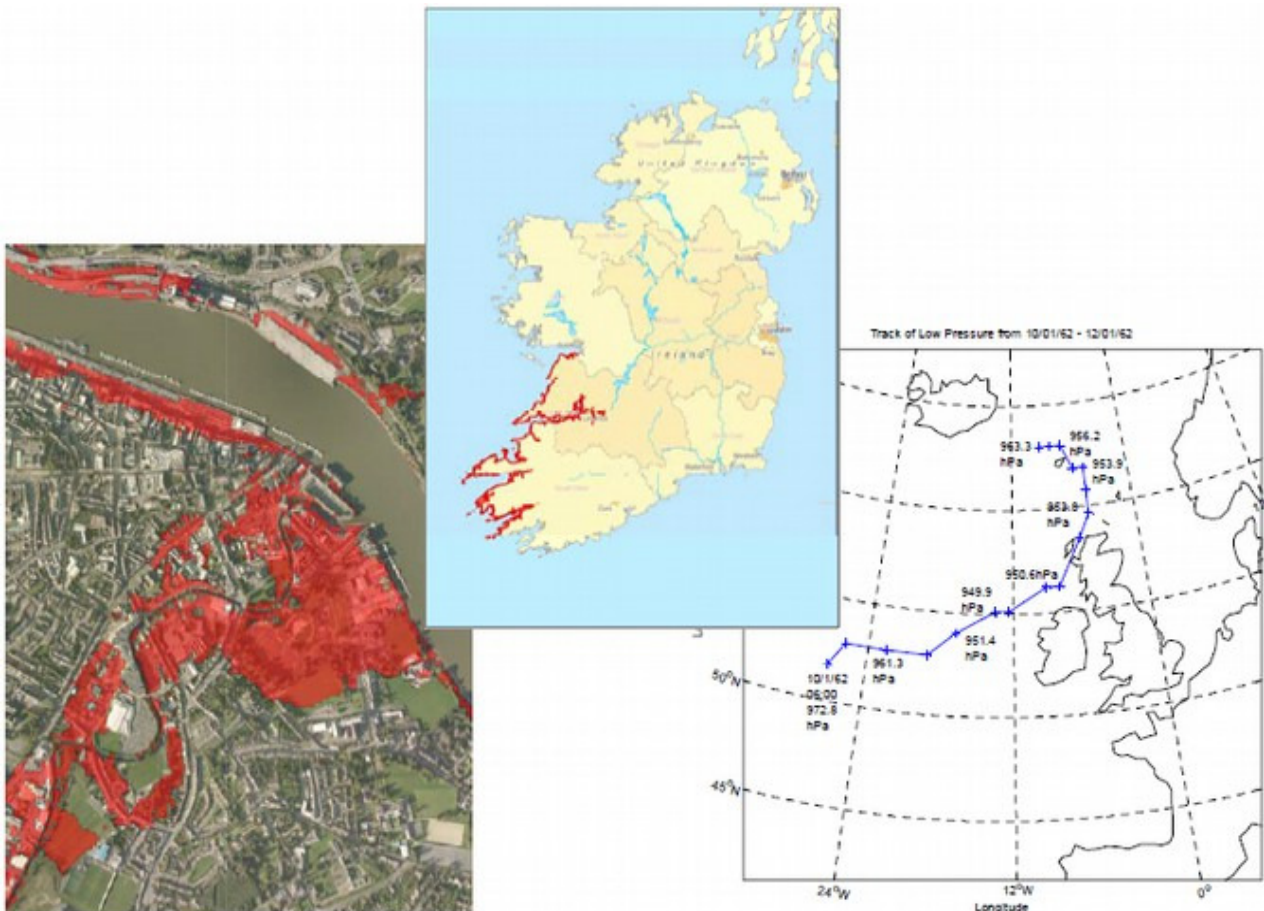
Work Package 9A

Strategic Assessment of Coastal Flooding Extents – Future Scenario

South West Coast – Bantry Bay to Ballyvaghan Bay

Appendix 1A - Flood Mapping for Mid Range Future Scenario

November 2013





Office of Public Works

Irish Coastal Protection Strategy Study - Phase 4

Work Package 9A

Strategic Assessment of Coastal Flooding Extents – Future Scenario

South West Coast - Bantry Bay to Ballyvaghan Bay

Appendix 1A - Flood Mapping for Mid Range Future Scenario

November 2013

DOCUMENT CONTROL SHEET

Client	Office of Public Works
Project Title	Irish Coastal Protection Strategy Study, Phase 4, Work Package 9A
Document Title	Strategic Assessment of Coastal Flooding Extents – Future Scenario
Document No.	IBE0071/ FS_App9A_R01
Document Date	November 2013

IMPORTANT DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE FOR FLOOD MAPS

COASTAL FLOOD MAPS FOR MID RANGE FUTURE SCENARIO FOR SOUTH WEST COAST

Please read the disclaimer, guidance notes and conditions of use below carefully to avoid incorrect interpretation of the information and data provided on the maps contained in this volume. The maps must be used only in conjunction with these notes, and must not be used in isolation.

PURPOSE OF THE MAPS

The maps contained within this bound volume were prepared under the following project:

- ***Project Name: Irish Coastal Protection Strategy Study (ICPSS)***
- ***Project Period: 2005 – 2013***

The maps were prepared for the purpose of assessing the degree of flood hazard and risk to assist in the identification and development of measures for managing the flood risk. They may, however, also be of use to the public, Local Authorities and other parties as indicative maps of flood-prone areas for a range of purposes, including raising awareness of flood hazard and risk, preparedness and response planning for flood events, assisting in planning and development decisions, adaptation to climate change etc.

DISCLAIMER

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GUIDANCE NOTES

This bound volume contains future scenario flood maps. How these maps have been derived, and what they do and do not present, is described below.

Derivation of Maps

The maps included within this bound volume are 'predictive' flood maps, as they provide predicted flood extent and other information for a future scenario 'design' flood event (Mid-Range to 2100) that has an estimated probability of occurrence (e.g., the 0.5% AEP event – see below), rather than information for floods that have occurred in the past (which is presented on 'historic' flood maps).

The predicted extents are based on analysis and modelling. This includes:

- Numerical Modelling of combined storm surges and tide levels which was used to estimate extreme water levels along the coastline
- Statistical extreme value analysis and joint probability analysis to both historic recorded tide gauge data and data generated by numerical modelling, which allowed an estimation of the extreme water levels of defined annual exceedance probability (AEP) to be established along the coastline
- Definition of the plan extent of the predictive floodplain, by use of a Digital Terrain Model (DTM) commissioned by the Office of Public Works. The predictive flood outlines shown on these maps were calculated by combining the results of the surge and tide level modelling, the statistical analysis, the DTM using GIS technology and incorporating future allowances for both mean sea level rise and glacial isostatic adjustment (GIA).

The maps have been produced at a strategic level to provide an overview of coastal flood hazard and risk in Ireland, and minor or local features may not have been included in their preparation. A DTM is used to generate the maps, which is a 'bare earth' model of the ground surface with the digital removal of man-made and natural landscape features such as vegetation, buildings, bridges and embankments. The mapping process can show some of these man-made features, such as bridges and embankments, as flooded on the flood maps, when in reality they do not flood. In addition, 'cleansing' is undertaken during flood map production, which involves various processes such as the removal of very small areas of flooding that is remote and isolated, the removal of very small islands within the flooded area, etc. Therefore, the maps should not be used to assess the flood hazard and risk

associated with individual properties or point locations, or to replace a detailed local flood risk assessment. Local factors such as flood defence schemes, structures in or around river channels (e.g. bridges), buildings and other local influences, which might affect a coastal flood, have not been accounted for.

The maps were produced based on survey data captured prior to, and during the early part of the project. They do not account for changes in development, infrastructure or topography that occurred after the date of survey data capture (except for GIA).

The DTM is derived from airborne survey data. The majority of this data is Interferometric Synthetic Aperture Radar (IfSAR) data. Where Light Detection and Ranging (LiDAR) data was available, namely for some localised coastal areas in Dingle Bay, Tralee Bay and Shannon estuary, it was used in lieu of IfSAR data to derive the DTM.

Detailed explanations of the methods of derivation, survey data used, etc. are provided in the relevant reports produced for the project under which the maps were prepared. **Users of the maps should familiarise themselves fully with the contents of these reports in advance of the use of the maps.**

Flood Event Probabilities

The maps refer to flood event probabilities in terms of a percentage Annual Exceedance Probability, or 'AEP'. This represents the probability of an event of this, or greater, severity occurring in any given year. These probabilities may also be expressed as odds (e.g., 100 to 1) of the event occurring in any given year. They are also commonly referred to in terms of a return period (e.g., the 100-year flood), although it should be understood that this does not mean the length of time that will elapse between two such events occurring, as, although unlikely, two very severe events may occur within a very short space of time.

Table 1 below sets out a range of flood event probabilities expressed in terms of AEP, and identifies their parallels under other forms of expression.

Table 1: Flood Event Probabilities

Annual Exceedance Probability (%)	Odds of Occurrence in any Given Year	Return Period (yrs)
50	2 : 1	2
20	5 : 1	5
10	10 : 1	10
5	20 : 1	20
2	50 : 1	50
1	100 : 1	100
0.5	200 : 1	200
0.2	500 : 1	500
0.1	1000 : 1	1000

Uncertainty

Although great care and modern, widely-accepted methods have been used to prepare the maps, there is a range of inherent uncertainties within the process of preparing the predicted flood extents maps. These include:

- **Uncertainty in Flood Levels:** This can arise due to uncertainties in topographic, bathymetric and other survey data, meteorological data, assumptions and / or approximations in the hydraulic / hydrodynamic models in representing physical reality, assumptions in the hydraulic / hydrodynamic modelling, and datum conversions, etc.
- **Uncertainty in Flood Extents:** This can arise due to uncertainties in flood levels, topographic and other survey data, assumptions and / or approximations in the way that flooding spreads over a floodplain, etc.

The flood maps are therefore only indicative, and the potential for inaccuracy should be recognised if these maps are to be used for any purpose.

Types of Flood Map

This volume contains only flood extent maps as outlined below. Further details on this type of map, including the methods of derivation, assumptions made, data used, etc. are provided in the relevant project reports.

Flood Extent Maps

Flood extent maps contained in this volume show the predicted extents of flooding for future scenario flood events of two estimated probabilities of occurrence:

- 0.5% AEP flood event
- 0.1% AEP flood event

It should be noted that the flood extent maps indicate the predicted maximum extent of flooding (subject to limitations referred to herein), and flooding in some areas, such as near the edge of the flooded area, might be very shallow.

Due to the various uncertainties within the process of preparing the maps (see 'Uncertainty' above), it is not possible to state that the maps are absolutely accurate.

Consideration of Projected Future Changes in Climate

The maps produced in this bound volume represent a projected future scenario for the year 2100 and include allowances for projected future changes in climate and glacial isostatic adjustment (GIA). The maps represent a Mid-Range Future Scenario (MRFS) reflecting changes that are within the typical range projected.

The allowances used for this Mid-Range Future Scenario are as follows:-

Mean Sea Level Rise: + 500 mm (to 2100)
Land Movement (GIA): Varies - 0.5 to - 0.1 mm/year (South West Coast)

This volume includes maps that show the predicted extents of (tidal/coastal) flooding for the MRFS for flood events of two estimated probabilities of occurrence:-

0.5 % AEP
0.1% AEP

The future scenario water levels shown on the maps are relative to Ordnance Datum Malin and include the above mean sea level rise allowance (+ 500mm) but have not been adjusted for GIA.

Sources of Flooding Not Mapped

The maps indicate only the extents associated with flooding from coastal areas and the sea. There are however many other possible sources of flooding, such as fluvial flooding from rivers, surcharged urban drainage systems, ponding rainwater, groundwater, overtopping or breaching of water retaining structures (such as embankments and reservoirs), etc. Flooding from these other sources have not been mapped, and so areas that are not shown as being within a flood extent may therefore be at risk from flooding from one of these other sources.

CONDITIONS OF USE

Please read the following statements and conditions of use of the maps in this bound volume carefully. Use of these maps is conditional upon the following:-

The user of these maps shall be deemed to have agreed to, and unconditionally accepted all of these statements and conditions.

The user is deemed to have read in full, understood and accepted all of the above disclaimer, guidance notes and statements concerning the preparation, limitations and use of the maps in this bound volume.

The user acknowledges that the flood-related data (including flood extents, levels, etc.) presented on the maps contained within this bound volume are copyright of the Office of Public Works.

The user agrees that the Office of Public Works has the absolute right to reprocess, revise, add to, or remove any of the information shown on these maps at any time, and that this will in no way render them, the State or it's servants or agents liable for any damage or cost incurred as a result of such acts.

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CONTACTS REGARDING MAP INFORMATION

Any user who has reason to believe that these maps contain an error, or who wishes to contribute additional information, is requested to contact the Office of Public Works Engineering Services Section at the following address:

Flood Mapping Queries
Engineering Services
Office of Public Works
17-19 Lower Hatch Street
Dublin 2

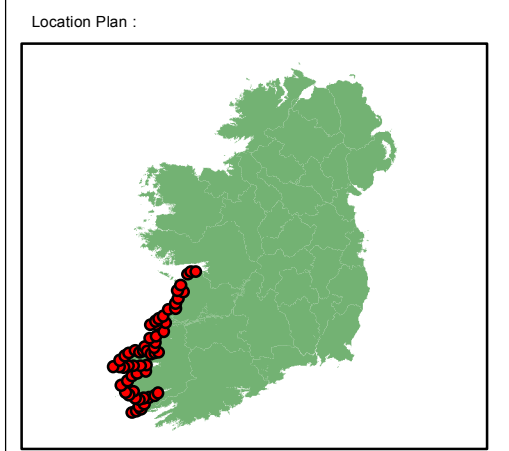
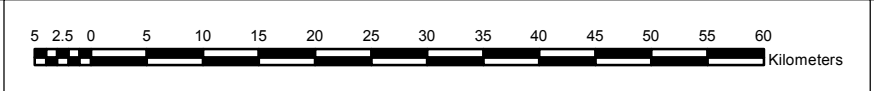
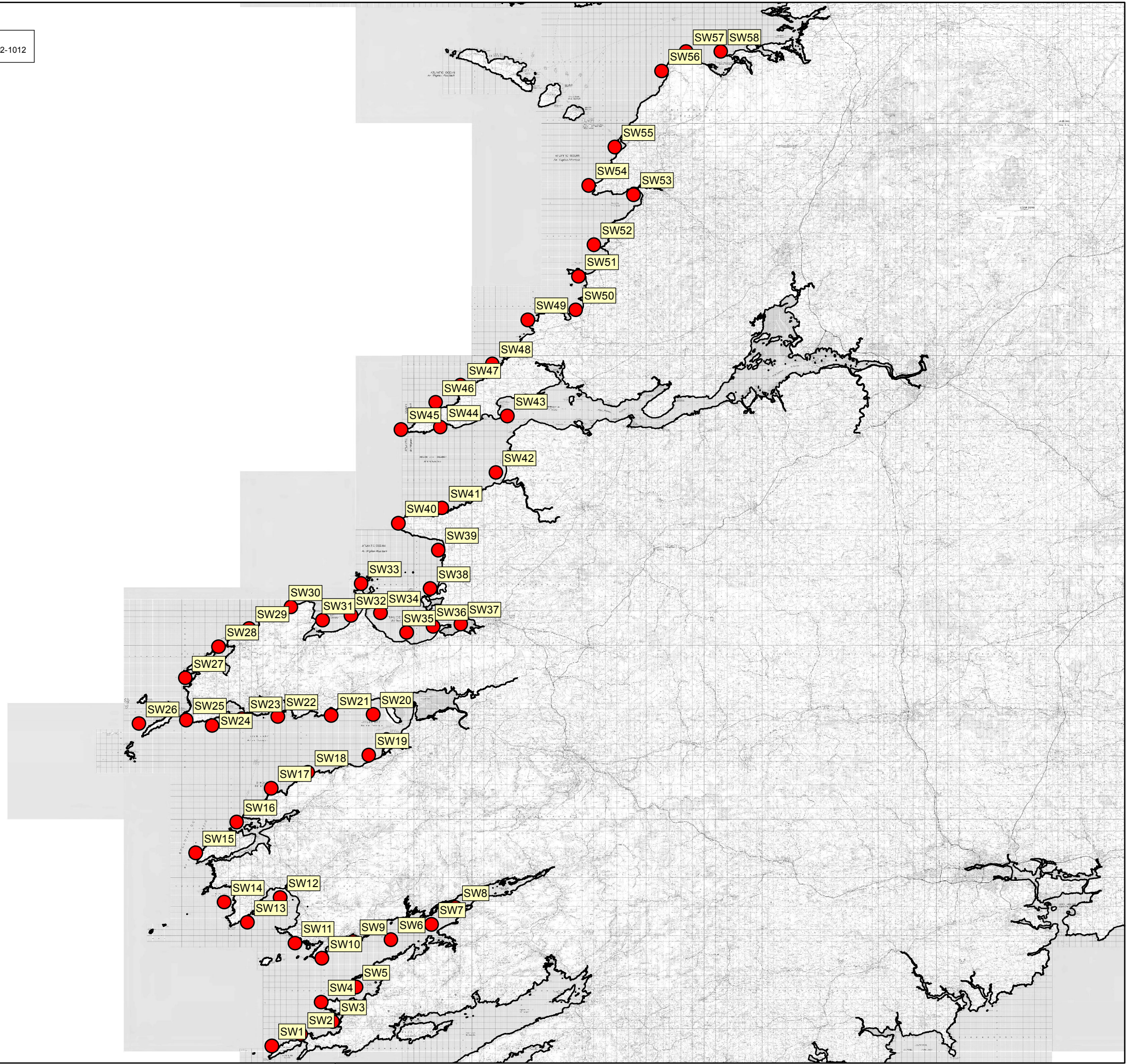
Predicted Extreme Water Levels Associated with Combined Tide and Surge

PREDICTION POINT ID	ANNUAL EXCEEDANCE PROBABILITY (AEP)								CO-ORDINATES OF PREDICTION POINTS	
	50%	20%	10%	5%	2%	1%	0.5%	0.1%	EASTINGS	NORTHINGS
SW1	2.43	2.53	2.60	2.67	2.75	2.81	2.88	3.02	45540	40898
SW2	2.46	2.55	2.62	2.68	2.76	2.83	2.89	3.03	50521	42864
SW3	2.47	2.56	2.62	2.68	2.75	2.80	2.86	2.98	56059	45041
SW4	2.48	2.57	2.63	2.69	2.76	2.82	2.88	3.01	54079	48438
SW5	2.49	2.58	2.63	2.69	2.76	2.81	2.87	2.99	60036	51053
SW6	2.52	2.62	2.68	2.75	2.83	2.89	2.95	3.10	66134	59237
SW7	2.60	2.69	2.76	2.82	2.90	2.96	3.02	3.17	73107	61840
SW8	2.62	2.72	2.78	2.85	2.93	2.99	3.06	3.20	77181	64744
SW9	2.49	2.59	2.66	2.72	2.80	2.87	2.93	3.07	59561	58860
SW10	2.48	2.58	2.64	2.71	2.79	2.85	2.92	3.06	54159	56007
SW11	2.47	2.57	2.64	2.71	2.79	2.86	2.92	3.07	49535	58593
SW12	2.49	2.59	2.67	2.74	2.83	2.90	2.97	3.13	47011	66463
SW13	2.48	2.58	2.66	2.73	2.82	2.89	2.96	3.12	41356	62185
SW14	2.51	2.62	2.69	2.76	2.85	2.92	2.99	3.15	37325	65654
SW15	2.60	2.70	2.77	2.84	2.93	2.99	3.06	3.21	32433	74168
SW16	2.65	2.75	2.82	2.88	2.96	3.02	3.09	3.23	39495	79505
SW17	2.68	2.78	2.85	2.91	3.00	3.06	3.13	3.27	45456	85330
SW18	2.71	2.81	2.88	2.94	3.02	3.08	3.15	3.29	51791	88033
SW19	2.85	2.95	3.01	3.08	3.16	3.22	3.28	3.43	62267	91015
SW20	2.87	2.98	3.06	3.13	3.23	3.31	3.38	3.56	63057	98065
SW21	2.76	2.86	2.93	3.01	3.10	3.17	3.24	3.40	55762	97873
SW22	2.70	2.80	2.88	2.95	3.04	3.11	3.18	3.35	46592	97656
SW23	2.68	2.79	2.87	2.94	3.04	3.11	3.18	3.35	40409	97293
SW24	2.67	2.78	2.85	2.93	3.02	3.10	3.17	3.34	35296	96124
SW25	2.68	2.79	2.87	2.94	3.04	3.11	3.18	3.35	30800	97054
SW26	2.71	2.82	2.90	2.97	3.07	3.14	3.21	3.38	22683	96446
SW27	2.82	2.92	2.99	3.06	3.15	3.21	3.28	3.43	30635	104299
SW28	2.88	2.98	3.06	3.13	3.23	3.30	3.37	3.54	36361	109676
SW29	2.92	3.03	3.11	3.18	3.28	3.35	3.42	3.59	41593	112847
SW30	2.97	3.08	3.16	3.24	3.34	3.41	3.48	3.65	48882	116516
SW31	3.02	3.13	3.20	3.27	3.36	3.43	3.50	3.66	45279	114238
SW32	3.03	3.14	3.21	3.28	3.37	3.44	3.50	3.66	59207	115106
SW33	3.06	3.17	3.25	3.32	3.42	3.50	3.58	3.75	60950	120616
SW34	3.18	3.29	3.36	3.43	3.51	3.58	3.65	3.80	64289	115512
SW35	3.19	3.29	3.36	3.44	3.53	3.60	3.67	3.83	68777	112162
SW36	3.22	3.33	3.41	3.48	3.58	3.65	3.72	3.89	73381	113155
SW37	3.33	3.44	3.52	3.60	3.71	3.79	3.86	4.05	78171	113613
SW38	3.13	3.24	3.31	3.39	3.48	3.55	3.62	3.79	72867	119737
SW39	3.13	3.24	3.32	3.40	3.50	3.58	3.66	3.83	74265	126382
SW40	3.09	3.21	3.29	3.36	3.47	3.54	3.62	3.79	67371	131016
SW41	3.13	3.24	3.32	3.40	3.50	3.57	3.65	3.82	74926	133602
SW42	3.17	3.29	3.37	3.46	3.57	3.65	3.73	3.92	84187	139720
SW43	3.14	3.27	3.36	3.45	3.57	3.66	3.75	3.95	86181	149471
SW44	3.12	3.25	3.33	3.42	3.53	3.62	3.70	3.90	74602	147527
SW45	3.07	3.19	3.28	3.36	3.47	3.56	3.64	3.83	67807	147150
SW46	3.09	3.21	3.29	3.38	3.48	3.57	3.65	3.83	73800	151815
SW47	3.10	3.22	3.30	3.38	3.49	3.57	3.65	3.84	78108	154787
SW48	3.11	3.23	3.32	3.40	3.51	3.60	3.68	3.87	83599	158464
SW49	3.12	3.24	3.33	3.42	3.53	3.62	3.70	3.90	89719	166059
SW50	3.14	3.27	3.36	3.45	3.56	3.65	3.74	3.94	97955	167774
SW51	3.15	3.28	3.37	3.46	3.58	3.67	3.76	3.96	98414	173525
SW52	3.16	3.29	3.38	3.47	3.58	3.67	3.76	3.96	101090	178980
SW53	3.20	3.33	3.43	3.52	3.65	3.74	3.83	4.05	107926	187640
SW54	3.19	3.32	3.42	3.51	3.63	3.72	3.81	4.02	100223	189240
SW55	3.22	3.35	3.45	3.54	3.66	3.74	3.83	4.04	104725	195829
SW56	3.32	3.47	3.57	3.67	3.80	3.89	3.99	4.22	112752	208923
SW57	3.42	3.56	3.66	3.76	3.89	3.98	4.08	4.30	117015	212298
SW58	3.44	3.58	3.68	3.78	3.91	4.00	4.10	4.32	122985	212310

Notes

- 1 - All water levels shown are in metres and referenced to Ordnance Datum Malin
- 2 - All co-ordinates shown are in Irish Grid (TM65)
- 3 - AEP denotes Annual Exceedance Probability

Prepared By:	RPS	Date:	June 2012
Checked By:	JMC & JR	Date:	June 2012
Table No.:	SW/MRFS/WL/1	Revision:	1



PREDICTION POINT ID

Legend:

- Denotes Prediction Point
- Denotes High Water Mark (HWM)

SW 15 Denotes West Prediction Point No. 15 (REFER TO TABLE SW / MRFS / WL / 1)

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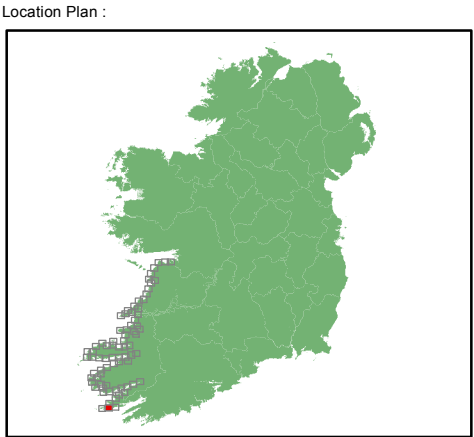
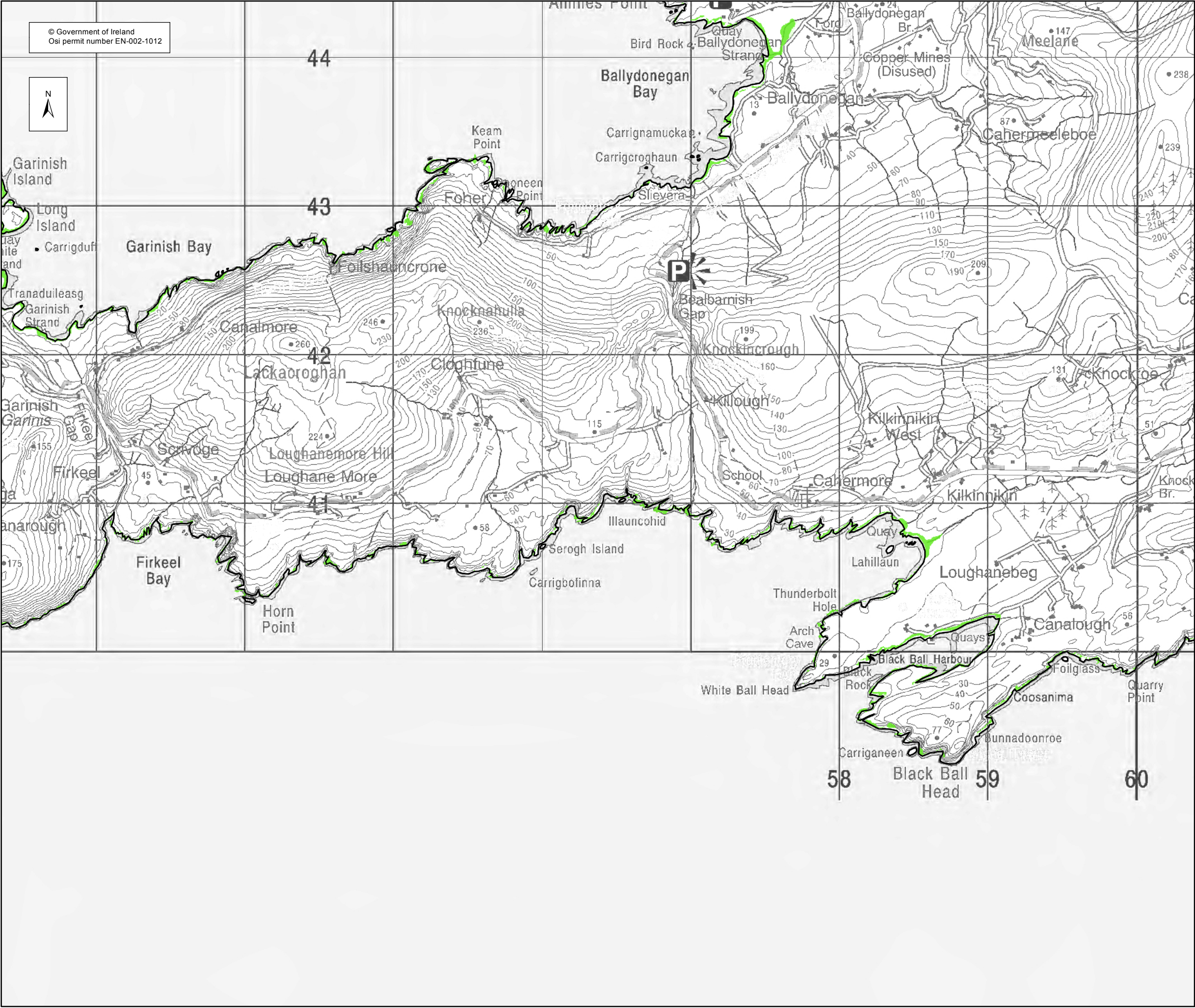
Project :
IRISH COASTAL PROTECTION STRATEGY
STUDY - PHASE IV

Map :
SOUTH WEST COAST -
EXTREME WATER LEVEL PREDICTION POINTS

Map Type :	PREDICTION POINT ID	
Source :	COMBINED TIDE & SURGE LEVELS	
Map area :	INDEX SHEET	
Scenario :	MID RANGE FUTURE SCENARIO	
Figure By :	PJW	Date : Apr 2012
Checked By :	JMC & JR	Date : Apr 2012

Figure No. :
SW / MRFS / POINT ID/1

Drawing Scale : 1:700,000 Plot Scale : 1:1 @ A3



EXTENT MAP

Legend:

- 0.5% AEP FLOOD EXTENT
(1 in 200 chance in any given year)
- 0.1% AEP FLOOD EXTENT
(1 in 1000 chance in any given year)
- High Water Mark (HWM)
- Node Point
- SW 15 Node Label (refer to table)

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Project :
IRISH COASTAL PROTECTION STRATEGY
STUDY - PHASE IV

Map :
SOUTH WEST COAST FLOOD EXTENT MAP

Map Type : FLOOD EXTENT

Source : TIDAL FLOODING

Map area : RURAL AREA

Scenario : MID RANGE FUTURE SCENARIO

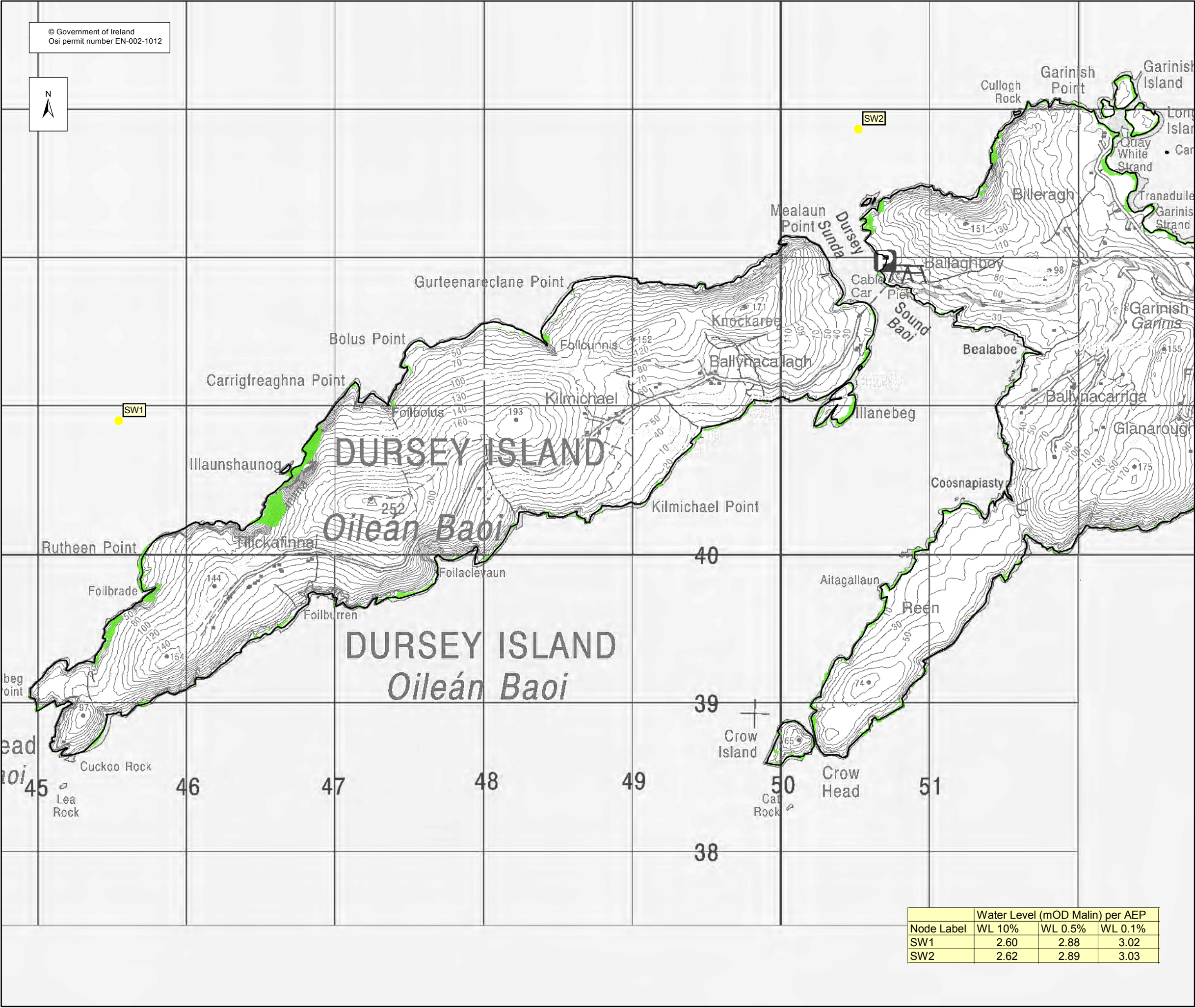
Figure By : PJW Date : Apr 2012

Checked By : JMC & JR Date : Apr 2012

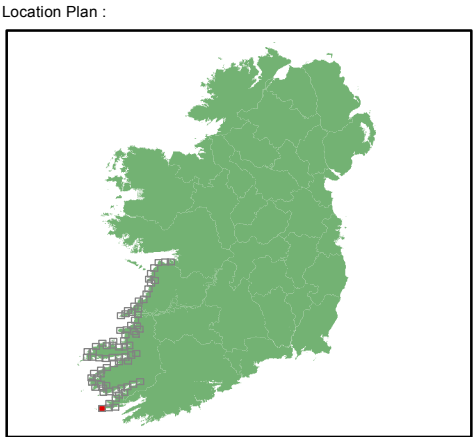
Figure No. :
SW / RA / EXT / MRFS / 2

Revision
0

Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3



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EXTENT MAP

- Legend:
- 0.5% AEP FLOOD EXTENT
(1 in 200 chance in any given year)
 - 0.1% AEP FLOOD EXTENT
(1 in 1000 chance in any given year)
 - High Water Mark (HWM)
 - Node Point
 - SW 15 Node Label (refer to table)

USER NOTE :
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Project :
IRISH COASTAL PROTECTION STRATEGY
STUDY - PHASE IV

Map :
SOUTH WEST COAST FLOOD EXTENT MAP

Map Type : FLOOD EXTENT
Source : TIDAL FLOODING
Map area : RURAL AREA
Scenario : MID RANGE FUTURE SCENARIO

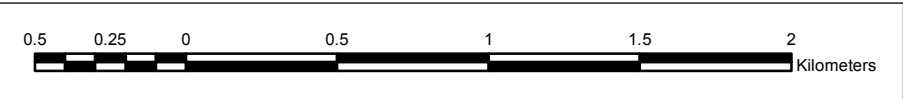
Figure By : PJW Date : Apr 2012
Checked By : JMC & JR Date : Apr 2012

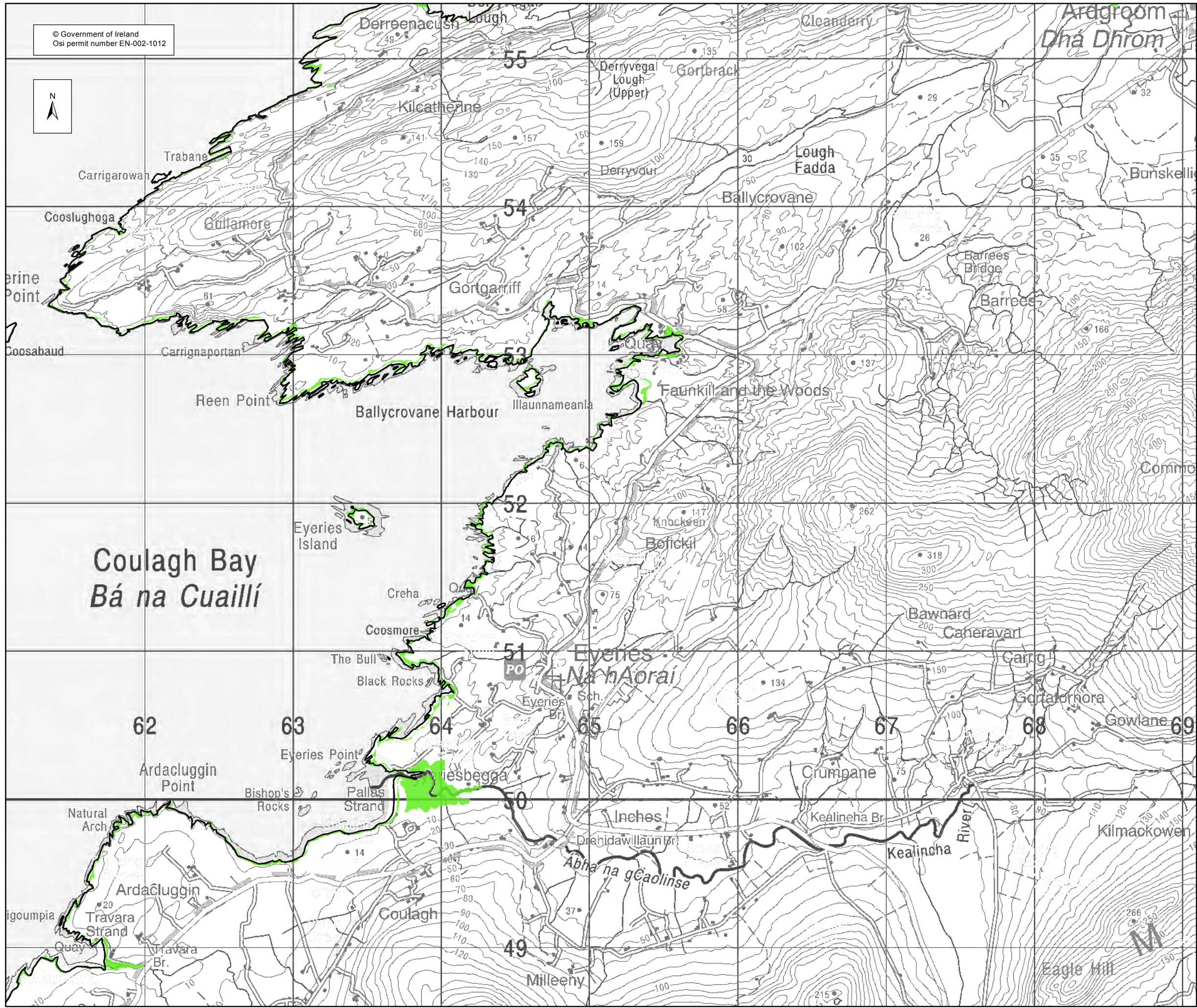
Figure No. :
SW / RA / EXT / MRFS /3

Revision
0

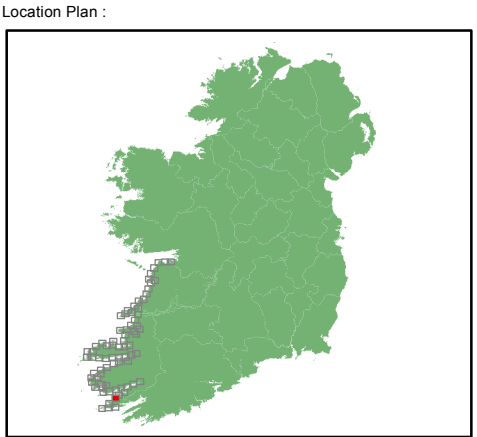
Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3

Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
SW1	2.60	2.88	3.02
SW2	2.62	2.89	3.03





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EXTENT MAP

Legend:

- 0.5% AEP FLOOD EXTENT
(1 in 200 chance in any given year)
- 0.1% AEP FLOOD EXTENT
(1 in 1000 chance in any given year)
- High Water Mark (HWM)
- Node Point
- SW 15 Node Label (refer to table)

USER NOTE :

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

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Project :
**IRISH COASTAL PROTECTION STRATEGY
STUDY - PHASE IV**

Map :
SOUTH WEST COAST FLOOD EXTENT MAP

Map Type : FLOOD EXTENT
Source : TIDAL FLOODING
Map area : RURAL AREA
Scenario : MID RANGE FUTURE SCENARIO

Figure By : PJW Date : Apr 2012
Checked By : JMC & JR Date : Apr 2012

Figure No. :
SW / RA / EXT / MRFS / 5

Revision
0

Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3