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Ballyragget 110kV Substation Drainage and Services Report

EIRGRID

Laois - Kilkenny Reinforcement Project
Ballyragget 110kV Substation

PE687-F0261-R261-017

ESBI Engineering
Stephen Court,
18/21 St Stephen's Green,
Dublin 2 Ireland
Tel: +353 (0)1 703 8000
Web: www.esbi.ie

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Prepared by:	John MacCarthy BE CEng
Title	Civil Engineer

APPROVED: Donal Walsh ***TITLE:*** ***CBE Team Leader***	***DATE: 10/11/12***

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Executive Summary

This report covers aspects of the surface water drainage, foul water drainage and water supply for the Ballyragget electrical substation.

Sustainability and minimising the impact of the proposed Electrical Substation Development have been key factors in formulating the proposals for the associated Surface Water drainage, Foul Water drainage and Water Supply services discussed in this report.

The use of Sustainable Drainage Systems (SuDS) in the Surface Water drainage will be referred to throughout the report. The SuDS techniques proposed in the design of the station will ensure that the natural drainage patterns are replicated and no negative impact results from the development in terms of water quality discharged from the development in the construction or operational stage or in the quantity of runoff from the development. Source Control through the use of soakaways is the preferred option for the disposal of surface water generated on the site.

Options for the treatment and disposal of the Foul Water generated on site were considered and proposed to the Local Authority. The most appropriate system to the development selected following on site testing and subsequent consultation with the relevant Local Authority is for provision of a septic tank and percolation area within the site.

Similarly the water supply proposals to the station have been the subject of consultation with the relevant Local Authority and have been agreed.

Contents

1 Introduction

1.1 Background

The site of the proposed 110kV/38kV/ MV Gas Insulated Switchgear (GIS) substation is located to the north of the town of Ballyragget Co. Kilkenny on the R432 (Moate Rd.) which connects Ballyragget and Ballinakill Co. Laois. The site is approximately 1.25km from the town of Ballyragget. There is an existing Electrical Substation on the site and there is a cemetery adjacent to the site to the North. The site is otherwise surrounded by land used for agricultural use.

There is an existing Air Insulated Switchgear (AIS) 38kV Electrical Substation on the site adjacent to the road with existing entrance gates from the R432. The proposed GIS substation will be behind the existing station from the perspective of the road. Site Layout drawings are included in Volume 1 of this application.

1.2 Project Description

The proposed development of the 110kV Electrical GIS Substation will include two buildings to house electrical equipment, four electrical transformer bunds and one arc suppression coil (ASC) bund within a fenced off compound. The compound will have internal concrete roadways and the remaining area will be surfaced with permeable single size clean stone. A number of overhead line support towers are also proposed within the site boundary but outside the electrical compound. The entrance to the site will be from the R432.

The Buildings, the electrical transformer bunds and the ASC bund are the areas of the development that require surface water drainage.

The Substation will be an unmanned facility in the operational phase but will require welfare facilities for staff visiting the substation for inspections, routine maintenance and extraordinary maintenance as the need arises. These welfare facilities including toilets (WC), wash hand basin (WHB) and sinks will have a water demand and will generate wastewater.

2 Surface Water

2.1 Existing Surface Water

There is an absence of well defined drainage ditches along the site boundaries or within the site of the proposed Electrical Substation. Site investigations reveal a very high infiltration rate in the subsoil. It can be deduced from the Site Investigations that the vast majority of rainfall on the site is currently recharged to groundwater.

The River Nore is in close proximity to the site, approximately 400m to the West. The Nore is part of the Nore-Barrow candidate Special Area of Conservation (cSAC) and a designated Pearl Mussel River. The proximity of such an environmentally sensitive water body was an important consideration in the formulation of the drainage proposals for the site.

2.2 Surface Water Drainage Proposals

Surface Water proposals for the development have been developed to mimic the natural drainage patterns of the site and in accordance with the Best Management Practices (BMPs) of Sustainable Drainage Systems (SuDS). The surface water proposals replicate Greenfield drainage conditions of the site through the use of Source Controls, i.e. dealing with surface water disposal within the site.

Infiltration tests were carried out on the site during site investigations. The tests were carried out in accordance with the Building Research Establishment (BRE) Digest 365 at three locations in the field where the compound is proposed. The results of these tests showed that there are excellent infiltration rates within the subsoil. The results of the infiltration tests are included in Appendix B – Site Investigations.

It is proposed to provide two soakaways on the site. One soakaway will be provided for runoff or roof drainage from the 38kV GIS building i.e. the smaller of the two buildings. A second soakaway is proposed in the South West corner of the site to provide for roof drainage from the Control Building and runoff from the bunds that house the electrical transformers and ASC.

The site drainage proposals are shown on drawings PE610-D003-004, 001, 002 and 003 which are located in Volume 1 of the planning pack. A full drawing list is appended directly to this report for reference purposes.

Consultation with the relevant department of Kilkenny Co. Co. was an important consideration in the development of the surface water proposals. A meeting was held in the offices of Kilkenny Co. Co. on the 02/05/2012.

2.2.1 Water Volumes

Runoff from the impermeable surfaces on the site which are positively connected to the site drainage network was calculated assuming a 100% runoff rate from these areas. This was agreed with the local authority. The soakaways on the site have been designed in accordance with the Building Research Establishment (BRE) Digest 365 using the Engineering Design software TEDDS. The soakaways were sized for the 1in 100 year rainfall period. This design rainfall return period was a requirement of Kilkenny Co. Co. during consultations on the proposals. Calculations for the sizing of the soakaways are appended herewith.

2.2.2 Water Quality

Surface water discharge quality was a major consideration in the formulation of the proposals given the proximity of the River Nore which is within a candidate Special Area of Conservation (cSAC) and is a designated Fresh Water Pearl Mussel habitat. This is covered in more detail by the Environmental report accompanying the application.

It is not envisaged that there will be any surface water runoff discharged to drainage ditches or watercourses during the construction or operational phases of the proposed development due to the use of source control SuDS measures.

Erosion control measures to prevent runoff flowing across exposed or excavated ground and becoming polluted with sediments will be provided for in the construction management proposals. Drainage runoff controls such as settlement tanks will be temporarily provided adjacent to excavations and installed before starting site clearance and earthworks if necessary.

The two electrical transformers in the substation are oil filled equipment and as such are placed within impermeable bunds. Surface water generated in these bunds will be pumped out by an oil sensitive pump

ensuring that only non contaminated water enters the site drainage network. The Class 1 Full Retention Oil Separator will provide a second level of defence. The soakaway will provide a third level of defence with filtration through the geotextile material and the stone fill providing further opportunity for the capture of hydrocarbons on the site in the extremely unlikely event of any being present at this point. It must be noted that an oil leak from an Electrical Transformer is an extremely rare occurrence. Such a leak will result in an electrical fault which will be notified to the transmission system operator and attended to on site by trained operatives immediately. The measures taken to ensure no potential for pollution from this unlikely event are as follows:

- Oil sensitive pump in impermeable bund;
- Full retention Class 1 Oil Separator;
- Filtration through Soakaway;
- Filtration through Subsoil within site;
- Filtration through subsoil between site and any watercourse.

3 Foul Water

3.1 Existing Foul

There are no existing foul water drains on the site or in the vicinity of the site. This has been confirmed by the local authority. Connection to the Ballyragget Wastewater Treatment Plant (WWTP) is therefore not possible as the site is remote from the town's wastewater collection network.

The dispersed settlement pattern of the surrounding area suggests that the individual houses and farm dwellings use standalone private foul treatment and disposal systems.

3.2 Foul Water Drainage Proposals

The foul drainage proposals have to cater for the wastewater generated in the welfare facilities of the proposed development. These welfare facilities include for a toilet (WC), wash hand basin (WHB) and a sink within a small tea making or mess room. The station will be unmanned in normal operation so demand for the facilities which generate foul flows will be low.

On site treatment and disposal of foul waste was considered and a site characterisation testing was carried out as part of the site investigations. The test was carried out on the site by a suitably qualified site assessor in accordance with EPA guidelines. The results of the test showed that the area is suitable for a septic tank and percolation area. The site characterisation report is appended herewith (Appendix E).

The relevant department of Kilkenny Co. Co. had a strong preference for a septic tank and percolation area over other options proposed. The alternative of a foul holding tank due to low volume foul flows was not considered necessary by Kilkenny Co. Co. due to the extremely favourable subsoil percolation characteristics encountered on the site. The proposals for the station foul management system reflect the preference of Kilkenny Co. Co.

3.2.1 Foul Water Volumes

The proposed station will be unmanned and as such will generate small quantities of foul waste. There will be visits to the station for scheduled and unscheduled visits for inspections, maintenance and repairs as

necessary. A two man crew visiting the site for two days a week would be the most that would be expected on the site. In such circumstances the operatives could be expected to use each of the facilities four times a day. This would result in a weekly contribution of 60 litres of foul waste per week. The breakdown of usage is included in Appendix D. In the very unlikely event that such a high visitation rate would be extrapolated throughout the year, this would result in 6,323 litres per annum. While such a consistently high visitation rate is improbable, there is the possibility of increased numbers of staff being present on site for short durations of one to two weeks for the commissioning of electrical elements of the station from time to time. It is envisaged that these extraordinary occurrences would balance out with the ordinary operation of the unmanned station to produce foul flows no greater than the 6,323 litres per annum.

It is common for much lower usage of the facilities on unmanned stations and therefore a much lower foul loading. A common problem on such unmanned stations is odours in the toilet areas due to the drying out of the water trap in the WC through evaporation resulting from the lack of use. For this reason it is proposed to use self flushing toilets in the station, which would flush automatically twice a week. The station will include 1 no. 6 litres flush WC's so a minimum weekly foul flow of 12 litres can be expected. The self flushing WC's will therefore contribute 624 litres per annum.

Combining the automatic flush and maximum user demand figures would result in a maximum annual generation of 6,947 litres of foul water.

The maximum and minimum foul flows are set out in appendix D of this report.

4 Water Supply

4.1 Existing Water Supply

There is currently no water connection within the main body of the site of the proposed electrical substation compound. There is a public watermain in the road fronting the site, the R432, on the opposite side of the road. This has been confirmed by the local authority as a 75mm watermain.

4.2 Water Supply Proposals

It is proposed to make a connection to the 75mm public watermain in the R432 to provide potable water to the development. This will require a road crossing and all connection works will be carried out in accordance with the requirements of Kilkenny Co. Co.

The water demand for the proposed station will be low and it is envisaged that the existing public watermain has adequate supply and pressure to serve the site. The connection will be metered and shut of valves will be provided on the connection.

The potable water demand within the site will be low as the proposed station is to be unmanned. To avoid problems like stagnation in the water supply line and problems resulting from this there will be a continual water demand of 12 litres per week from automatically flushing WC's within the station.

Consultation with the relevant departments of Kilkenny Co. Co. was an important consideration in formulating the water supply proposals for the proposed development.

4.2.1 Water Supply Volumes

The water demand within the proposed development will be low and will be similar to the figures for the foul water generation as set out in section 3.2.1 of this report. The water demand will be slightly higher than the figure for the foul flow allowing for consumption within the tea making station or

mess room located within one of the buildings in the proposed development.

Water supply demand calculations are set out in Appendix C of this report.

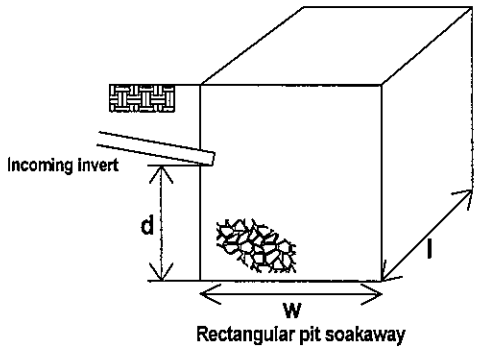
Appendices

Appendix A – Surface Water Calculations

Tedds ESBI	Project: Ballyragget Substation				Job no.	
	Calcs for: Soakaway 1 - 38kV GIS Building Roof Drainage				Start page no./Revision: 1	
	Calcs by: J MacC	Calcs date: 11/07/2012	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN – BRE DIGEST 365

TEDDS calculation version 1.0.01



Rectangular pit soakaway

Rectangular Pit Design

Pit length	l = **3500** mm	Pit width	w = **3500** mm
Pit depth below invert	d = **1600** mm	Free volume	V_{free} = **30.0** %
Location of soakaway	**Scotland & Ireland**	Return period	**100 years**

Ratio of 60 minute to 2 day rainfalls of 5 year return period (BRE digest 365 - fig 1) r = **0.30**

Impermeable area A = **200.0** m^2 Soil infiltration rate f = **0.0001200** m/s

Surface area of soakaway to 50% storage depth

$A_{s50} = 2 \times (l + w) \times d / 2 =$ **11.200** m^2

Outflow factor $AF = A_{s50} \times f =$ **1.34×10^{-3}** m^3/s

M5 rainfalls are calculated from table 1 BRE digest 365 using Factor Z1

Duration	M5 rainfalls	Growth factor Z2	100 year rainfall	Inflow	Outflow	Storage required
5 mins	6.8 mm	1.90	12.9 mm	2.6 m^3	0.4 m^3	2.2 m^3
10 mins	9.8 mm	1.97	19.3 mm	3.9 m^3	0.8 m^3	3.0 m^3
15 mins	11.8 mm	1.97	23.3 mm	4.7 m^3	1.2 m^3	3.4 m^3
30 mins	15.4 mm	1.98	30.4 mm	6.1 m^3	2.4 m^3	3.7 m^3
1 hour	20.0 mm	1.93	38.6 mm	7.7 m^3	4.8 m^3	2.9 m^3
2 hours	25.0 mm	1.89	47.3 mm	9.5 m^3	9.7 m^3	-0.2 m^3
4 hours	31.4 mm	1.84	57.7 mm	11.5 m^3	19.4 m^3	-7.8 m^3
6 hours	35.6 mm	1.81	64.3 mm	12.9 m^3	29.0 m^3	-16.2 m^3
10 hours	42.4 mm	1.76	74.5 mm	14.9 m^3	48.4 m^3	-33.5 m^3
24 hours	56.8 mm	1.69	96.2 mm	19.2 m^3	116.1 m^3	-96.9 m^3

Required storage volume $S_{reqd} =$ **3.7** m^3

Soakaway storage volume $S_{act} = l \times d \times w \times V_{free} =$ **5.9** m^3

Soakaway storage volume- OK

Time for emptying soakaway to half volume

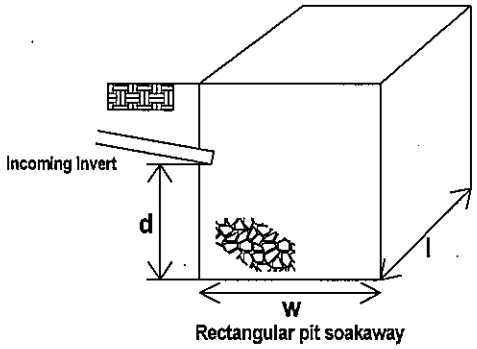
$T_{s50} = S_{reqd} \times 0.5 / (A_{s50} \times f) =$ **0 hr 22 min 44 s**

Soakaway discharge time - OK

Tedds ESBI	Project: Ballyragget Substation				Job no.	
	Calcs for: Soakaway 2 - Control Building & Bund Drainage				Start page no./Revision: 1	
	Calcs by: J MacC	Calcs date: 11/07/2012	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN – BRE DIGEST 365

TEDDS calculation version 1.0.01



Rectangular pit soakaway

Rectangular Pit Design

Pit length	l = **8000** mm	Pit width	w = **5500** mm
Pit depth below invert	d = **1400** mm	Free volume	V_{free} = **30.0** %
Location of soakaway	**Scotland & Ireland**	Return period	**100 years**

Ratio of 60 minute to 2 day rainfalls of 5 year return period (BRE digest 365 - fig 1) r = **0.30**

Impermeable area A = **840.0** m^2 Soil infiltration rate f = **0.0002800** m/s

Surface area of soakaway to 50% storage depth

$A_{s50} = 2 \times (l + w) \times d / 2 =$ **18.900** m^2

Outflow factor $AF = A_{s50} \times f =$ **5.29×10^{-3}** m^3/s

M5 rainfalls are calculated from table 1 BRE digest 365 using Factor Z1

Duration	M5 rainfalls	Growth factor Z2	100 year rainfall	Inflow	Outflow	Storage required
5 mins	6.8 mm	1.90	12.9 mm	10.9 m^3	1.6 m^3	9.3 m^3
10 mins	9.8 mm	1.97	19.3 mm	16.2 m^3	3.2 m^3	13.0 m^3
15 mins	11.8 mm	1.97	23.3 mm	19.6 m^3	4.8 m^3	14.8 m^3
30 mins	15.4 mm	1.98	30.4 mm	25.6 m^3	9.5 m^3	16.0 m^3
1 hour	20.0 mm	1.93	38.6 mm	32.4 m^3	19.1 m^3	13.4 m^3
2 hours	25.0 mm	1.89	47.3 mm	39.7 m^3	38.1 m^3	1.6 m^3
4 hours	31.4 mm	1.84	57.7 mm	48.5 m^3	76.2 m^3	-27.7 m^3
6 hours	35.6 mm	1.81	64.3 mm	54.0 m^3	114.3 m^3	-60.3 m^3
10 hours	42.4 mm	1.76	74.5 mm	62.6 m^3	190.5 m^3	-127.9 m^3
24 hours	56.8 mm	1.69	96.2 mm	80.8 m^3	457.2 m^3	-376.5 m^3

Required storage volume $S_{reqd} =$ **16.0** m^3

Soakaway storage volume $S_{act} = l \times d \times w \times V_{free} =$ **18.5** m^3

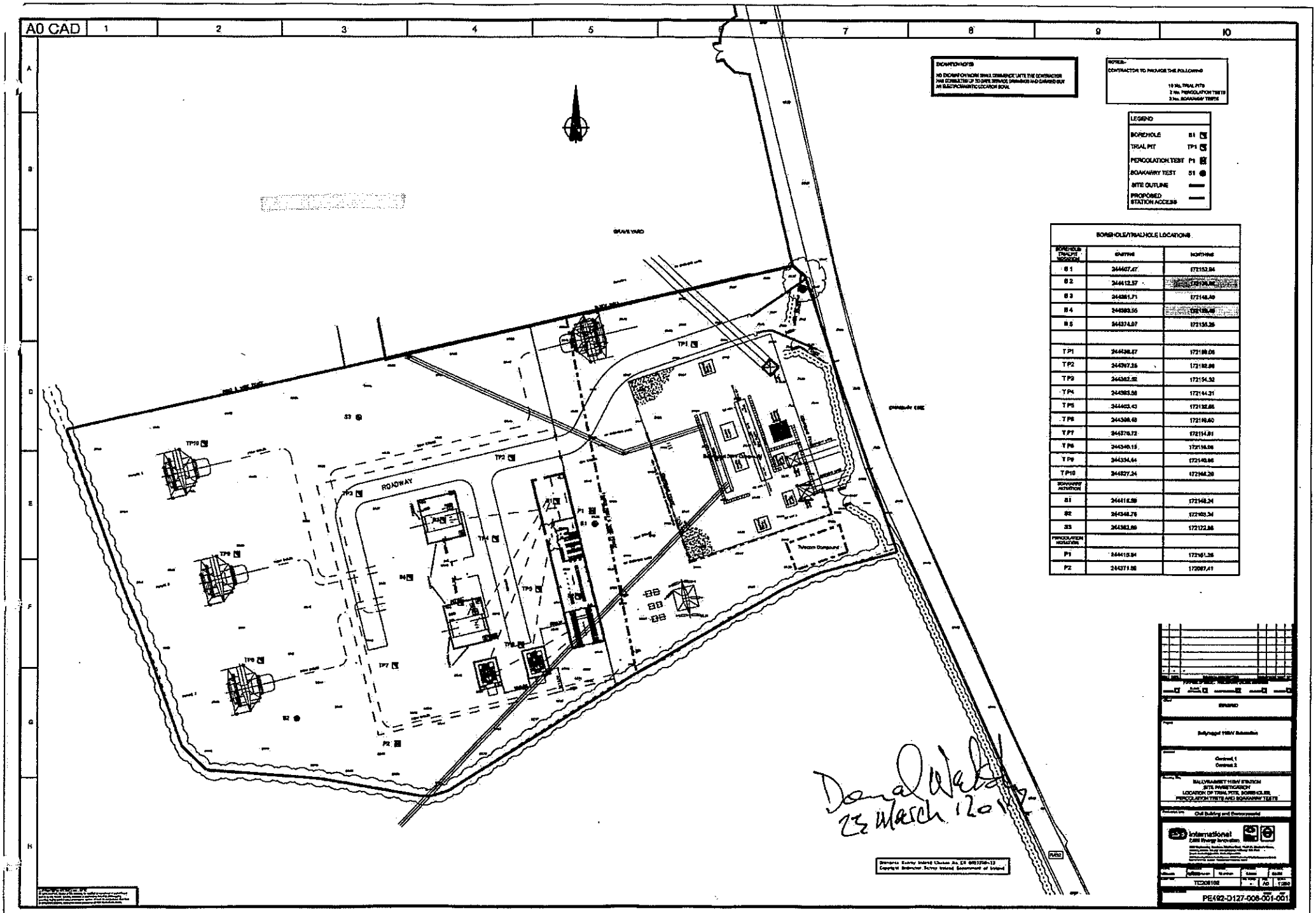
Soakaway storage volume- OK

Time for emptying soakaway to half volume

$T_{s50} = S_{reqd} \times 0.5 / (A_{s50} \times f) =$ **0** hr **25** min **15** s

Soakaway discharge time - OK

Appendix B – Site Investigations

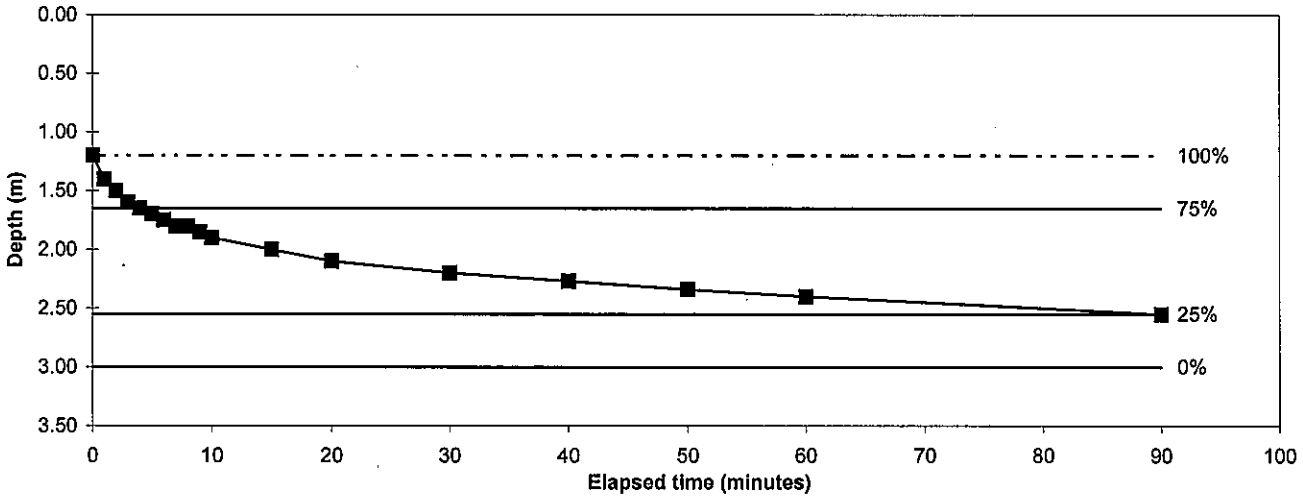

A0 CAD
EXCAVATION NOTE
NO EXCAVATION WORK SHALL COMMENCE UNTIL THE CONTRACTOR HAS CONSULTED UP TO DATE SERVICE DRAWINGS AND CARRIED OUT AN ELECTROMAGNETIC LOCATOR SCAN.
NOTES:
CONTRACTOR TO PROVIDE THE FOLLOWING
10 No. TRIAL PITS
2 No. PERCOLATION TESTS
3 No. SOAKAWAY TESTS
LEGEND
BOREHOLE
TRIAL PIT
PERCOLATION TEST
SOAKAWAY TEST
SITE OUTLINE
PROPOSED STATION ACCESS
BOREHOLE/TRIALHOLE LOCATIONS
BOREHOLE/ TRIALPIT/ SOAKAWAY
EASTING
NORTHING
B1
B2
B3
B4
B5
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
SOAKAWAY INITIATION
S1
S2
S3
PERCOLATION INITIATION
P1
P2
ROADWAY
Telecom Compound
GRAVE YARD
Donal Walsh
23 March 2012
ESB International
TC308100
PE492-D127-006-001-001

Soakaway Test

Soil Mechanics

Trial Pit No:	SA1	Test No:	1	Date:	22/03/2012
Length (m):	1.60		Datum height:	0.00 m agl	
Width (m):	0.90		Granular infill:	None	
Depth (m):	3.00				

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.20	40	2.27
1	1.40	50	2.34
2	1.50	60	2.40
3	1.60	90	2.55
4	1.65		
5	1.70		
6	1.75		
7	1.80		
8	1.80		
9	1.85		
10	1.90		
15	2.00		
20	2.10		
30	2.20		



Start water depth for analysis (mbgl):	1.20		
75% effective depth (mbgl):	1.65	Elapsed time (mins):	4.0
50% effective depth (mbgl):	2.10		
25% effective depth (mbgl):	2.55	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	3.00		

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 5.94
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate**

Remarks	Results processed following BRE 365 (2007). 2.27

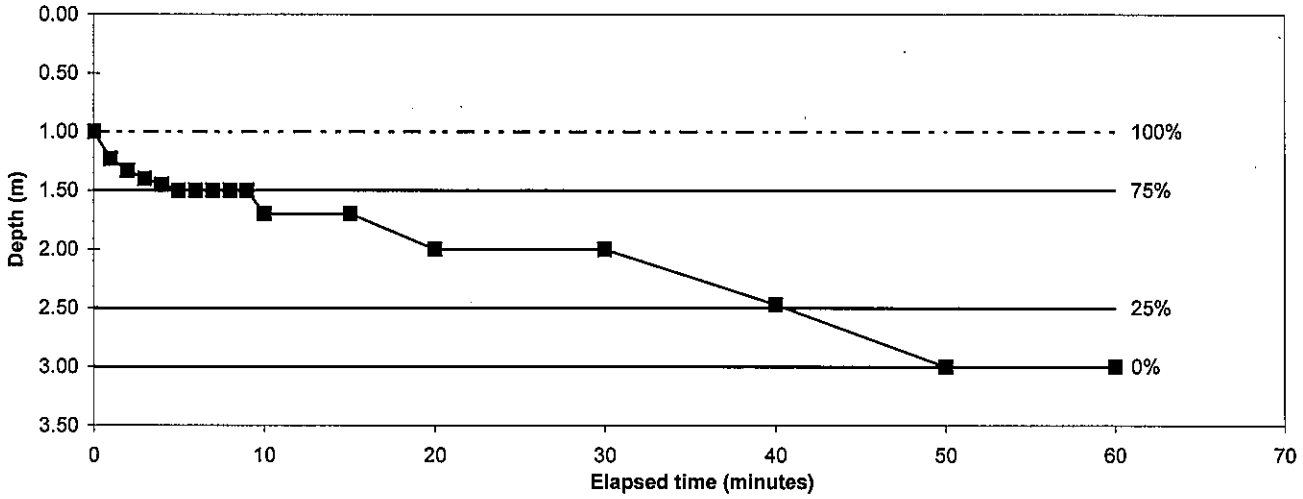
Notes:	Project	LAOIS KILKENNY REINFORCEMENT PROJECT - BALLYRAGGET	Figure
	Project No.	Y2012-12B	**SKWY/SA1/1**
	Carried out for	EirGrid	Sheet 1 of 1

Soakaway Test

Soil Mechanics

Trial Pit No:	SA1	Test No:	2	Date:	22/03/2012
Length (m):	1.60		Datum height:	0.00 m agl	
Width (m):	0.90		Granular infill:	None	
Depth (m):	3.00				

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.00	40	2.47
1	1.23	50	3.00
2	1.33	60	3.00
3	1.40		
4	1.45		
5	1.50		
6	1.50		
7	1.50		
8	1.50		
9	1.50		
10	1.70		
15	1.70		
20	2.00		
30	2.00		



Start water depth for analysis (mbgl):	1.00		
75% effective depth (mbgl):	1.50	Elapsed time (mins):	9.0
50% effective depth (mbgl):	2.00		
25% effective depth (mbgl):	2.50	Elapsed time (mins):	40.6
Base of soakage zone (mbgl):	3.00		

Volume outflow between 75% and 25% effective depth (m3):	1.440
Mean surface area of outflow (m^2):	6.44
(side area at 50% effective depth + base area)	
Time for outflow between 75% and 25% effective depth (mins):	31.6

Soil infiltration rate (m/s):	**1.2E-4**

Remarks Results processed following BRE 365 (2007).

Notes:

Project: LAOIS KILKENNY REINFORCEMENT PROJECT - BALLYRAGGET
Project No.: Y2012-12B
Carried out for: EirGrid

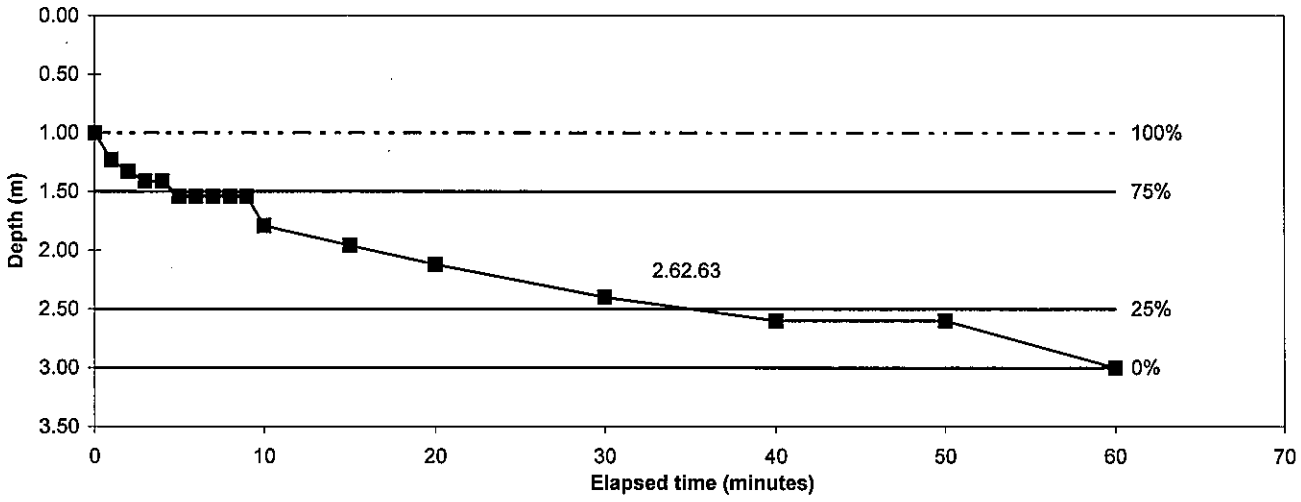
Figure: **SKWY/SA1/2**
Sheet 1 of 1

Soakaway Test

Soil Mechanics

Trial Pit No:	SA1	Test No:	3	Date:	22/03/2012
Length (m):	1.60		Datum height:		0.00 m agl
Width (m):	0.90		Granular infill:	None	
Depth (m):	3.00				

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.00	40	2.60
1	1.23	50	2.60
2	1.33	60	3.00
3	1.41		
4	1.41		
5	1.54		
6	1.54		
7	1.54		
8	1.54		
9	1.54		
10	1.79		
15	1.96		
20	2.12		
30	2.40		



Start water depth for analysis (mbgl):	1.00		
75% effective depth (mbgl):	1.50	Elapsed time (mins):	4.7
50% effective depth (mbgl):	2.00		
25% effective depth (mbgl):	2.50	Elapsed time (mins):	35.0
Base of soakage zone (mbgl):	3.00		

Volume outflow between 75% and 25% effective depth (m3):	1.440
Mean surface area of outflow (m^2):	6.44
(side area at 50% effective depth + base area)	
Time for outflow between 75% and 25% effective depth (mins):	30.3

Soil infiltration rate (m/s):	**1.2E-4**

Remarks Results processed following BRE 365 (2007).

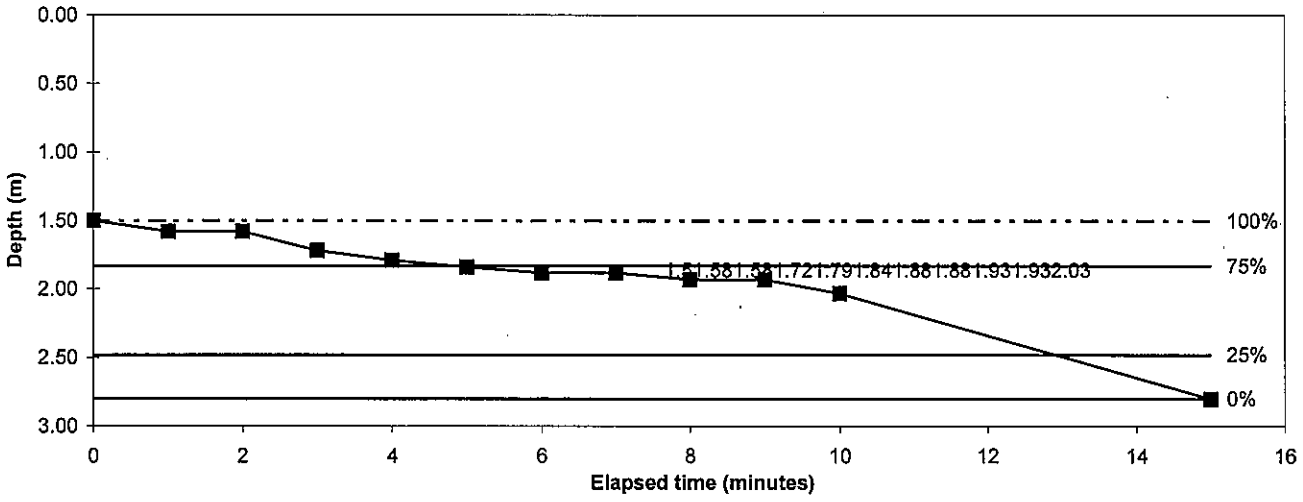
Notes:	Project	LAOIS KILKENNY REINFORCEMENT PROJECT - BALLYRAGGET	Figure
	Project No.	Y2012-12B	**SKWY/SA1/3**
	Carried out for	EirGrid	Sheet 1 of 1

Soakaway Test

Soil Mechanics

Trial Pit No:	SA2	Test No:	1	Date:	22/03/2012
Length (m):	1.80		Datum height:		m agl
Width (m):	1.40		Granular infill:	None	
Depth (m):	2.80				

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.50		
1	1.58		
2	1.58		
3	1.72		
4	1.79		
5	1.84		
6	1.88		
7	1.88		
8	1.93		
9	1.93		
10	2.03		
15	2.80		



Start water depth for analysis (mbgl):	1.50		
75% effective depth (mbgl):	1.83	Elapsed time (mins):	4.8
50% effective depth (mbgl):	2.15		
25% effective depth (mbgl):	2.48	Elapsed time (mins):	12.9
Base of soakage zone (mbgl):	2.80		

Volume outflow between 75% and 25% effective depth (m3):	1.638
Mean surface area of outflow (m^2):	6.68
(side area at 50% effective depth + base area)	
Time for outflow between 75% and 25% effective depth (mins):	8.1

Soil infiltration rate (m/s):	**5.0E-4**

Remarks Results processed following BRE 365 (2007).

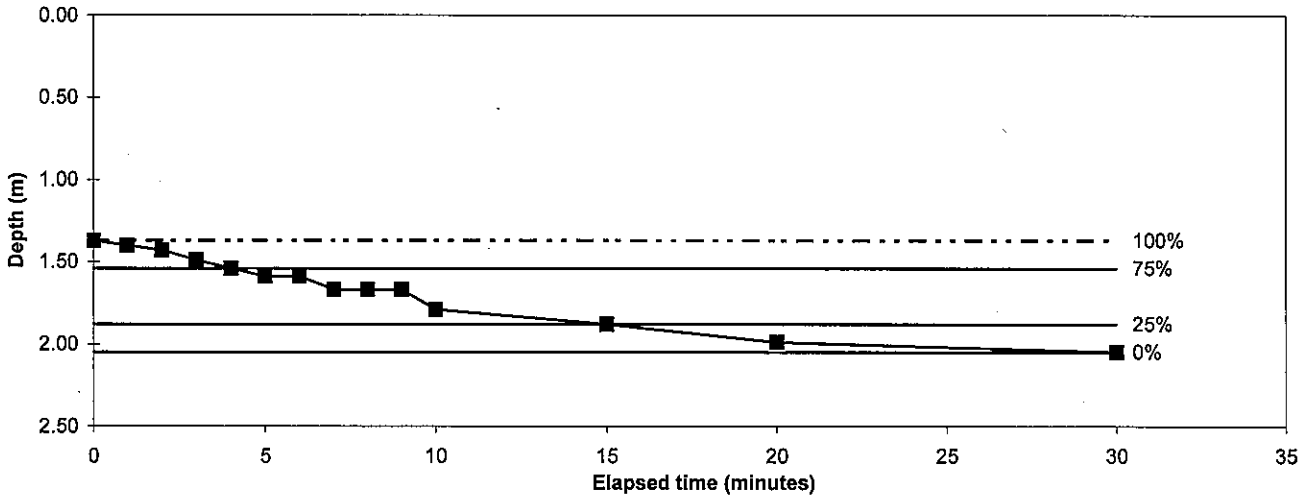
Notes:	Project	LAOIS KILKENNY REINFORCEMENT PROJECT - BALLYRAGGET	Figure
	Project No.	Y2012-12B	**SKWY/SA2/1**
	Carried out for	EirGrid	Sheet 1 of 1

Soakaway Test

Soil Mechanics

Trial Pit No:	SA2	Test No:	2	Date:	22/03/2012
Length (m):	1.80		Datum height:	0.00 m agl	
Width (m):	1.40		Granular infill:	None	
Depth (m):	2.05				

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.37		
1	1.40		
2	1.43		
3	1.49		
4	1.54		
5	1.59		
6	1.59		
7	1.67		
8	1.67		
9	1.67		
10	1.79		
15	1.88		
20	1.99		
30	2.05		



Start water depth for analysis (mbgl):	1.37		
75% effective depth (mbgl):	1.54	Elapsed time (mins):	4.0
50% effective depth (mbgl):	1.71		
25% effective depth (mbgl):	1.88	Elapsed time (mins):	15.0
Base of soakage zone (mbgl):	2.05		

Volume outflow between 75% and 25% effective depth (m3):	0.857
Mean surface area of outflow (m^2): (side area at 50% effective depth + base area)	4.70
Time for outflow between 75% and 25% effective depth (mins):	11.0

Soil infiltration rate (m/s):	**2.8E-4**

Remarks Results processed following BRE 365 (2007).

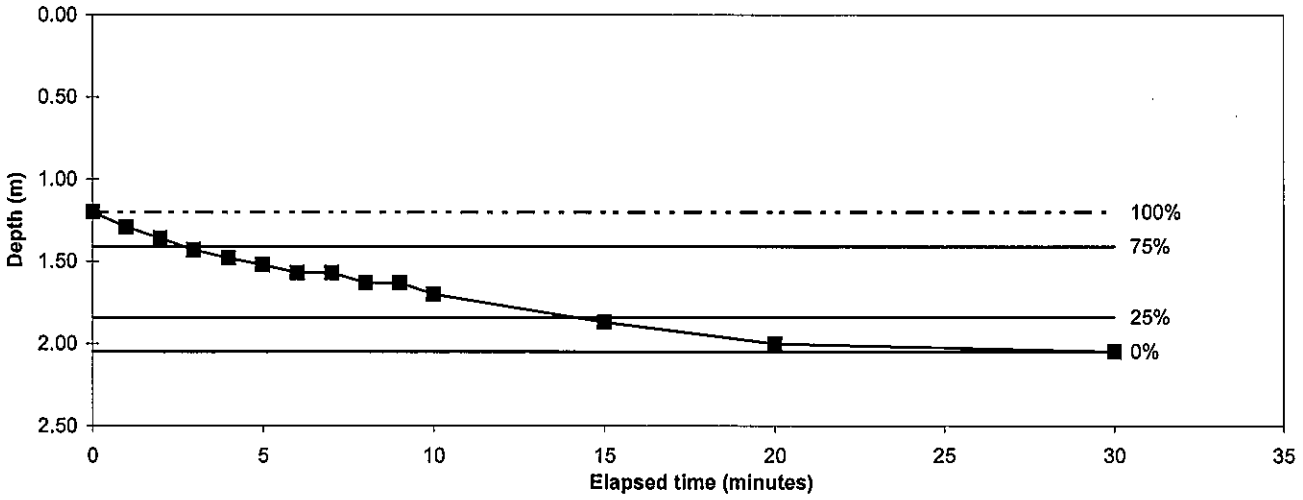
Notes:	Project	LAOIS KILKENNY REINFORCEMENT PROJECT - BALLYRAGGET	Figure
	Project No.	Y2012-12B	**SKWY/SA2/2**
	Carried out for	EirGrid	Sheet 1 of 1

Soakaway Test

Soil Mechanics

Trial Pit No:	SA2	Test No:	3	Date:	22/03/2012
Length (m):	1.80		Datum height:	0.00 m agl	
Width (m):	1.40		Granular infill:	None	
Depth (m):	2.05				

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.20		
1	1.29		
2	1.36		
3	1.43		
4	1.48		
5	1.52		
6	1.57		
7	1.57		
8	1.63		
9	1.63		
10	1.70		
15	1.87		
20	2.00		
30	2.05		



Start water depth for analysis (mbgl):	1.20		
75% effective depth (mbgl):	1.41	Elapsed time (mins):	2.7
50% effective depth (mbgl):	1.63		
25% effective depth (mbgl):	1.84	Elapsed time (mins):	14.1
Base of soakage zone (mbgl):	2.05		

Volume outflow between 75% and 25% effective depth (m3):	1.084
Mean surface area of outflow (m^2):	5.21
(side area at 50% effective depth + base area)	
Time for outflow between 75% and 25% effective depth (mins):	11.4

Soil infiltration rate (m/s):	**3.0E-4**

Remarks Results processed following BRE 365 (2007).

Notes:	Project: LAOIS KILKENNY REINFORCEMENT PROJECT - BALLYRAGGET Project No.: Y2012-12B Carried out for: EirGrid	Figure: **SKWY/SA2/3** Sheet 1 of 1

Appendix C – Water Supply Calculations

Potable Water Demand in Proposed Development

Personnel Demand for Potable Water

Use	Demand (Litres)	Frequency per day	Potable Water Demand (litres)
WC Flush	6	4	24
WHB	1	4	4
Sink	0.6	4	2.4
Total demand for 1 PE			30.4

Annual Water demand (2 persons 2 days per wk)	6,323

Automatic Flush Water Demand

Use	Demand (Litres)	Frequency per week	Potable Water Demand (litres)
Auto WC Flush	6	2	12

Annual Automatic Flush demand from 1 no. WC's	624

Total Potable Water Demand Per Annum (litres)	6,947

Appendix D – Foul Water Calculations

Foul Water Volumes Generated in Proposed Development

Personnel Generated Foul Waste

Use	Loading (Litres)	Frequency per day	Foul Waste Generated (litres)
WC Flush	6	4	24
WHB	1	4	4
Sink	0.6	4	2.4
Total Foul Loading - 1 operative			30.4

Annual PE load (2 operatives for 2 days per wk)	6,323

Automatic Flush Generated Foull Waste

Use	Loading (Litres)	Frequency per week	Foul Waste Generated (litres)
Auto WC Flush	6	2	12

Annual Automatic Flush load from 1 no. WC's	624

Total Foul Loading Per Annum (litres)	**6,947**

Note: No allowance made for human consumption which would generally constitute a 10% reduction on the PE related foul loading.

Appendix E – Site Suitability Assessment Report

SOIL CHARACTERISATION AND
SITE SUITABILITY ASSESSMENT REPORT
TE REF: 12.050 TE

EIRGRID
LAOIS-KILKENNY REINFORCEMENT PROJECT
BALLYRAGGET 110KV STATION
BALLYRAGGET
CO KILKENNY

IN ACCORDANCE WITH
EPA CODE OF PRACTICE
WASTEWATER TREATMENT AND DISPOSAL
SYSTEMS SERVING SINGLE HOUSES 2009

Traynor Environmental Ltd
Belturbet Business Park, Creeny, Belturbet
Co. Cavan
Tel: +353 49 9522236
Fax: +353 49 9522808
Web: www.traynorenvironmental.com

SITE CHARACTERISATION FORM FOR AN ON-SITE WASTEWATER TREATMENT SYSTEM

CONTENTS

1.0 GENERAL DETAILS (From planning application)

Company	*ESB Networks*

Address	**Site Location and Townland**
ESB Networks *c/o Geotech Specialists Ltd part of* *Environmental Scientifics Group* *Carewswood,* *Castlemartyr,* *County Cork,* *Ireland*	*ESB Networks* *Laois-Kilkenny Reinforcement Project* *Ballyragget 110KV Station* *Ballyragget* *Co Kilkenny*

Telephone Number	*N/A*	**Fax Number**	*N/A*
Email	*N/A*		

Maximum No. of Employees	*6*	**No. of Double Bedrooms**	*N/A*	**No. of Single Bedrooms**	*N/A*

Proposed Water Supply	Mains	✓	Private Well/Borehole		Group Well/Borehole	

2.0 DESK STUDY

Soil Type	***Soil Association 34.*** *Minimal Grey Brown Podzolics - 70%* *Gleys - 20% Brown Earth - 10%*

Aquifer Category:	Regionally Important	*Rkd*	Locally Important		Poor			
Vulnerability	Extr		Hg	✓	Moderate		Low		High to Low		Unknown	

Bedrock Type	*DPBL – Dinantian Pure Bedded Limestones*

Name of Public/Group Scheme Water Supply within 1km	*Group Water Scheme*				
Groundwater Protection Scheme (Y/N)	*No*	**Source Protection Area**	SI	N/A	SO N/A
Groundwater Protection Response:	*R2*[1]				
Presence of Significant sites (Archaeological, natural and historical):	*None identified or evident on the site.*				
Past experience in the area:	*Variable percolation characteristics in the locality*				

Comments *(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).*

R2[1]*: Acceptable subject to normal good practice (i.e. System selection, construction, operation and maintenance in accordance with EPA (2009). Site may be suitable for discharge to ground, if the minimum depths are met on the site and if there exists suitable percolation. As the soil type in the area is Minimal Grey Brown Podzolics (70% of the land area), and as the area is mapped as High Vulnerability, surface water may be at risk around the site. Groundwater as a resource will be at risk if the minimum depths required are not achieved on the site, or if the percolation rate is too rapid. Older wells in the area may also be at risk, if the minimum separation distances are not adhered to. Groundwater and wells are therefore the main targets, following the desk study. Given the response and the aquifer type, the site is potentially suitable for a conventional septic tank system if the minimum depths required are met on the site, if the minimum separation distances can be met, and if the percolation rate is adequate. A regionally important bedrock aquifer will generally have a high permeability, rapid flow velocities and will provide little attenuation.*

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position	*Relatively Flat*					
Slope	*Steep <1:5*		*Shallow 1.5 to 1.20*		*Relatively Flat*	✓

Surface features within a minimum of 250 metres (Distances to features should be noted in metres)

Houses	*The nearest house is located approximately >70m Southeast of the proposed percolation area (ppa). Graveyard located North of the ppa.*
Existing Land Uses	*Agricultural Grazing*
Vegetation Indicators	*Grass is the pre-dominant vegetation on the site. The absence of rushes could indicate adequate percolation characteristics in the area.*
Groundwater Flow Directions	*Western Direction.*
Ground Condition	*Dry and firm underfoot in the ppa which could indicate good percolation characteristics of the subsoil.*
Site Boundaries	*Hedge, trees and road located on the Eastern boundary. Hedge and trees located on the Southern boundary. Post and wire fence and wall located on the Northern boundary. Hedge and trees located on the Western boundary.*
Roads	*Road (R 432) is located approximately >100m East of the ppa.*
Outcrops (Bedrock and/or subsoil)	*None identified or evident in the vicinity.*
Surface water ponding	*No evidence of surface water ponding when examined on 21.03.12. It must be noted that weather conditions prior to the site assessment taking place was dry with sunny spells.*
Drainage Ditches	*None identified or evident in the vicinity*

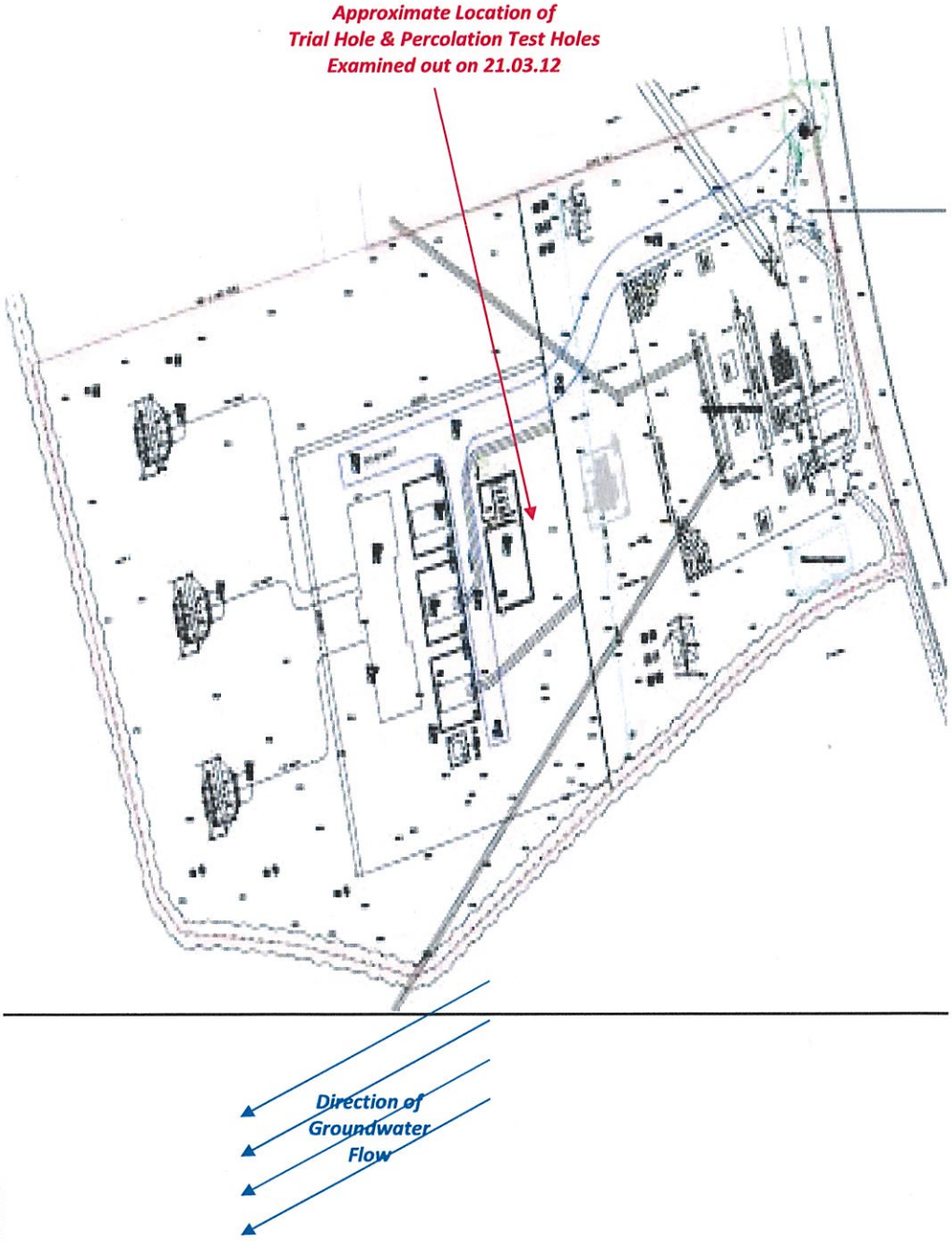
Beaches/Shellfish	*None identified or evident in the vicinity.*	**Areas/Wetlands**	*None identified or evident in the vicinity.*
Karst Features	*None identified or evident in the vicinity.*	**Watercourse/streams**	*Nearest watercourse is located approximately >100m West of the ppa*
Lakes	*None identified or evident in the vicinity*	**Springs/Wells**	*None identified or evident in the vicinity.*

Comments *(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed treatment system on the site.*

**Percolation area is ideally located within the confines of the site. The proposed percolation area should be a minimum of 10m from a dwelling, 10m from a watercourse, 30m down gradient of a well/spring, 20m from any other percolation area, 3m from a boundary and 4m from a roadway*

Sketch of site showing measurement to Trial Hole location and Percolation test Hole locations, wells and direction of ground water flow, proposed house (incl. distances from boundaries) adjacent houses, watercourses, significant sites and other features. North point should always be included.

SITE LAYOUT DRAWING SHOWING TEST HOLE LOCATIONS



3.2 Trial Hole

Depth of Trial Hole	*3.0m*				
Depth from Ground Surface to bedrock (m) if Present	*None encountered*		**Depth from Ground Surface to Water Table (m) if Present**	*None encountered*	
Depth of water ingress	*None encountered*		**Rock Type if Present**	*None encountered*	
Date and Time of Excavation	*18.03.12*	*11.00*	**Date and Time of Examination**	*21.03.12*	*09.20*

	Depth of P & T Test	Soil/Subsoil Texture Classification	Plasticity and Dilatancy	Soil Structure	Density Compactness	Colour	Preferential Flowpaths
0.1m		*Silt/CLAY*	*Ribbons 20,20,30mm 1,3,1 Threads*	*Blocky*	*Low*	*Brown*	*None*
0.2m							
0.3m							
0.4m							
0.5m		*Gravelly Sand*	*Ribbons 10mm 2 Threads*	*Blocky*	*Low*	*Brown - Grey*	
0.6m	*Depth of T Test*						
0.7m							
0.8m							
0.9m		*Gravel*	*Ribbons 5mm 1Threads*	*Blocky*	*Low*	*Grey*	
1.0m							
1.1m							
1.2m							
1.3m							
1.4m							
1.5m							
1.6m							
1.7m							
1.8m							
1.9m							
2.0m							
2.1m							
2.2m							
2.3m							
2.4m							
2.5m							

Evaluation: ***Weather conditions:*** *Dry and Bright – Weather generally wet prior to testing.*

According To The Flowchart For Describing Subsoil's based on BS5930:1999, the subsoil is best described as a Gravelly Sand

****Excellent percolation characteristics of the subsoil exhibited in the trial hole.***

Likely T Value *< 5.00 min /25mm*

*Note: Depth of percolation test holes should be indicated on log above (Enter P & T Depths as appropriate)
* See Appendix E for BS5930 Classification
** 3 samples to be tested on each horizon and results should be entered above for each horizon.
*** All signs of mottling should be recorded.

3.3a Percolation ("T" Test for Deep Subsoils and Water Table)

Step 1 Test Hole Preparation

Percolation Test Hole	*1*	*2*	*3*
Depth from ground surface to top of hole (mm) (A):	*400*	*400*	*430*
Depth from ground surface to base of hole (mm) (B):	*800*	*810*	*850*
Depth of hole (mm) (B-A):	*400*	*410*	*420*
Dimensions of hole [length x breadth (mm)]:	*320 x 300*	*300 x 300*	*330 x 320*

Step 2 Pre-Soaking Test Holes

Date and Time Pre-soaking Started	*20.03.12*	*10.17*	*20.03.12*	*10.18*	*20.03.12*	*10.19*

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

Step 3 Measuring T_{100}

Percolation Test Hole	*1*	*2*	*3*
Date of Test	*21.03.12*	*21.03.12*	*21.03.12*
Time Filled to 400mm	*11.25*	*11.25*	*11.25*
Time Water Level at 300mm	*11.36*	*11.38*	*11.41*
Time to drop 100mm (T_{100})	*11.00*	*13.00*	*16.00*
Average T_{100}			*13.33*

If T_{100} >300mins then P Value >90 – site unsuitable for discharge to ground
If $T_{100} \leq$ 210mins then go to Step 4
If $T_{100} \geq$ 210mins then go to Step 5

Step 4 Standard Method (where $T_{100} \leq 210$min)

Percolation Test Hole	1			2			3		
Fill No.	Start Time at 300mm	Finish Time at 200mm	Δt (min)	Start Time at 300mm	Finish Time at 200mm	Δt (min)	Start Time at 300mm	Finish Time at 200mm	Δt (min)
1	*11.37*	*11.50*	*13.00*	*11.39*	*11.54*	*15.00*	*11.42*	*11.59*	*17.00*
2	*11.51*	*12.06*	*15.00*	*11.55*	*12.13*	*18.00*	*12.00*	*12.19*	*19.00*
3	*12.07*	*12.26*	*19.00*	*12.14*	*12.36*	*22.00*	*12.20*	*12.43*	*23.00*
Average Δt			*15.67*			*18.33*			*19.67*
	Average Δt/4 = [Hole No. 1]		*3.91*	Average Δt/4 = [Hole No. 2]		*4.58*	Average Δt/4 = [Hole No. 2]		*4.91*

Result of Test : T *4.47* min/25mm

Comments
Excellent percolation characteristics of the subsoil

4.0 CONCLUSIONS of SITE CHARACTERISATION:

Not suitable for Development	☐

Suitable for		**Discharge Route**
1. Septic tank System (Septic tank and soil percolation system)	✓	***Groundwater***
2. Secondary Treatment System		
a. Septic tank and intermittent filter system and polishing unit	✓	
b. Package Wastewater Treatment system and polishing unit	✓	

5.0 RECOMMENDATION:

Propose to install	*The site is suitable for a conventional EN Certified septic tank and percolation area. Primary treatment within a two chamber septic tank designed and installed in accordance with Section 7.1.1 of the EPA CoP 2009 - 'Wastewater Treatment System and Disposal systems serving Single Houses'.*

And discharge to	*Groundwater*

Trench Invert Level (m)	*0.20m*

Site Specific Conditions (if any) e.g. special works, Site Improvement Works, Testing etc.

The tests showed that the site has a "T" value rating of 4.47min/25mm Groundwater level was not encountered in the trial hole. Bedrock level was not encountered in the trial hole.

The purpose built percolation area which is constructed on site has a minimum of 1.20m of suitable percolating material between the base of the lowest part of the percolation area at all times. The distribution pipes used in the system are smooth walled, have a diameter of 100mm have 7mm holes drilled in them 300mm apart, and each pipe is spaced parallel and 2000mm apart. The distribution pipes are bedded on 250mm depth of crushed stone (20 - 30 mm in size). The distribution pipes which are in place are surrounded and covered to a depth of 150mm of crushed stone which extends the full width of the percolation area. Before the distribution pipes were backfilled with the topsoil the crushed stone was covered with geotextile.

Anua's range of septic tanks for single houses and larger developments are designed and manufactured to the highest standards and are the only septic tank in Ireland with EN 12566-1 Certification

6.0 TREATMENT SYSTEM DESIGN DETAILS

SYSTEM TYPE: *Septic Tank System (EN Certified 12566) Recommendation Bord Na Mona Septic Tank*

Tank Capacity (m^3)	*2.8m^3*	***Percolation Area***		***Mound Percolation Area***	
		No. of Trenches	*2*	*No. of Trenches*	*N/A*
		Length of Trenches (m)	*15m*	*Length of Trenches (m)*	*N/A*
		Invert Level (m)	*0.2m*	*Invert Level (m)*	*N/A*

SYSTEM TYPE: *Package Sewage Treatment System*

Filter Systems

Media Type	**Area (m^2)**	**Deep of Filter (m)**	**Invert Level (m)**
Sand/Soil	*N/A*	*N/A*	*N/A*
Soil	*N/A*	*N/A*	*N/A*
Constructed Wetland	*N/A*	*N/A*	*N/A*
Other	*N/A*	*N/A*	*N/A*

Package Treatment Systems

Type	*N/A*
Capacity PE	*N/A*
Sizing of Primary Compartment	*N/A* **m^2**

SYSTEM TYPE: *Tertiary Treatment*

Polishing Filter: *Surface Area (m^2)*	*N/A*	**Package Treatment Systems:** Capacity (PE)	*N/A*
or Gravity Fed:		**Constructed Wetland:** *Surface Area (m^2)*	*N/A*
No. of Trenches	*N/A*		
Length of Trenches (m)	*N/A*		
Invert Level (m)	*N/A*		

DISCHARGE ROUTE:

Groundwater	✓	Hydraulic Loading Rate (l/m^2.d)	*210l/d*
Surface Water		Discharge Rate	*0.024l/s*

TREATMENT STANDARDS:

Treatment System Performance Standards (mg/l)	**BOD**	**SS**	**NH_3**	**Total N**	**Total P**
Conventional Septic Tank	*<20*	*<30*	*<10*	*5 - 10*	*12.5*

QUALITY ASSURANCE:

Installation & Commissioning	**On-going Maintenance**
Recommend to be overseen by plant supplier.	*Maintain and de-sludge annually*

7.0 SITE ASSESSOR DETAILS

Company:	*Traynor Environmental Ltd*				
Prefix:	*Mr.*	**First Name:**	*Nevin*	**Surname:**	*Traynor*
Address:	*Belturbet Business Park, Creeny, Belturbet, Co. Cavan.*				
Qualifications/Experience:	*BSc. Env, H.Dip I.T, Cert SHWW, EPA/FAS Cert.*				
Date of Report:	*30.03.12*				
Phone:	*049 9522236*	**Fax:**	*049 9522808*	**E-mail:**	*nevin@traynorenvironmental.com*
Indemnity Insurance Number:	*AGD /11 / 109*				

Signed: 

Nevin Traynor

BSc. Env, H.Dip I.T, Cert SHWW, EPA/FAS Cert.

For Traynor Environmental Ltd

8.0 SITE PHOTOGRAPHS

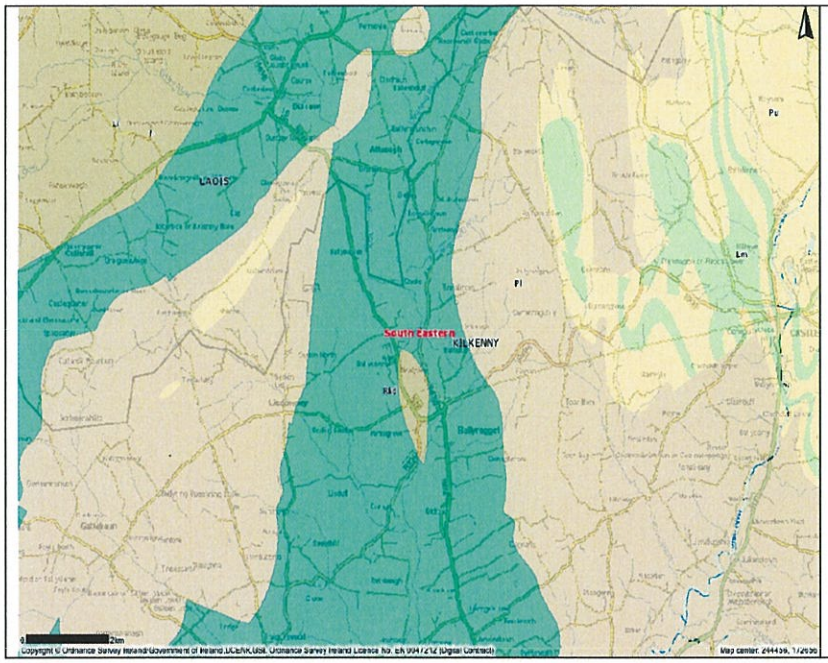
Facing South From the Proposed Percolation Area	*Facing West From the Proposed Percolation Area*
	
Facing North From the Proposed Percolation Area	***Facing East From the Proposed Percolation Area***
	
Trial Hole Side View	***Trial Hole Front View***
	

Percolation ("T") Test 1	*Percolation ("T") Test 2*
	

Percolation ("T") Test 3

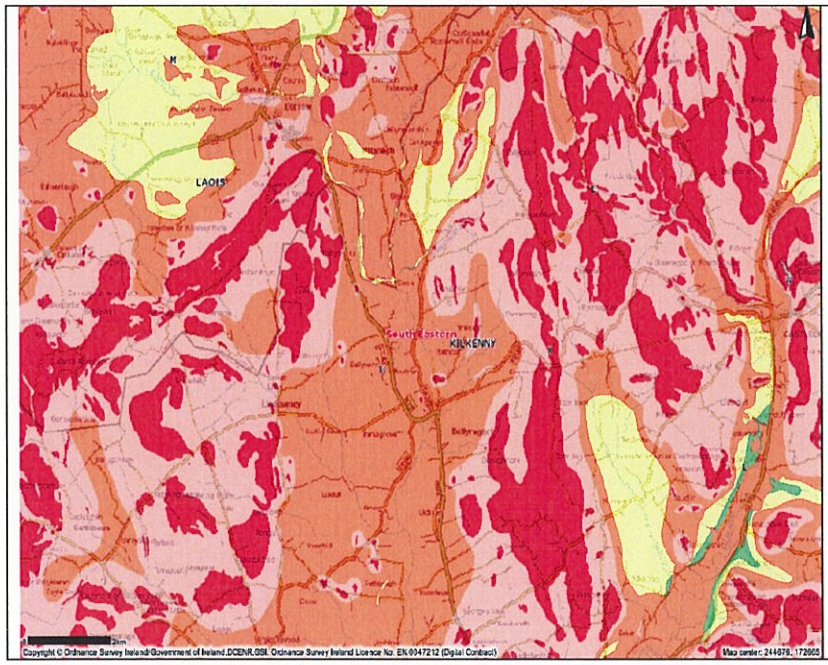

Maps Used As Part of the EPA Site Suitability Assessment

Groundwater/Aquifer Map



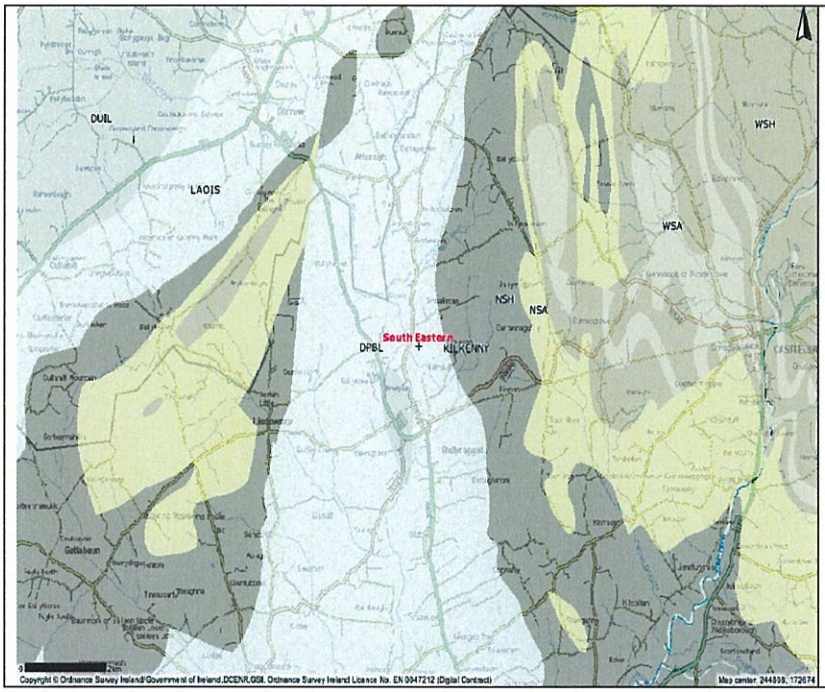
From the GSI Groundwater Aquifer Map Site is classified as Regionally Important (RKd)

Vulnerability Map



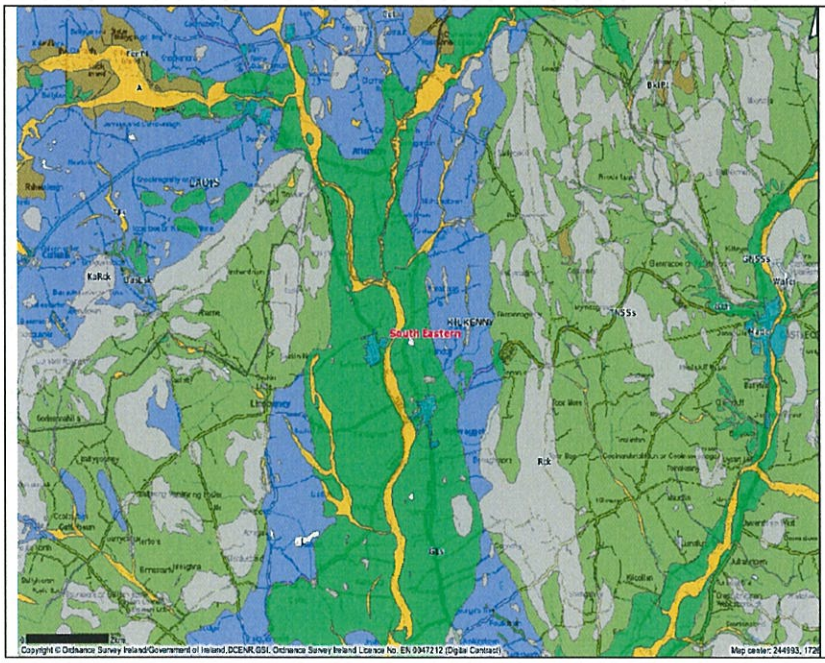
From the GSI Vulnerability Map Site is classified as High

Bedrock Map



From the GSI Bedrock Map Site is classified as DPBL – Dinantian Pure Bedded Limestones

Teagasc Subsoil Map



From the GSI Teagasc Subsoil Map Site is classified as GLs

9.0 EPA/FAS CERTIFICATE

FETAC

Further Education and Training Awards Council

Comhairle na dTeastas Breisoideachais agus Oiliúna

National Skills Certificate

(FÁS)

Awarded to

Bronnta ar

Nevin Traynor

who has achieved the National Standards for

a bhain Caighdeáin Náisiúnta amach maidir le

Site Suitability Assessment for On-Site

Wastewater Treatment Systems

Chair, FETAC

Chief Executive, FETAC

F/NSC 003535

Griffiths & Armour

ENGINEERS IRELAND
VERIFICATION OF PROFESSIONAL INDEMNITY INSURANCE

Insured:	**Traynor Environmental Ltd**
Address:	**Belturbet Business Park Creeny Belturbet Co. Cavan**
Description of Business:	**Consulting Engineers**
Policy Number and Name/Address of Lead Insurer:	**A G Doré Syndicate 2526 at Lloyd's 4th Floor, 70 Gracechurch Street London EC3V 0XL United Kingdom Policy No: AGD/11/109**
Period of Insurance:	**12 July 2011 to 11 July 2012**
Renewal Date:	**12 July 2012**
Retroactive Date:	**None**
Limit of Indemnity any one claim:	**A sum not less than €1,000,000 (separate aggregate limits of indemnity for all claims in the period relating to • pollution or contamination • asbestos)**
Excess applying to each and every claim:	**€5,000**
Total amount of Excess amounts payable for all claims during any one period of insurance:	**€15,00**
Does cover include Joint Venture Projects?	**Yes**
Does cover include Sub-Consultants?	**Yes - Insured's liability**
Is there a Sub-Consultant's Warranty?	**None**
Are there any Restrictions/Limitations/Warranties in relation to the Policy connected with the Project or Brief presented by the Local Authority, Health Board, Vocational Educational Committee, Regional Technical College or other Public Body?	**None other than those which are standard to this class of insurance protection**
If so, could you provide details:	
Signed:	**For and on behalf of Griffiths & Armour Professional Risks** GROUP OFFICES Liverpool London Manchester Glasgow Dublin Guernsey
Date:	**13 July 2011**

The policy is subject to the insuring agreements, exclusions, conditions and declarations contained therein. The above is accurate at the date of signature. No obligation is imposed herein on the signatory to advise of any alteration.

Appendix F – Flood Risk Assessment Report

ESB International
ESBI Energy Innovation

Ballyragget Substation

EIRGRID

Flood Risk Assessment

QG-000028-01-R01-001

ESBI Civil Building Environment
Stephen Court,
18/21 St Stephen's Green,
Dublin 2 Ireland
Tel: +353 (0)1 703 8000
Web: www.esbi.ie

August 2012

File Reference:	
Client / Recipient:	EirGrid
Project Title:	Ballyragget Substation
Report Title:	Ballyragget Substation Flood Risk Assessment
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Volume 1 of 1	

PREPARED: Ann Marie Downey ***TITLE: Professional Engineer***	***DATE: August 2012***
VERIFIED: Jim Fitzpatrick ***TITLE: Senior Consultant***	***DATE: August 2012***
APPROVED: Tommy Bree ***TITLE: CBE Technology Manager***	***DATE: August 2012***

Latest Revision Summary:

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1 Introduction

It is proposed to construct a new 110kV High Voltage Substation to replace an existing 38kV substation in the townland of Moatpark, Co. Kilkenny, approximately 1km north of Ballyragget village and 18km North West of Kilkenny City.

This Flood Risk Assessment was prepared in accordance with *'The Planning System and Flood Risk Management - Guidelines for Planning Authorities'* issued by the Department of Environment, Heritage and Local Government in November 2009. Flood risk from fluvial, surface water and ground water sources has been assessed based on existing available information and a site visit in May 2012.

1.1 Scope

This assessment considers the following:

- The Department of Environment, Heritage and Local Government guideline document to Planning Authorities in relation to Flood Risk Management.
- Risk of flooding to the proposed Substation from flood flow from neighbouring watercourses.
- Risk of flooding due to direct rainfall.
- Risk of flooding from groundwater.
- Impact of presence of the Substation on the existing flood risk regime at its proposed site. The impacts addressed under this heading comprise:
    - The impact of surface water runoff from the sites on the flow regimes in neighbouring watercourses.
    - Loss of floodplain.
- Review of data on recorded historic floods.

2 Planning Guidelines

In November 2009 the Department of Environment, Heritage and Local Government issued a guideline document to Planning Authorities in relation to Flood Risk Management.

These Guidelines set out the policy on development and flood risk in Ireland and provide a framework for the integration of flood risk assessment into the planning process. The objective is to ensure that flood risk is taken into account at all stages in the planning process and as a result to:

- Avoid inappropriate development in areas at risk of flooding,
- Avoid new developments increasing flood risk elsewhere,
- Ensure effective management of residual risks for development permitted in floodplains.

The Guidelines set out a staged approach for the consideration of flood risk in relation to developments as follows:-

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and Local Area Plans or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

The Guidelines classify developments into three vulnerability classes based on the effects of flooding

(i) Highly vulnerable development,

(ii) Less vulnerable development and

(iii) Water Compatible development.

Essential infrastructure such as electricity substations is classed as highly vulnerable development.

The Guidelines classify Land areas within three flood zones based on the probability of flooding. Flood zones are defined as follows in the Guidelines:

- Zone A is at highest risk. In any one year, Zone A has a 1 in 100 year (1%) chance of flooding from rivers and a 1 in 200 year (1%) chance of flooding from the sea.
- Zone B is at moderate risk. The outer limit of Zone B is defined by the 1 in 1,000 year (or 0.1%) flood from rivers and the sea.
- Zone C is at low risk. In any one year, Zone C has less than 1 in 1,000 year (<0.1%) chance of flooding from rivers, estuaries or the sea.

In the identification of flood zones, no account should be taken of any flood relief walls or embankments.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 1: Matrix of Vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test (reproduced from Table 3.2 of Ref 1)

Table 1, which is reproduced from the guideline document to Planning Authorities in relation to Flood Risk Management states that essential infrastructure, including electricity substations should be located within Flood Zone C. Section 4 of this Flood Risk Assessment document will consider the Flood Zone assignment for the proposed site.

Table 1 refers to the use of a Justification Test under certain circumstances. In cases where there are insufficient sites available to locate a development in the appropriate low flood risk zone, the guideline documents allows for consideration of sites within flood risk zones. A Justification Test is then required to assess such proposals in the light of proper planning and sustainable development objectives.

This report considers the Flood Risk of the proposed substation in relation to Stages 1 and 2 of the staged approach outlined above.

3 Ballyragget, Co. Kilkenny Site

The proposed site is approximately 1km north of Ballyragget village and 10km west of Castlecomer in Co. Kilkenny. An existing 38kV substation lies to the east of the site and a graveyard to the north..The field in which the substation is planned has short grass and is mainly surrounded by hedges and trees. Post and wire fencing and wall surround the northern boundary of the site. See Figure 1 and Figure 2 and photo 1.

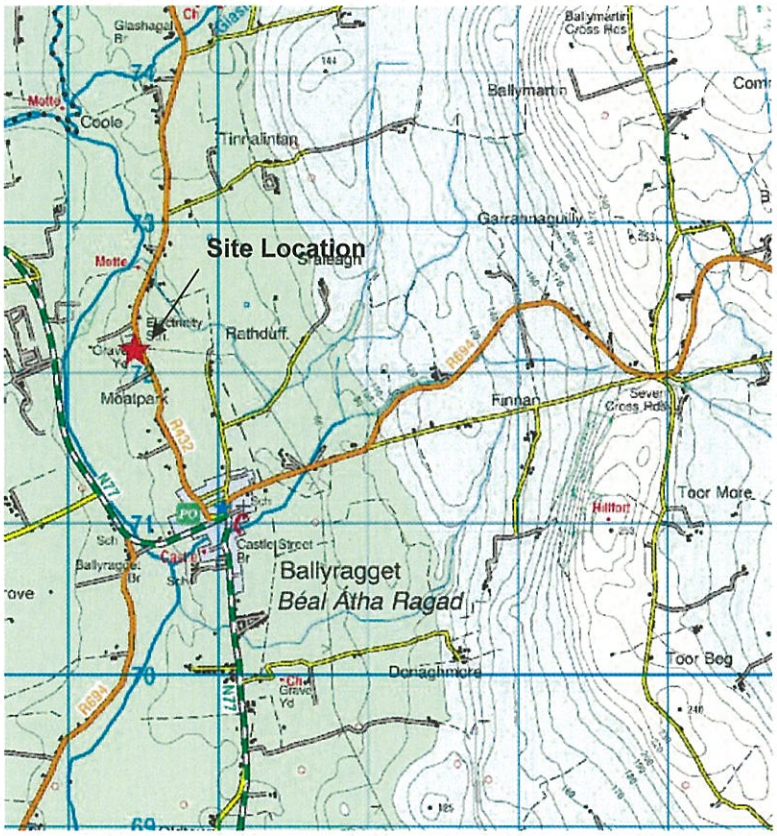


Figure 1: General Site Location (NTS)

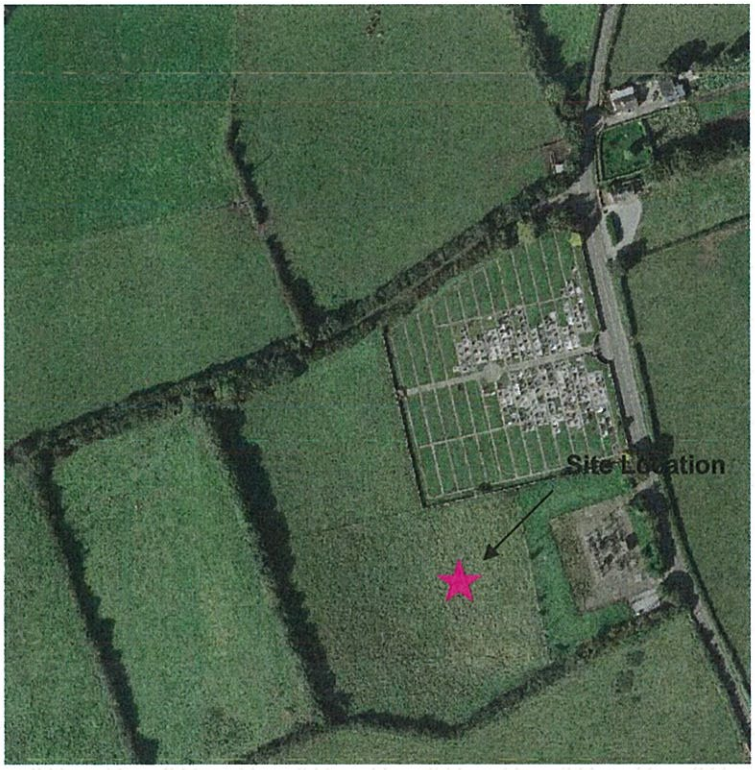


Figure 2: Site Location on Orthophoto (NTS)

Photo 1: General site area showing grass field (Facing eastwards)

4 Flooding Risk

Flood Risk to the site is considered in relation to the following criteria:

- Available Predictive Flood Risk Mapping
- Fluvial Risk: Inundation from flow from neighbouring watercourses
- Pluvial Risk: Flooding due to direct rainfall
- History of Flooding
- Impact of presence of the Substation on the existing flood risk regime at its proposed site.

4.1 Review of OPW Flood Risk Mapping

"As part of Ireland's obligations under Directive 2007/60/EC (the "Floods Directive"), the office of public works (OPW) is currently engaged in the generation of new mapping which will provide predictive estimates of the extent of floodplains as part of its Catchment Flood Risk Assessment Management Studies (CFRAMS)". This programme is being undertaken on a River Basin District basis. The Ballyragget site is located within the South Eastern River Basin District SERBD. Draft Flood Risk mapping from the CFRAM study is scheduled to be published in 2013.

A Preliminary Flood Risk Assessment (PFRA), a requirement of the EU "Floods" Directive, is being undertaken on a national basis. The objective of the PFRA is to identify areas where the risks associated with flooding might be significant and requiring future more detailed assessment. The more detailed assessment will be undertaken through the CFRAM Studies.

According to the OPW, the PFRA has been undertaken by:

- Reviewing records of historic floods
- An assessment to determine areas vulnerable to future flooding
- Consultation with relevant bodies (Local Authorities, Government departments and agencies)

This assessment considered flood risk from rivers, the sea and estuaries, direct rainfall and groundwater. Mapped output from the draft PFRA, with explanatory notes, is available for public consultation on the following Web site: http://www.cfram.ie/pfra/interactive-mapping/ (Refer to Map 168 for Ballyragget).

The draft mapping identifies approximate extents of "the 'Indicative 1% AEP (100-yr)" and Extreme" Event zones. The proposed Ballyragget site is located north of Ballyragget village approximately 0.4km east of the left bank of the River Nore.

The proposed site lies outside the indicative 1% AEP (100-yr) event extent. It lies close to but outside the indicative extreme event extent.

The OPW note that the flood extent maps are based on broad-scale simple analyses and may not be accurate for specific locations.

The risk of flooding from the Nore is discussed in further detail in Section 4.2 below.

4.2 Fluvial Flood Risk

4.2.1 Description of Site

The site is located in the catchment of the River Nore. The River Nore rises in the townland of Borrisnoe, North Tipperary and then flows south eastwards passing through the village of Ballyragget flowing south until it reaches the sea at Waterford Harbour. The proposed site is approximately 0.4km east of the left bank of the River Nore. The overall Nore catchment area upstream of the substation site is approximately 1,053 km². See Figure 3 and Figure 4.

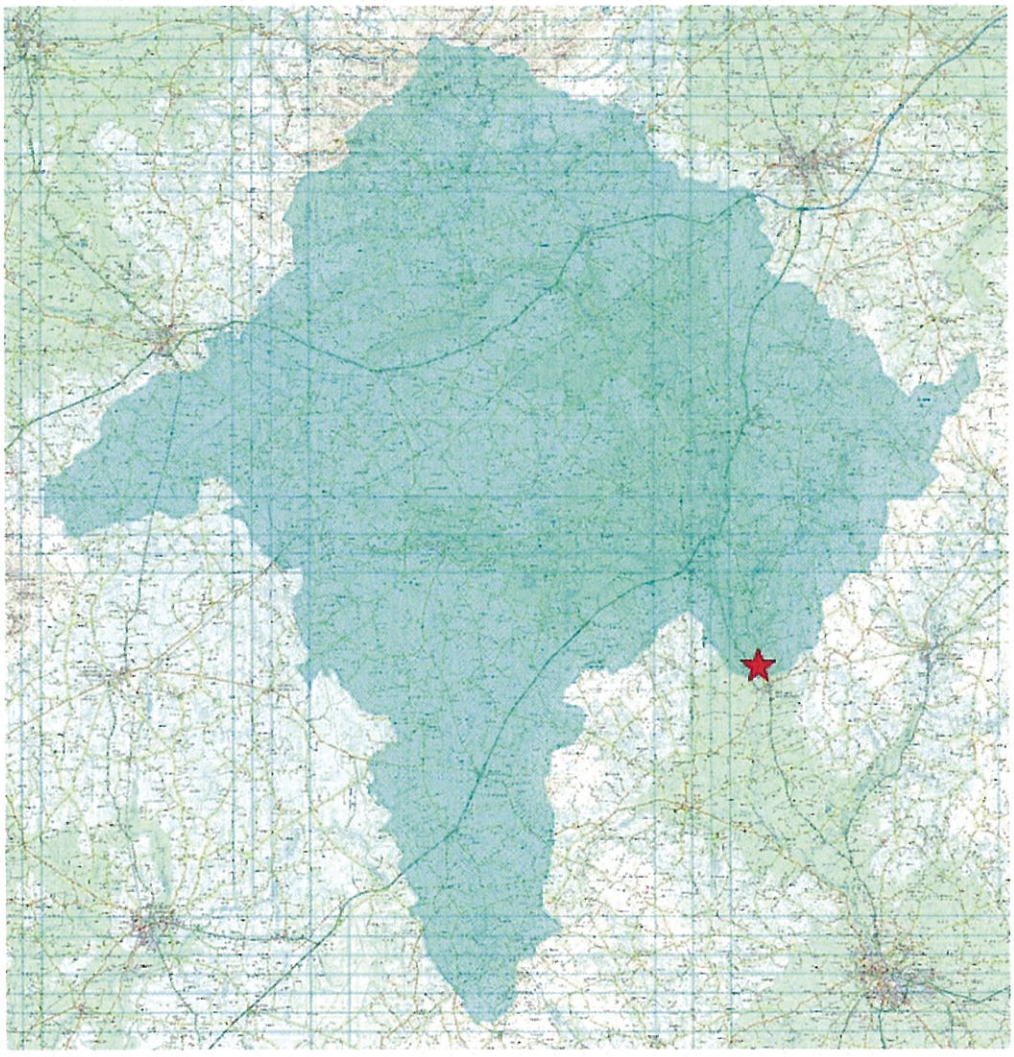


Figure 3: Proposed site showing estimated extent of river catchment upstream (Light Blue Hatching)

Figure 4: Proposed site showing the River Nore downstream

Figure 5 overleaf illustrates the site location and surrounding hedges and trees. Current spot elevations are also shown. The elevation of the area to be occupied by the proposed Substation varies from approximately 68.9mOD to 69.0mOD. The proposed ground level of the substation is 69.00 mOD.

No drainage ditches are present within or directly adjacent to the site.

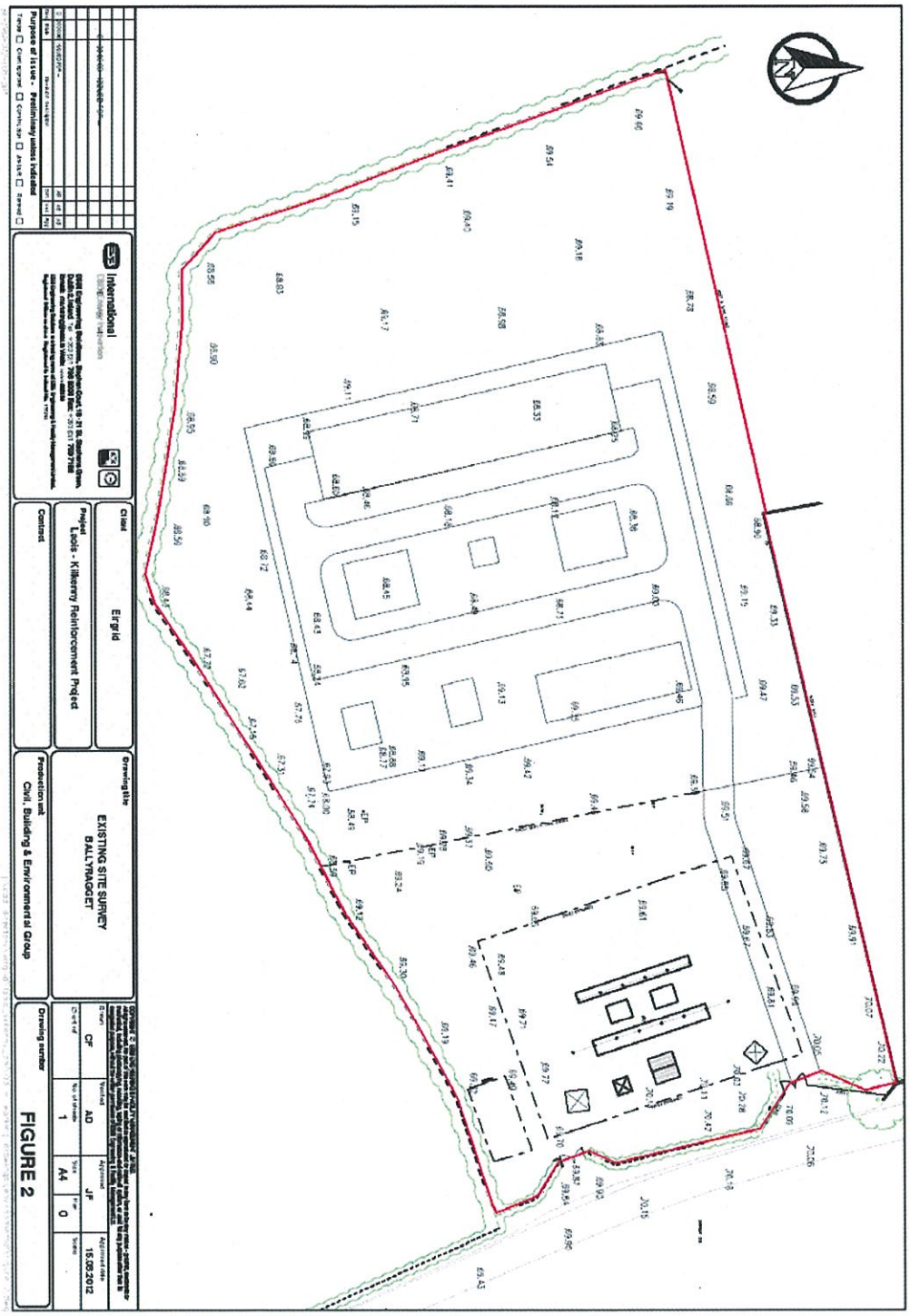


Figure 5: Site Elevation Information

Hydrometric Gauge No. 15012 which is owned by Kilkenny County Council and operated by the EPA is sited on the River Nore upstream of Ballyragget. The gauge is sited on the left bank of the Nore approximately 700m downstream of the Substation site see Figure 6.

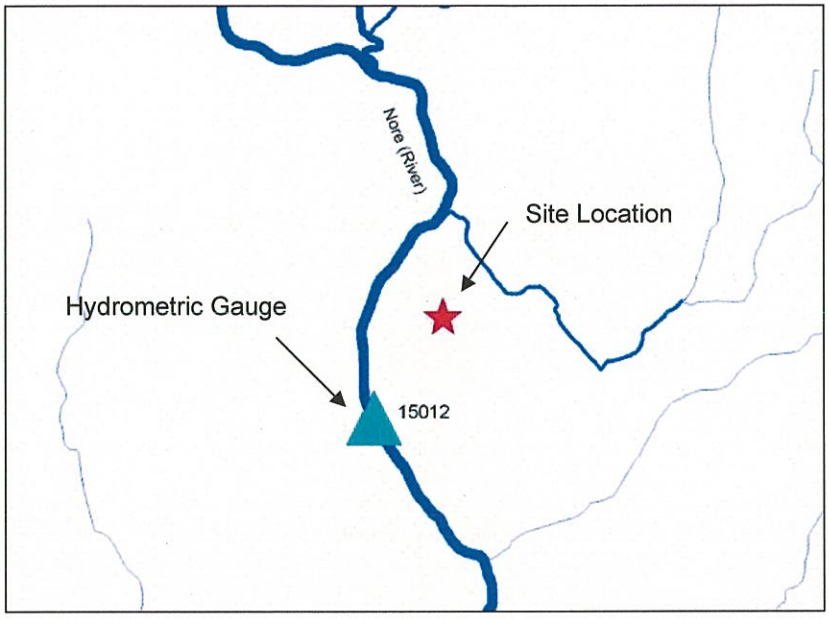


Figure 6: Location of Hydrometric Gauge No. 15012 on the River Nore

Station Name:	BALLYRAGGET
Station Number:	15012
River:	NORE
Operator:	EPA Kilkenny Hydrometric Team
Easting:	244048
Northing:	171562
Datum:	62.005 mOD Malin

Table 2: Summary Information on Hydrometric Gauge 15012

Recorded water levels from this station are available from the EPA from 1989. Records of the annual maximum levels at the gauge from 1989 to date have been made available by the EPA. See Table 3. The highest level on record is 64.257mOD which occurred in February 1990.

15/03/1989	21:00:00	1.34	63.345
08/02/1990	01:00:00	2.252	64.257
02/01/1991	12:00:00	1.692	63.697
25/11/1991	12:30:00	1.411	63.416
12/06/1993	13:00:00	1.518	63.523
17/01/1994	01:00:00	1.668	63.673
29/01/1995	06:30:00	2.03	64.035
09/01/1996	00:15:00	1.726	63.731
08/08/1997	10:45:00	1.522	63.527
20/11/1997	20:45:00	1.623	63.628
05/01/1999	12:45:00	1.664	63.669
26/12/1999	21:15:00	1.928	63.933
07/11/2000	18:45:00	1.95	63.955
04/02/2002	18:15:00	1.726	63.731
22/10/2002	00:30:00	---	---
22/03/2004	14:30:00	---	---
31/10/2004	08:45:00	1.668	63.673
01/10/2005	00:00:00	---	---
01/10/2006	00:00:00	---	---
18/08/2008	16:15:00	---	---
02/02/2009	14:30:00	1.785	63.79
21/11/2009	19:00:00	2.08	64.085
08/02/2011	04:45:00	1.791	63.796
10/06/2012	20:45:00	---	---

Table 3: Hydrometric Gauge 15012. Series of Maximum Annual Water Levels 1989-2011 (EPA)

Using this data a return period analysis was carried out using the Extreme Value type 1 (EV1) distribution. See Figure 7.

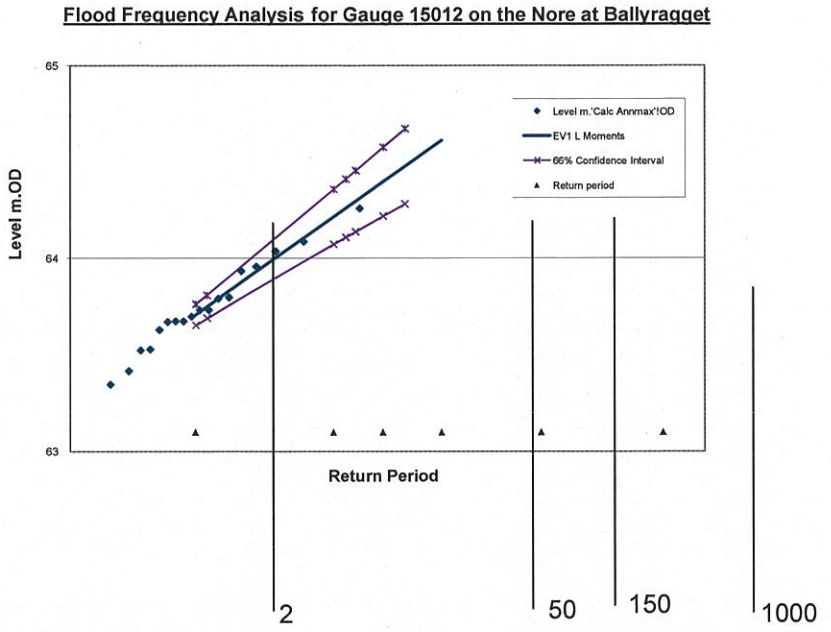


Figure 7: Plot showing Return Period of Level Series from Gauge 15012 on the Nore

As noted above, the proposed finished ground level for the site is 69.0 mOD. This level is approximately 4.5m higher than the estimated 50 year return period at Gauge 15012 and when extrapolated (albeit significantly beyond the recommended range for the available data) is approximately 4.0m higher than the 1000 year return period. Figure 5 above indicates that the lowest point at the edge of the site at present is approximately 67.93m.

Given the relative elevation of the site to the Nore and the 400m distance, the risk of flooding to the Substation from the Nore River is considered to be minimal.

"It is considered that the site is located in a Flood Zone C as defined in section 2 above".

4.3 Pluvial Flood Risk

The proposed development will increase the impermeable area of the existing site and hence surface water runoff from the site will be increased. This can present an increased risk of pluvial flooding on site and downstream if not managed properly. Consideration needs to be given to the existing surface water runoff route and the drainage characteristics in order to develop an appropriate site drainage system and minimise impacts that increased discharge from the site may have.

Drainage on the site will mimic greenfield runoff characteristics. Sustainable Drainage Systems will be employed to achieve this. The site will be served by an adequate number of appropriately sized and spaced roof and road gullies to ensure that pluvial flooding will not be a problem on the site. Adequate falls in the drainage pipe network are achievable to provide self cleansing velocities and adequate flow capacity for runoff from the site. Sufficient and appropriately located access points to allow maintenance of the drainage network will be provided to further protect against pipe blockages.

The site surface water drainage system will be designed to best practice to provide protection from surface runoff (pluvial flooding) due to direct rainfall.

The drainage system design will reflect the latest rainfall-return period guidance from Met Éireann.

4.4 Groundwater Flood Risk

Groundwater can sometimes present a risk of flooding due to the fact that high groundwater levels can prevent surface water from infiltrating below ground level during extreme rainfall events. This can result in site flooding in the form of ponding.

Information on the site can be found in the report Factual Report on Ground Investigation, Report No. Y2012-12B, ESG 2012.

Based on findings in this report and the fact that there are no structures below ground level the likelihood of groundwater flooding affecting the sites in general is not significant.

4.5 Impact of Development on Current Flood Regime at Site

4.5.1 Impact of Site Surface Water Runoff

Attenuation of discharges from the site will be undertaken using best practice measures to preserve the current general flow regime. These measures will include as appropriate, the provision of on-site storage and the management of discharges.

The use of permeable ground surfaces will be used where possible.

There will be no foul discharges.

4.5.2 Loss of floodplain

The site is not located in a floodplain

5 Historic floods

The review of historic flooding was undertaken using the Office of Public Works (OPW) Web site www.floodmaps.ie.

This Web site www.floodmaps.ie forms a record of all available flood records held by the OPW, all local authorities and other relevant state organisations such as the EPA and the Department of Environment Heritage and Local Government. As part of the data collection exercise, all area engineers in Kilkenny County Council were interviewed and the Council made available its documentary records on past flood events. This Web site represents the current definitive database of historic flood information in this country.

The Web site has two records of flooding in the applicable area. (see Appendix A)

The first record dated June 1948 discusses potential Arterial drainage of the Nore and refers to flooding at a number of locations along the River in Co. Kilkenny. There is no record of flooding at Ballyragget mentioned in this report.

The second record is an assessment report on severe flooding dated November 2000 which was due to very heavy rainfall. The National Secondary Road N77 at Ballyragget was closed at the peak of the flood for a short length of time. The N77 road is 0.5km from the proposed site to the west and 1.2km from the site to the south.

6 Climate Change

Predictions of increases in rainfall due to climate change are very uncertain, but in Autumn and Winter in mid-century it is expected to be of the order of 5 – 10% (http://www.c4i.ie/docs/IrelandinaWarmerWorld.pdf).

The SUDS drainage design can accommodate this increase.

7 Conclusions

There is a minimal risk of flooding to the Substation site at Ballyragget, Co. Kilkenny. It is reasonable to conclude that the site lies within Flood Zone C as defined by the guideline document to Planning Authorities in relation to Flood Risk Management.

The development will not increase the current flood risk in the catchment.

8 References

1. The Planning System and Flood Risk Management - Guidelines for Planning Authorities, Department of Environment, Heritage and Local Government, November 2009.

2. Factual Report on Ground Investigation, Report No. Y2012-12B, ESG 2012.

3. www.floodmaps.ie

4. http://www.cfram.ie/pfra/interactive-mapping/

Appendix A

Extract from
www.floodmaps.ie

OPW *National Flood Hazard Mapping*

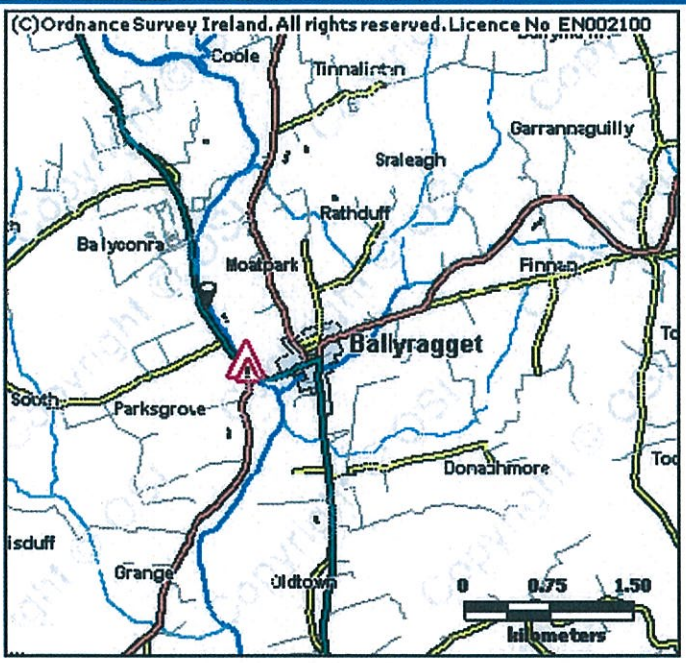
Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Kilkenny

NGR: S 452 712



Map Scale 1:62,129

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

2 Results

1. Nore Ballyragget Nov 2000
County: Kilkenny
Start Date: 06/Nov/2000
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

2. Nore Ballyragget recurring
County: Kilkenny
Start Date:
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

12th June, 1948.

KILKENNY COUNTY COUNCIL.

Report of County Surveyor.

RIVER NORE DRAINAGE.

The River Nore rises in Co. Tipperary, flows through part of Tipperary and Laoighis, enters Kilkenny some two miles north of Ballyraggat, and from thence it flows southwards through Ballyraggat, Inchbeg, Threecastles, Kilkenny City, Bonnettsbridge, Thomastown and Inistioge, until it joins the River Barrow about three miles north of New Ross.

The River Nore has five main tributaries in Co. Kilkenny, viz., the Rivers Goul, Muenna, Dinan, Breagha and King's River.

Even in times of moderate flooding a large proportion of lands and buildings are covered and affected, at Ballyraggat, Inchbeg, Threecastles and Dunmore. In more severe flooding a large proportion of lands are affected, as well as a considerable number of dwellings and business premises.

As far as I can gather from previous investigations, between 5,000 and 6,000 acres of land are affected in times of flood. It is difficult to estimate the damage, either temporary or permanent, which is done to dwelling houses and business premises.

The main damage to dwelling houses and shops takes place, in Freshford which is situated on the tributary Muenna; in Kilkenny, Thomastown and Inistioge, which are situated on the main river, and in Callan which is situated on the King's River.

In Kilkenny City alone, during the heavy floods of March, 1947, cases of flooding and hardships were investigated by a Local Committee set up to relieve distress arising from the floods. From the information they could gather, it would appear that 236 houses were rendered temporarily unfit for habitation, and some houses were rendered permanently unfit for habitation. A certain number of people were rendered homeless and relief measures had to be taken. Many of these people are still in temporary quarters in the Old Military Barracks, Kilkenny, and up to quite recently, a further number were in the Old Central Hospital, Kilkenny. There was also material damage done to furniture and goods of all descriptions, including food stuffs, and the estimate of this damage is £14,000.

Normal flooding which has been experienced almost yearly, and sometimes twice in the one year, affects approximately 80% of the above figures.

Thomastown has also been severely affected, and even in normal yearly floods, the water rises about three feet in the main streets. The number of houses affected in the March, 1947, flood is 115. These houses largely consist of combined dwelling and business premises. There is consequent heavy loss of goods, and it has been recorded that food stuffs such as sugar and tea have been destroyed and washed away.

Similar remarks apply to Inistioge, but the number of houses affected here is 10.

In Callan, in the March, 1947, floods, approximately forty shops or houses were flooded, and this flooding takes place in Upper and Lower Bridge Street. In the case of normal flooding, about 50% of these houses would be affected.

From time to time there have been efforts to have the drainage of the River Nore carried out. About the year 1932 Kilkenny Corporation employed the services of as Consulting Engineer to prepare a Scheme. Previous to reporting on the Nore Drainage, proposals for the drainage of various sections of the River Nore were submitted. It was found that a comprehensive survey of the river was necessary, as one section could not be treated without influencing the other sections downstream. Another influencing factor would be the drainage of the River Dinan which is a tributary of the River Nore. Any treatment of the River Dinan would worsen conditions in the Nore particularly in the neighbourhood of Kilkenny City.

In the year 1939 a Drainage Scheme was carried out on the River Goul, a tributary of the River Nore, and the people of Kilkenny are of the opinion that the flooding in Kilkenny City is much worse than before the River Goul was drained.

In Report on a comprehensive scheme for the drainage of the River Nore, he dealt with a length of approximately 55 miles upstream from Inistioge. The total estimated cost of the Scheme was £200,000, and the cost of subsequent maintenance would involve an annual expenditure of £3,000. It was calculated that the area of land which would be improved by that Scheme was about 5,500 acres, and that would probably represent an increase in the annual value of the lands, of about £2,000 at that time. Therefore, the Scheme was considered uneconomic, as the estimated annual maintenance would be greater than the increased annual value of the lands which would benefit.

However, I am of the opinion that consideration should be given to the actual loss involved, and the subsequent unhealthy and insanitary conditions that prevail following flooding in the Urban Areas. This applies particularly to Kilkenny City, Thomastown, Inistioge, Freshford and Callan.

I would like to point out that there are a number of banks retaining the river in the lower reaches near Inistioge. These banks are in a very bad state of repair and would require immediate attention. There is also a bank in Dunmore. This bank was breached by the floods in March, 1947, and even in small floods, considerable damage is caused. I submitted a report and estimate for the building of a concrete retaining wall on the River Dinan at Dunmore. At the time it was thought that it might be possible to have a Rural Improvements Scheme allocated to this work.

On the River Nore itself, in Co. Kilkenny, there are a number of mills and weirs. Some of these mills are not now working, but at the same time they have water rights on the river, and if the River Nore was being drained, it would be necessary to have an agreement with, or compensation paid to, the owners of these mills and weirs.

With regard to the drainage of the River Nore, it would appear that under the terms of the Arterial Drainage Act, 1945, the carrying out of the Scheme is a matter for the Office of Public Works. From an agricultural point of view the Scheme may not seem economic, but the health of a large number of people in the various towns is endangered, and every flood repeats the danger to these people.

Therefore, it is necessary that the Drainage Scheme should be carried out immediately so as to alleviate this danger to public health.

(Signed)_____
County Surveyor.

Kilkenny County Council.

KILKENNY COUNTY COUNCIL.

NORE DRAINAGE.

During last ten years Petitions under Arterial Drainage Act, 1925, have been submitted for various sections of the Nore, viz., Thomastown, Kilkenny Urban area, Threecastles and Jenkinstown.

These sections have been reported on individually, but as any one section cannot be treated without influencing the other sections downstream, a comprehensive survey of the river was made.

Another influencing factor is the proposed drainage of the Dinan river which is a tributary of the Nore.

Any treatment of the Dinan will worsen conditions in the Nore, particularly in the neighbourhood of Kilkenny City.

A further reference will be made to the Dinan later.

The Comprehensive Scheme for the drainage of the Nore dealt with a length of approximately 55 miles upstream from Inistioge.

The total estimated cost of this Scheme is £200,000, and the cost of subsequent maintenance would involve an annual expenditure of £3,000.

It was calculated that the area of the land which would be improved by the Scheme is about 5,500 acres. This would probably represent an increase in the annual value of the lands of about £2,000.

I am of the opinion that consideration should be given to the actual loss involved, and the subsequent unhealthy and insanitary conditions that prevail following flooding in the Urban areas. This latter sentence applies particularly to Kilkenny City, Thomastown and Inistioge.

This Scheme is obviously uneconomic as the estimated annual maintenance would be greater than the increased annual value of the Lands benefited.

A Scheme of partial drainage dealing with three sections was put forward.

The sections are:-

(1) Jenkinstown section (including improvement of mouth of Dinan River) - 8 miles.

(2) Kilkenny City section (including portion of tributary river Breaghagh and extending some distance above and below City) - 3¾ miles.

(3) Thomastown section - 2½ miles.

The capital sum involved in this case was estimated to be £92,000, and the annual cost of maintenance £1,400.

The area to be benefited was again in this case very low, the figure being 1,260 acres, and the estimated increase in annual value of the land, £590.

Probably the strongest point in favour of this Scheme is the prevention of flooding in the Urban areas. Negotiations took place between the Local Bodies concerned, viz., Kilkenny County Council, Kilkenny Corporation and Departmental Officials. The Local Bodies would not contribute a sufficiently large sum, and it would appear that the Scheme was dropped owing to its uneconomic nature.

There are a number of Woollen Mills and Flour Mills at Kilkenny, Bennettsbridge and Thomastown. These derive their power from the Nore.

The acquisition of the necessary rights, and the fixing of compensation, would probably present a difficult problem.

The situation would probably be best dealt with by an Arbitration Board having at its disposal the advice of Financial and Engineering experts.

There are quite a number of weirs between Threecastles and the mouth of the river. Some of these have, from time to time, been breached. There is of course a weir at each mill, and I give the following information in respect of the weirs at the Mills:-

Kilkenny Woollen Mills: Situated approximately two miles upstream from Kilkenny town.

Total horse-power derived - 63 H.P.

Maximum difference in level at weir in D. W. F. - 5' 4".

Normal winter difference in level - 4'.

<u>Langabridge Mills and Chancellor's Mill</u>: Situated in Kilkenny.
Total maximum horse-power developed - 121 H.P.
Maximum difference in level in D. W. F. - 7'.
Average difference in level in winter conditions - 5'.
<u>Ormonde Woollen Mills</u>: Situated one mile from Kilkenny downstream.
Maximum horse-power derived - 50 H.P.
Difference in level in D. W. F. - 5'.
Normal winter flow - 3' 6".
<u>Mosse's Mills, Bennettsbridge.</u>
Total horse-power developed - 134 H.P.
Average difference in level - 8'.
<u>Grennan Mills, Thomastown.</u>
Average maximum horse-power - 100 H.P.
Difference in level in D.W. F. - 7'.
Average winter difference in level - 4' 6".

There are, in addition, a number of derelict mills along the river that have not been used for a number of years. The question of water rights would, I am sure, still arise with those.

A drainage scheme of the magnitude of either Scheme previously outlined would necessitate the reconstruction, and in some areas the replacement, of road bridges in the sections dealt with.

In addition, when figures of the altered flow downstream are calculated, consideration should be given to the suitability of existing bridges to take this flow. Where these are found unsuitable, their reconstruction should be made part of the actual Scheme.

It may be taken that drainage operation will not interfere to any great extent with existing sewerage or water schemes. Any adjustment needed in this respect can be met with by a relatively small expenditure.

As far as Kilkenny County as a whole is concerned, this problem presents no engineering difficulties.

<u>RIVER DINAN.</u>

The most serious flooding takes place at the junction of the Dinan and the Nore. Any improvement in the drainage of the Dinan cannot be contemplated without catering in the Nore for the extra

flow which would result.

A Petition was signed under Section 2, Arterial Drainage Act, 1925, in September, 1925.

This Petition was concerned with that portion of the river from the junction of the Nore and the Dinan to a point approximately three miles upstream.

A report was made in June, 1931, by the County Surveyor dealing only with the actual junction of the rivers. He was of the opinion that considerable improvement could be effected for an expenditure of a little over £1,000.

In March, 1932, the Office of Public Works stated they would have the area inspected.

I cannot trace any further developments in this case.

A petition to have a Minor Scheme carried out on a section of the river near Castlecomer was sent to the Office of Public Works on 9-9-'31.

I can trace no further development in this case but I take it that this section would get consideration, as a survey of the whole river would be necessary to deal with the petition under the 1925 Act already referred to.

I have not figures available to show the area which would be benefited by a Drainage Scheme for the Dinan. From local knowledge I am of the opinion that the area is in the neighbourhood of 800 acres. I further believe that the concern of many land owners on this river is the checking of erosion.

I do not think there would be any difficulties encountered in the acquisition of land or fixing of compensation. To the best of my knowledge there are no vested interests to be acquired, and no serious problems arise in dealing with roads or bridges.

Kilbricken and Tullamaine.

In 1928 a Petition for a Drainage Scheme under the 1925 Act was submitted. The County Surveyor reported and recommended that the Petition be submitted to the Board of Works.

The Board of Works, after inspection, reported that the Scheme was uneconomic and stated that the circumstances were not such as to justify the preparation of a detailed Scheme. They, however, suggested that the cleaning of the river for about 1½ miles at the outfall would be beneficial.

The estimated cost of this work which could be suitably carried out under the 1928 (Minor Schemes) Act, was £800.

Aughtanny.

A Petition under the 1925 Act was forwarded to the Board of Works in August, 1928.

In October, 1929, the Board of Works rejected the Scheme as being uneconomic. No details as to cost or area which would be benefited are available.

Kinr's River.

A Petition under 1925 Act was sent to the Board of Works in 1928.

After a preliminary survey the Board of Works estimated the cost of the Scheme at £3,000, and the annual upkeep at £60.

The annual increase in the benefited lands was stated to be £61: 14: 8.

The Council were asked to provide a free grant amounting to 50% of the cost. They declined to do this, and the matter was then dropped.

Graiguenamanagh.

In December, 1932, a Petition under the 1925 Act was sent to the Board of Works dealing with the drainage of the River Barrow at Graiguenamanagh. The suggested proposals were the removal of:-

(1) Island and dock at Graigue Weir;

(2) Lengthening Graigue weir by 100 feet;

(3) Cleaning the down basin of Knockeen weir;

(4) Lengthening this weir by 30 feet.

The object of the Scheme was to prevent flooding in the town of Graigue in Co. Kilkenny, and in Tinnahinch, Co. Carlow. The estimated cost was £2,500.

In November, 1933, the Board of Works rejected the Scheme as being uneconomic.

The following Schemes were rejected by the occupiers:-

Lisdowney.

The Scheme provided for the drainage of Lisdowney river to alleviate flooded lands.

A Petition was forwarded in September, 1933, and the matter was investigated by the Board of Works.

The Scheme was estimated to cost £1,800, with an annual upkeep cost of £35. The estimated value of lands benefited was £61:12: 6.

The County Council were asked to contribute 34·3% of the total cost. The land holders to be benefited were circularised to ascertain their willingness to pay a drainage rate. In all cases they refused and the Scheme was dropped.

Leaghaillin.

A Petition under the 1925 Act was forwarded to the Board of Works in 1950.

A survey was made and a Scheme drawn up. The work proposed the lowering of the river bed for approximately one mile so as to lower the level of the lake by about 6 feet.

The cost of the proposed works was £2,500, with an annual upkeep charge of £35.

The annual value of lands benefited was estimated to be £72: 5:11. The County Council were asked to contribute a free grant of 27%. The land holders, however, refused to pay the extra drainage rate and the Scheme was dropped.

In addition there are in the Co. Kilkenny quite a lot of lands adjacent to the tidal sections of the Nore and the Barrow protected by embankments. In almost all cases serious flooding has taken place during the last ten years owing to neglect and lack of maintenance. There are no funds available for the maintenance and repair of embankments, and in almost all cases the land holders cannot afford to expend any money. Even where these embankments are under the control of the Land Commission, the procedure and process of repair is by far too tedious to be effective.

I have visited some embankments in which minor slips and breaches occurred. No funds were available to carry out a small repair costing perhaps a few pounds. The result has been that an ensuing storm or high tide did damage estimated at several hundred pounds.

In the case of embankments I consider it essential to have money and staff available to carry out immediate repairs.

I also give hereunder particulars dealing with Drainage Schemes that have already been carried out in Co. Kilkenny:-

(1) Kilbride District - part Kilkenny and part Tipperary S.R.

Date of Charging Order	...	17th January, 1929.
Total cost of Scheme	...	£2,449: 3: 0
Grant from Minister of Finance		612: 5: 9 (equal to 25%)
Balance chargeable to Rated Occupiers repayable in ten years with interest at 5½%.	...	£1,836:17: 3 (equal to 75%)
Half-yearly Annuity chargeable to Kilkenny	...	£75: 1: 8
do. do. Tipperary S.R.		58: 7:10
Due to date by Kilkenny Rated Occupiers	...	£960: 7: 7.

No Grant towards foregoing made by the County Council.

(2) Ballyragget and Kilfane District.

Date of Charging Order	...	3rd January, 1934.
Total cost of Scheme	...	£2,098: 9: 0
Provided by Oireachtas	...	£1,049: 4: 6 (equal to 50%)
Grant from County Council	...	405: 13:11
Loan from Board of Works	...	643: 10: 7

Assessed on benefited lands - repayable in 35 years - half yearly annuity £22: 14: 4.

Cost of maintenance during past two years ... £62: 14: 0.

(3) Goul River.

Estimated sum chargeable to Kilkenny area - repayable in 35 years.	...	£3,510: 0: 0
Liability of owners of benefited lands - half-yearly annuity	...	103: 7: 0

Other contributory Bodies - Leix and Tipperary S.R. Co. Councils.

Charging Order not yet issued.

(Signed)

Acting County Surveyor.

Court House,
Kilkenny.

Kilkenny County Council
County Hall, John Street, Kilkenny
Tel: 056-52699 Fax: 056-64316

Chomhairle Chontae Chill Chainnigh
Halla an Chontae, Sraid Eoin, Cill Chainnigh
E-mail: coengin@kilkennycoco.ie

9th November, 2000 County Engineer

County Secretary

Re: DOE Circular Letter EP 2/00 – Assessment Reports on Severe Flooding

A Chara,

I refer to the above circular and wish to advise as follows:

- **Chronology of events**
  Severe weather warnings were received from the Meteorological Office on Friday, 3rd November, 2000. These warnings were distributed to all relevant staff, including all Area Engineers, Senior Executive Engineers, Chief Fire Officer and the County Engineer. Arrangements were made to alert emergency crews to the possibility of call-out during the coming weekend.

  There was no rainfall on Saturday, 4th November and, consequently, no response was necessary. Heavy rainfall was encountered early on Sunday, 5th, and approximately at 11 a.m., The County Engineer alerted the County Manager to the possibility of severe flooding, and confirmed that he had activated regular monitoring of the river levels and flood prediction system. He also advised that he would be available to co-ordinate any necessary emergency response.

  At approximately 6 p.m. on Sunday, 5th November, the County Engineer was contacted by , Asst. Chief Fire Officer, the Senior Officer on duty for the weekend, who advised that there was substantial flooding throughout the county and that several fire brigades had responded to emergency call-outs. The County Engineer appraised the Mayor of Kilkenny and the Chairman of the Council on the situation and updated them on a regular basis during the emergency period. Arrangements were also made to call out both Kilkenny Corporation and County Council crews. These crews responded to many incidents throughout the county during Sunday, 5th & Monday 6th November.

In Kilkenny City, the River Nore did not break its banks until early in the morning of Monday, 6th. Corporation crews worked throughout the night to close the affected road to traffic and secure private property against flood damage.

Fire and road crews worked throughout Monday, 6th and the remaining crews were stood down at approximately 11 p.m. on Monday, 7th.

- **Emergency Plan**
  It was no necessary to activate the Major Emergency Plan.

- **Services Involved**
  All of the fire brigades in the County were involved, as were the road crews in each of the area engineers' area, i.e. 7 No. fire brigades and 13 No. road crews. In addition, the road crews of Kilkenny Corporation were deployed in the City area.

- **Contribution of each service**

  Fire Service
  The Fire Service responded to emergency calls as received, engaging in the protection of property from flood damage, pumping out of flooded property, and relieving road flooding. The Fire Service also provided emergency signage on some flooded roads.

  Road Crews
  Each road crew worked to relieve road flooding where roads were blocked, or partially blocked. Where flooding could not be relieved, emergency signs and lights were provided. The road crews also helped to secure private property against flood damage and assisted in distribution of sandbags throughout the county.

- **Road Closures**
  Many roads throughout the county were closed at the peak of the flood. These included the National Primary N9 at Ballyhale & Mullinavat; National Primary N24 at Piltown; National Secondary N78 at Ballyhemmin, and the National Secondary N77 at Ballyragget. A full schedule of road closures will be prepared and forwarded to the Department in due course. All of the above roads were closed as a result of river flooding and could only be re-opened when river levels had subsided. The last National Road to be re-opened was the N24 at Piltown, at approximately 10.30 p.m. on Tuesday, 7th November. The Council has not yet prepared an accurate register of flooded property, and it is difficult to be definitive regarding the exact amount. Based on the reports which have been received from the Fire Service and from each overseer's area, the best estimate is that approximately 100 premises were flooded, and that approximately 25% of these were commercial premises.

- **Residential Properties Evacuated**
  Approximately 24 properties were evacuated by their owners or occupiers during the flood period. None of these evacuations were ordered by the emergency services. However, the service did provide help and assistance to those evacuating their houses. In all cases the evacuees made their own arrangements for emergency accommodation and none was sought from or provided by the Council or Corporation. In Kilkenny city, a number of private businesses provided emergency meals etc. to the evacuees and others affected by the flooding.

- **Number of People Evacuated**
  The Council does not have a record of the number of evacuees. However, it is likely that between 70 and 100 were affected. In all instances, private properties only were affected. There is no report of a local authority house having been flooded.

- **Alternative Accommodation Provided**
  The Council did not provide any accommodation to evacuees. In each case the evacuees made their own arrangements for accommodation which, in the main, was provided by relatives. The Council has since received one request for accommodation.

  Flood levels have now receded in all areas. However, it will be sometime before all the properties are dried out and fit for habitation. Each individual family is making its own arrangements. The Council is not in a position to indicate the likely duration of continued evacuation. No special arrangements were necessary to evacuate elderly or disabled persons.

- **Sanitary Infrastructure**
  There was not any substantial adverse affect on water supply schemes throughout the county and, while in many instances sewerage schemes had to deal with increased quantities of rainwater, there was no significant environmental impact.

A summary log prepared by the Fire Service indicating the major events during the emergency is attached. A full Fire Brigade log is available on request.

Mise, le meas,

County Engineer

Appendix G – Drainage & Services Drawings List

All Drawings are located in Volume 1 of the Planning Pack

- PE610-D003-004-001 Site Drainage Plan
- PE610-D003-004-002 Drainage Details (Sheet 1 of 2)
- PE610-D003-004-003 Drainage Details (Sheet 2 of 2)