White Hill Wind Farm Electricity Substation & Electricity Line

Environmental Impact Assessment Report

Annex 12.3: Gas Pipeline Crossing Assessment

White Hill Wind Limited

Galetech Energy Services

Clondargan, Stradone, Co. Cavan Ireland

Telephone +353 (0)49 555 5050

www.galetechenergyservices.com

Distribution:	White Hill Wind Ltd. / Galetech Energy Services Ltd.
Title:	Whitehill WF HP Gas Pipeline Crossing Assessment
Project:	300-101087 Whitehill WF

Rev	Date	Description	By	Checked	Approved
00	09/10/24	Draft - Issued for Client Review	JCO	DTA	JCO
01	17/10/24	Issued for Client Approval	JCO	DTA	JCO
02	19/02/25	Figure 1 Grid Route Updated	JCO	DTA	JCO

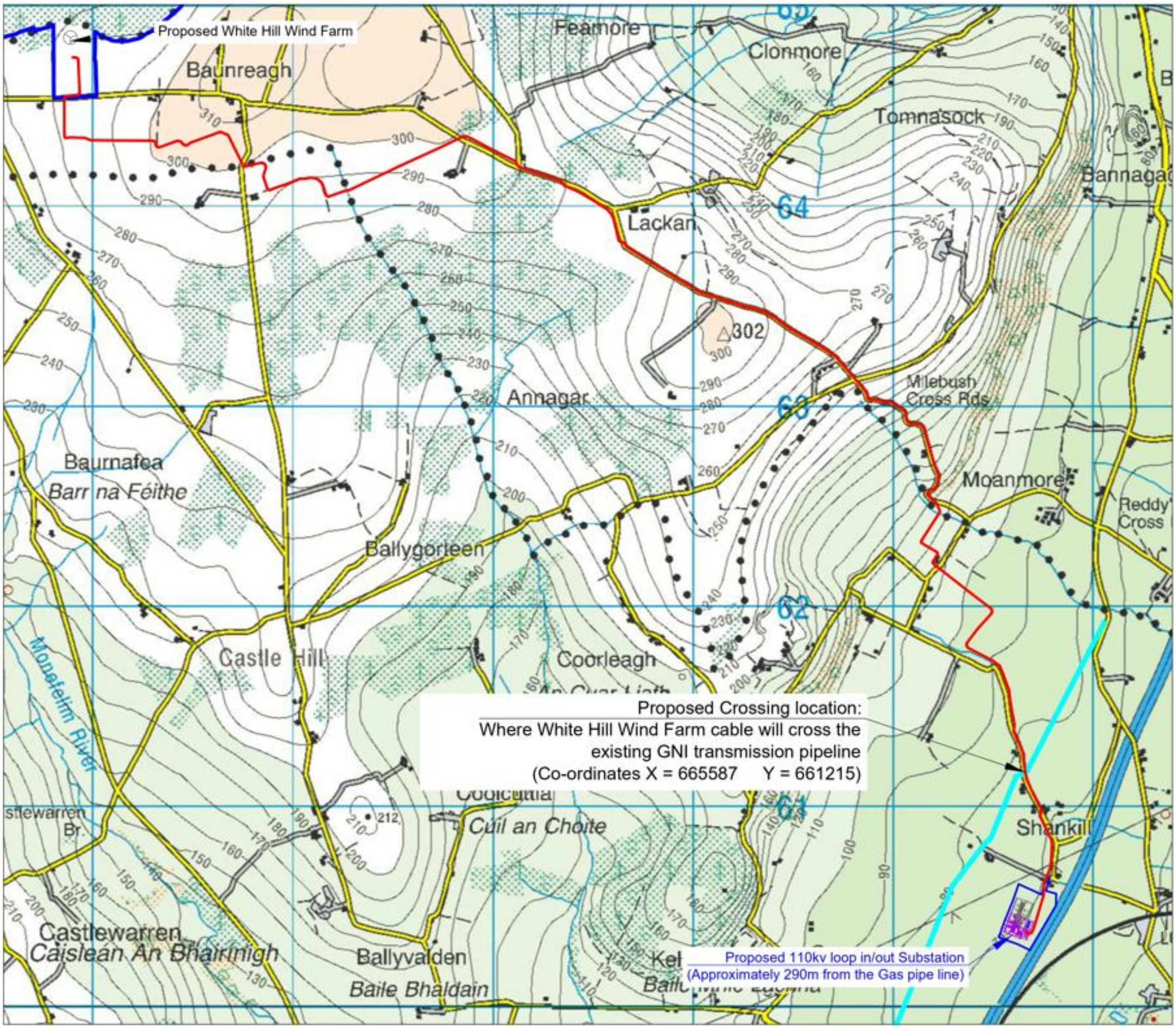
Contents

1 Introduction

1.1 Background

TLI Group ("The Consultant") was engaged by White Hill Wind Ltd. ("The Client") to perform pipeline crossing studies for the 33 kV grid connection of the proposed Whitehill onshore windfarm project ("The Project"), located along the border between County Kilkenny and County Carlow. The Project is seeking to connect to the existing transmission grid at a planned loop-in substation on the Kilkenny-Kellis 110 kV OHL at Shankill. This study includes a high-level load assessment of the Cork-Dublin high pressure gas transmission pipeline where its crosses a local road containing the proposed 33 kV circuits running from Whitehill to Shankill (crossing point indicated in Figure 1).

The planned grid connection will consist of 2 no. 33 kV circuits (trefoil configuration) with a MEC of 50.4 MW plus 3 no. spare sets of ducts (in trefoil configuration).



Proposed White Hill Wind Farm

Proposed Crossing location:
Where White Hill Wind Farm cable will cross the existing GNI transmission pipeline
(Co-ordinates X = 665587 Y = 661215)

Proposed 110kv loop in/out Substation
(Approximately 290m from the Gas pipe line)

Figure 1 – Whitehill Grid Route and Crossing location.

1.2 Design Brief

The purpose of this document is a high-level assessment of the buried pipeline where it crosses under the public roadway containing the proposed 33 kV circuits. The pipeline crossing is assessed in accordance with **BS31.4** and **API RP 1102** codes to evaluate steel pipeline road crossings.

The pipeline will be subject to stresses induced by internal loads (internal operating pressure) and external loads such as temperature (neglected for the purposes of this study), earth loads (due to self-burial) and live loads (i.e. road traffic). From the pipeline drawings received it does not appear the pipeline has a protective sleeve at the road crossing location.

The pipeline crosses at a depth of 3.0 m below a local public road which will be subject to normal maximum traffic (axle) loads as set down by TII / RSA guidelines (taken as maximum 12 tonnes per axle). As the pipeline depth is greater than 1 m, combined loads due to adjacent wheels / axes will also be taken into account in the calculation.

The nearest pipe girth weld is located approx. 1m outside (west) of the existing road / backfill. The nearest pipe bend is located approx. 4m away (west) of the existing road / backfill.

Under the current road crossing the pipeline lies in a bed of compacted sand (300 mm cover) with the remaining cover (2.7m) up to road level comprising of lean mix concrete. The proposed 33 kV circuit ducting will be laid at a depth of 1250 mm in various layers of compacted thermal sands with a top cover of compacted granular material or cement bound granular material (CBGM) – refer to the trench details in Appendix A.

Design parameters used in the pipeline crossing load evaluation are shown in Table 1.

Pipeline Parameter	Value
Service	Gas (methane)
Pipe Outer Diameter	450 mm
Wall thickness	9.52 mm
Steel Material Grade	API 5L X42 (minimum assumed)
SYMS	42 KSI / 289 MPa
Max Operating Pressure	69 bar / 6.9 MPa (assumed)
Cover depth	3.0 m
Corrosion Allowance	1.5 mm
Pavement type	Flexible
Road Traffic Wheel Load (single Axis)	58.9 kN
Road Traffic Wheel Load (tandem Axis)	49 kN

Table 1 – API RP 1102 Calculation Parameters

1.3 API RP 1102 Calculation Results

Allowable Barlow Stress:

SMYS = 289 MPa

Allowable = SMYS x F x E x T = 208.5 MPa (F=0.72, E=1.0, T=1.0)

S_{HI} (Barlow) = 196.6 MPa Pass as less than allowable

Effective Stress: Combination of Earth load, Live load and Internal load.

Earth Load: S_{He} = 31.8 MPa

Cyclic Circumferential Stress: ΔS_{Hh} = 22.1 MPa

Cyclic Longitudinal Stress: ΔS_{Lh} = 0.1 MPa

Circumferential Stress (Internal Pressurisation): S_{Hi} = 162.2 MPa

Principle Stresses:

S1 (S_{He}, ΔS_{Hh}, S_{Hi}) = 216.1 MPa

S2 (ΔS_{Lh}, S_{He}, S_{Hi}) = 58.5 MPa

S3 (p) = -6.9 MPa

Combination of Earth load, Live load and Internal load.

S_{eff} = 185.5 MPa	Pass as less than SMYS x F_a
SMYS x F_a = 208.5 MPa	(F_a = 0.72)

Fatigue Check:

Girth Welds:

S_{FG} x F = 59.6 MPa	(F=0.72)
ΔS_{Lh} = 0.1 MPa	Pass as less than S_{FG} x F

Longitudinal Welds:

S_{FL} x F = 104.3 MPa	(F=0.72)
ΔS_{Hh} = 7.6 MPa	Pass as less than S_{FL} x F

1.4 Conclusions

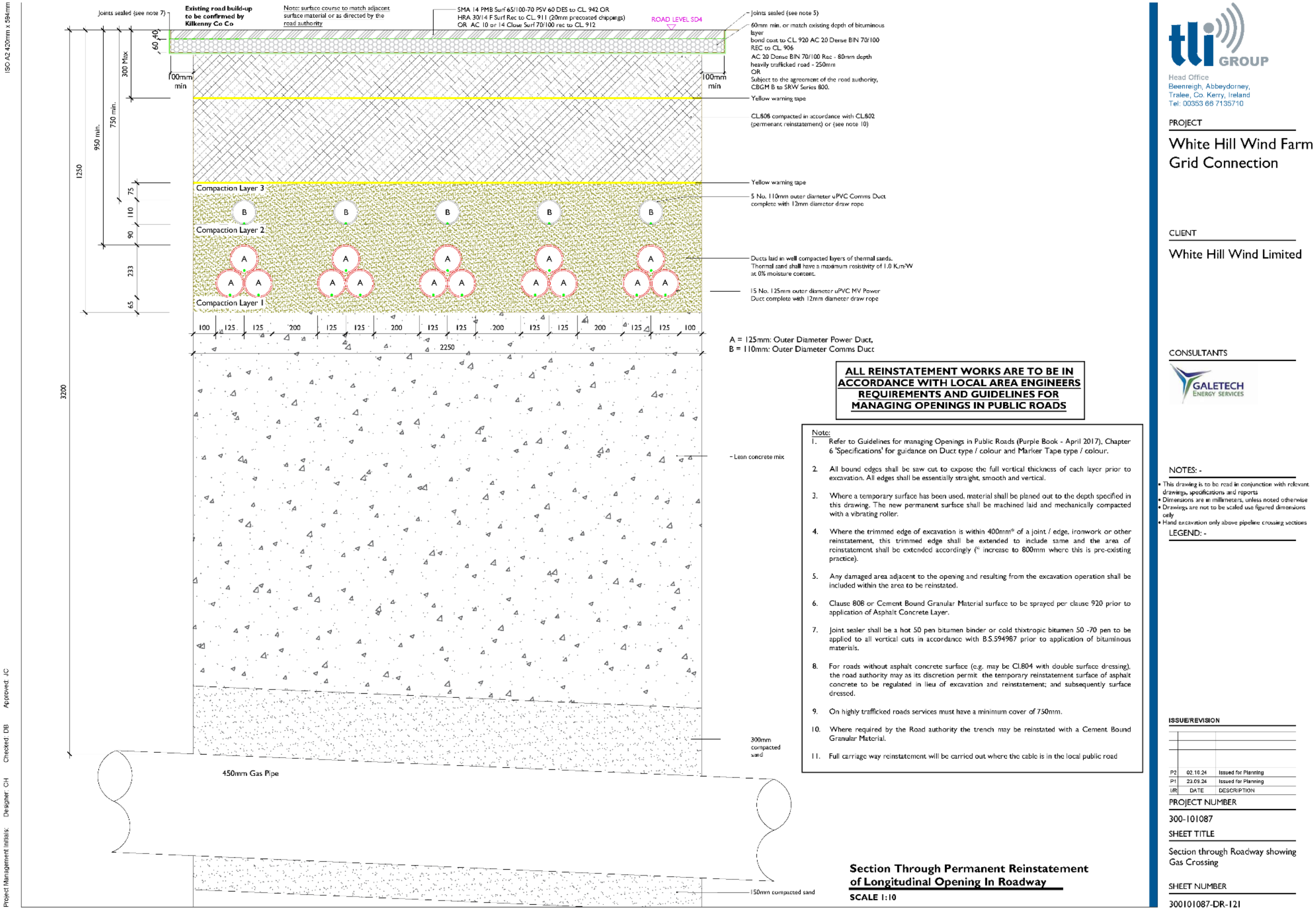
The proposed Whitehill WF 33 kV circuit trench detail is found to not impact on the existing 450 mm high pressure gas pipeline at the designated road crossing and at a cover depth of 3 m. This conclusion is based on the implementation of API RP 1102 stress checks for the pipeline, assuming a minimum pipe steel grade of X42, an operating pressure of 6.9 MPa and the application of maximum allowable road haulage loads.

1.5 Recommendations

The crossing assessment has been performed assuming a minimum pipe steel grade of X42 (API 5L). The steel grade of the HP pipeline should be confirmed with Gas Networks Ireland from as-built records.

To ensure no risk of damage to the pipeline during excavation and construction activities extra care needs to be taken to avoid impact or excess loads or vibration on the pipe, i.e. when cutting out the existing concrete cover. In particular, heavy machinery (tracked or wheeled) should be carefully managed when working near the crossing / avoid unnecessary crossing / point loading of the pipeline.

Appendix A – Drawing – Circuit Crossing in Roadway over Gas Pipeline



A = 125mm: Outer Diameter Power Duct,
B = 110mm: Outer Diameter Comms Duct

ALL REINSTATEMENT WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AREA ENGINEERS REQUIREMENTS AND GUIDELINES FOR MANAGING OPENINGS IN PUBLIC ROADS

Note:

1. Refer to Guidelines for managing Openings in Public Roads (Purple Book - April 2017), Chapter 6 'Specifications' for guidance on Duct type / colour and Marker Tape type / colour.
2. All bound edges shall be saw cut to expose the full vertical thickness of each layer prior to excavation. All edges shall be essentially straight, smooth and vertical.
3. Where a temporary surface has been used, material shall be planed out to the depth specified in this drawing. The new permanent surface shall be machined laid and mechanically compacted with a vibrating roller.
4. Where the trimmed edge of excavation is within 400mm* of a joint / edge, ironwork or other reinstatement, this trimmed edge shall be extended to include same and the area of reinstatement shall be extended accordingly (* increase to 800mm where this is pre-existing practice).
5. Any damaged area adjacent to the opening and resulting from the excavation operation shall be included within the area to be reinstated.
6. Clause 808 or Cement Bound Granular Material surface to be sprayed per clause 920 prior to application of Asphalt Concrete Layer.
7. Joint sealer shall be a hot 50 pen bitumen binder or cold thixtropic bitumen 50 -70 pen to be applied to all vertical cuts in accordance with B.S.594987 prior to application of bituminous materials.
8. For roads without asphalt concrete surface (e.g. may be Cl.804 with double surface dressing), the road authority may as its discretion permit the temporary reinstatement surface of asphalt concrete to be regulated in lieu of excavation and reinstatement; and subsequently surface dressed.
9. On highly trafficked roads services must have a minimum cover of 750mm.
10. Where required by the Road authority the trench may be reinstated with a Cement Bound Granular Material.
11. Full carriage way reinstatement will be carried out where the cable is in the local public road

Section Through Permanent Reinstatement of Longitudinal Opening In Roadway
SCALE 1:10

PROJECT
White Hill Wind Farm
Grid Connection

CLIENT
White Hill Wind Limited

CONSULTANTS
GALETECH ENERGY SERVICES

NOTES: -
- This drawing is to be read in conjunction with relevant drawings, specifications and reports
- Dimensions are in millimeters, unless noted otherwise
- Drawings are not to be scaled use figured dimensions only
- Hand excavation only above pipeline crossing sections

LEGEND: -

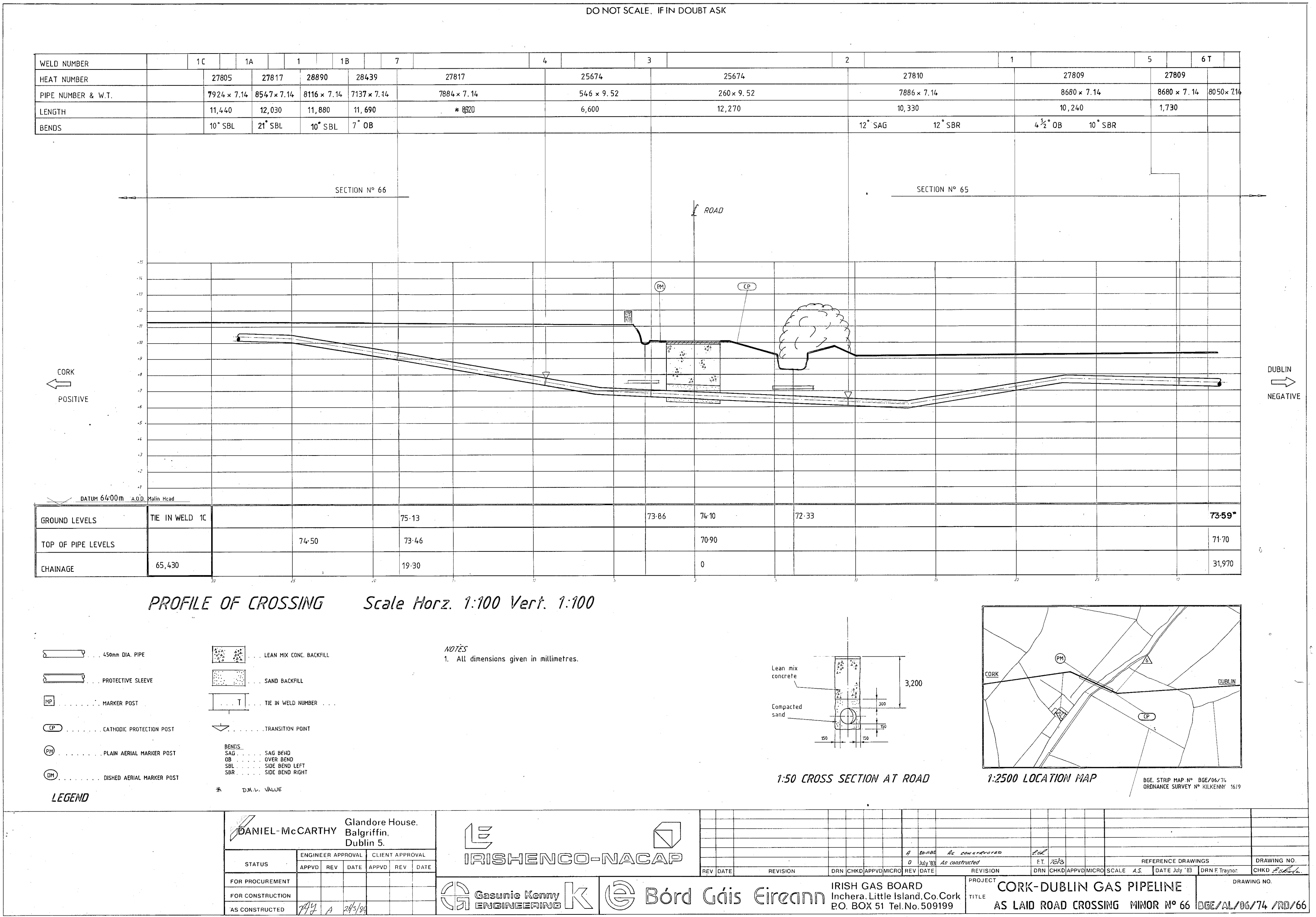
ISSUE/REVISION

I/R	DATE	DESCRIPTION
P2	02.10.24	Issued for Planning
P1	23.09.24	Issued for Planning

PROJECT NUMBER
300-101087

SHEET TITLE
Section through Roadway showing Gas Crossing

SHEET NUMBER
300101087-DR-121



DO NOT SCALE. IF IN DOUBT ASK

WELD NUMBER	1C	1A	1	1B	7	4	3	2	1	5	6T
HEAT NUMBER	27805	27817	28890	28439	27817	25674	25674	27810	27809	27809	
PIPE NUMBER & W.T.	7924 × 7.14	8547 × 7.14	8116 × 7.14	7137 × 7.14	7884 × 7.14	546 × 9.52	260 × 9.52	7886 × 7.14	8680 × 7.14	8680 × 7.14	8050 × 7.14
LENGTH	11,440	12,030	11,880	11,690	* 8,920	6,600	12,270	10,330	10,240	1,730	
BENDS	10° SBL	21° SBL	10° SBL	7° OB				12° SAG 12° SBR	4½° OB 10° SBR		

GROUND LEVELS	TIE IN WELD 1C		75·13	73·86	74·10	72·33	73·59*
TOP OF PIPE LEVELS		74·50	73·46		70·90		71·70
CHAINAGE	65,430		19·30		0		31,970

PROFILE OF CROSSING Scale Horz. 1:100 Vert. 1:100

- 450mm DIA. PIPE
- PROTECTIVE SLEEVE
- MP . . . MARKER POST
- CP . . . CATHODIC PROTECTION POST
- PM . . . PLAIN AERIAL MARKER POST
- DM . . . DISHED AERIAL MARKER POST
- LEAN MIX CONC. BACKFILL
- SAND BACKFILL
- T . . . TIE IN WELD NUMBER
- TRANSITION POINT

BENDS
SAG . . . SAG BEND
OB . . . OVER BEND
SBL . . . SIDE BEND LEFT
SBR . . . SIDE BEND RIGHT

* D.M.L. VALUE

LEGEND

NOTES
1. All dimensions given in millimetres.

1:50 CROSS SECTION AT ROAD

1:2500 LOCATION MAP

BGE. STRIP MAP Nº BGE/06/74
ORDNANCE SURVEY Nº KILKENNY 16/9

DANIEL-McCARTHY
Glandore House,
Balgriffin,
Dublin 5.

STATUS	ENGINEER APPROVAL APPVD	REV	DATE	CLIENT APPROVAL APPVD	REV	DATE
FOR PROCUREMENT						
FOR CONSTRUCTION						
AS CONSTRUCTED		A	26/3/84			

IRISHENCO-NACAP

Gasunie Kenny ENGINEERING

Bórd Gáis Eireann
IRISH GAS BOARD
Inchera, Little Island, Co. Cork
P.O. BOX 51 Tel. No. 509199

REV	DATE	REVISION	DRN	CHKD	APPVD	MICRO
A	30-11-83	As constructed	E.O'R.			
0	July '83	As constructed	F.T.	7o/3		

REFERENCE DRAWINGS

SCALE A.S. DATE July '83 DRN F. Traynor CHKD

PROJECT CORK-DUBLIN GAS PIPELINE
TITLE AS LAID ROAD CROSSING MINOR Nº 66

DRAWING NO. BGE/AL/06/74 /RD/66