Appendix 14F

Falling Weight Deflectometer Assessment

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MILESTONE
Pavement Technologies

Falling Weight Deflectometer Survey

L4310 Tynagh, Co. Galway

Unit M Kells Business Park, Cavan Road, Kells, Co. Meath Ph. 086-7947688

Client: Gravis Planning

Address: Denshaw House, 121 Baggot Street Lower, Dublin 2.

Site: L4310 Tynagh

Date: 11-February-2022

Contents:

1. Introduction:

Falling Weight Deflectometer (FWD) surveys are carried out to assess pavement condition and to identify weakness in the pavement structure. Gravis Planning required a FWD survey on the L4310 at Tynagh.

2. FWD Details

Testing was carried out using a trailer mounted Primax FWD manufactured by Sweco. Readings were taken from 7 geophones mounted radially from the centre of the load plate and positioned as follows:

Geophone Number	D1	D2	D3	D4	D5	D6	D7
Distance from centre of load (mm)	0	300	600	900	1200	1500	1800

3. Description of FWD testing

A load pulse is produced by dropping a known mass, and is transmitted to the pavement through the loading plate. The load cell measures the load imparted to the pavement surface. Geophones mounted radially from the centre of the load plate measure the pavement deflection in response to the load.

In this case the load level was set at 40kN and the load pulse applied through a 300mm diameter plate. Deflections at each geophone were measured at a resolution of 1 micron. At each test point at least 3 drops were made, after an initial drop to settle the load plate.

All testing was carried out in accordance with T.I.I. Publication AM-PAV-06050. Measurements were taken at 50 metre intervals in each lane, staggered by 25 metres between lanes, along the test section.

The survey was carried out by Peter Shipp. Analysis and interpretation of results was by Seamus O'Reilly. Particular training records in this regard are contained in Appendix C.

4. Survey Details

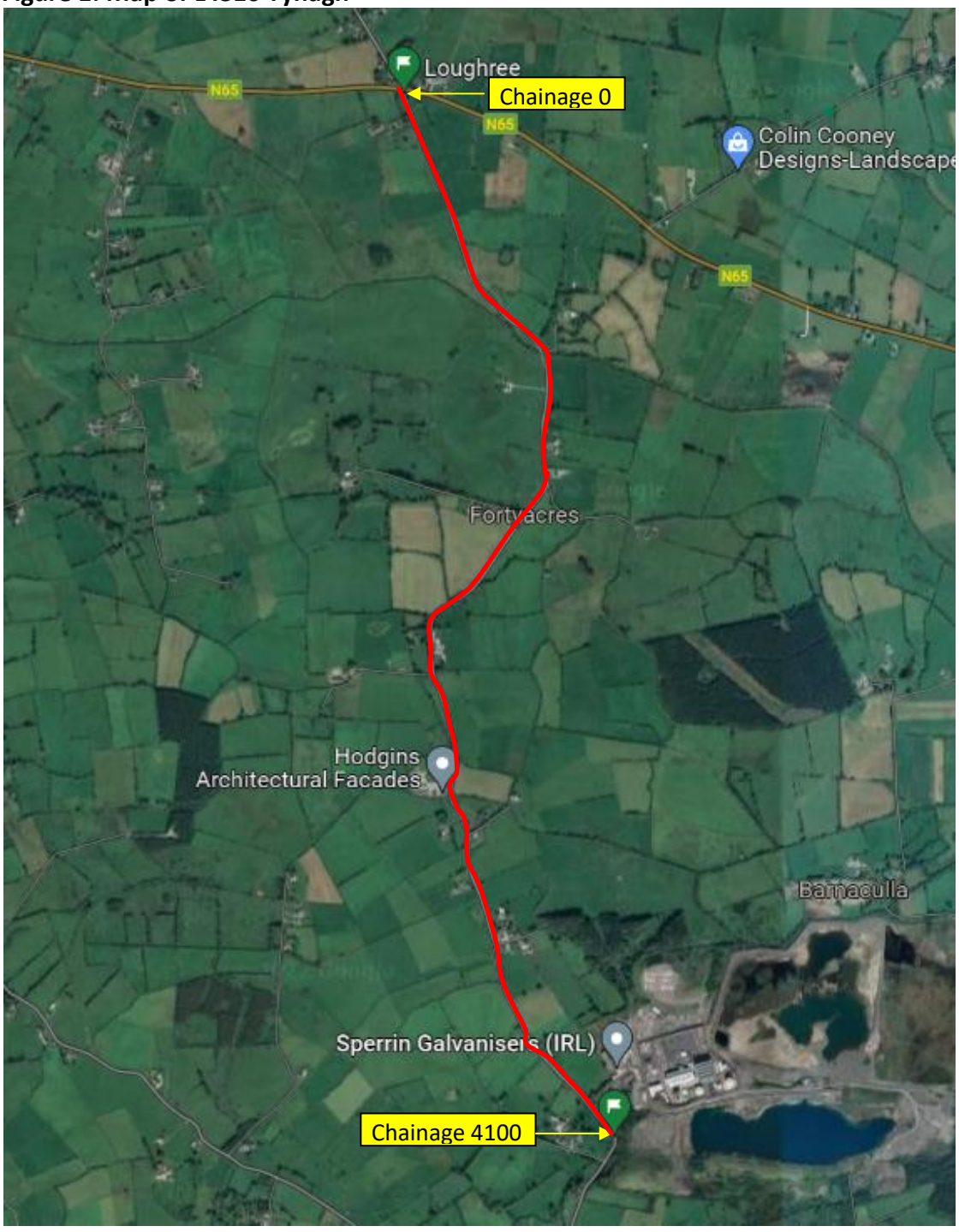
4.1. Date of Survey

The survey took place on February 8th, 2022.

4.2. Site Details

Testing commenced at the junction with the N65 (Chainage 0) and proceeded south for a distance of 4,100 metres as shown in Figure 1.

Figure 1: Map of L4310 Tynagh



5. Results

5.1. Tabulated Deflections

The deflection bowl created by the FWD load pulse is influenced by the stiffness of the different pavement layers. Deflection values are tabulated in Appendix A as follows:

D1: Indication of overall pavement performance

D1-D2: Indicates condition of upper pavement layers

D7: Indication of sub-grade condition

Lower deflections generally indicate better pavement condition. Guidance on the relevance of deflection values given in T.I.I. Publication AM-PAV-06050 is reproduced in Table 1 and Table 2, and results in this report are highlighted based on the colour key shown.

Table 1: Upper Pavement Layers

Central Deflection (D1)	SCI (D1-D2)	Comment
<100	<40	Very strong pavement
100-200	40-80	Strong pavement
200-350	80-140	Reasonably strong pavement.
350-500	140-200	Moderate pavement.
500-700	200-300	Moderate to weak pavement.
>700	>300	Poor pavement

Table 2: Subgrade Reaction

Outer Deflection (D7)	Comment
<10	Very stiff subgrade
10-20	Stiff subgrade
20-30	Stiff to moderate subgrade
30-40	Moderate to weak subgrade
40-50	Weak subgrade
>50	Very weak subgrade

The pavement condition can be considered as homogenous sub-sections with deflections of similar magnitude. In this case eight such sub-sections were identified, and average values for each are shown in Table 3.

In general, this pavement structure could be described as strong to reasonably strong with a very stiff sub-grade. A small number of higher values highlighted in Appendix A may indicate isolated, localised weak points.

It should be noted that although this is a local road the deflection values are compared to guidance for national roads. Guidance in DTTAS Publication *'Guidelines on the Depth of Overlay to be used on Rural Regional and Local* Roads' would be more appropriate for the L4310 and would indicate a very strong pavement structure for its type of use.

Table 3: Average Deflection Values for L4310 Tynagh

Chainage	Southbound			Northbound		
	D1	D1-D2	D7	D1	D1-D2	D7
0 to 575	248	98	8	240	101	9
600 to 1150	193	78	6	146	62	6
1175 to 1600	234	100	6	187	80	5
1600 to 1900	265	107	7	277	123	5
1925 to 2200	237	89	7	138	57	5
2225 to 2450	199	81	7	221	93	8
2475 to 3100	223	83	7	307	125	8
3125 to 4100	279	107	10	281	117	8

5.2. Deflection Plots

The selected deflection parameters were plotted against distance and are presented in Appendix B. Deflection and deflection difference plots are useful for showing relative differences in the condition of the layers.

Appendix A

Tabulated Deflections

Table A1: L4310 Tynagh Southbound

Chainage	D1	D1-D2	D7
0	194	97	5
50	194	80	3
100	283	94	7
150	336	128	5
200	240	97	8
250	255	95	3
300	318	127	5
355	312	108	15
400	203	78	13
450	200	90	8
500	195	85	8
550	249	93	16
600	112	69	2
650	164	82	3
700	186	83	7
750	258	119	4
800	227	93	5
850	228	87	3
900	294	104	12
950	273	92	15
1000	50	15	3
1070	96	38	3
1100	183	61	5
1150	240	89	3
1200	267	110	8
1250	265	115	4
1300	190	91	2
1350	235	104	5
1400	194	96	3
1450	286	108	13
1500	338	118	9
1550	185	81	4

Table A2: L4310 Tynagh Northbound

Chainage	D1	D1-D2	D7
0	146	72	4
25	322	128	9
75	154	77	3
125	237	91	22
175	272	90	24
225	250	110	4
275	236	91	8
325	279	126	3
375	239	112	4
425	224	89	7
475	257	111	10
525	257	103	13
575	243	117	7
625	147	94	3
675	158	62	8
725	159	81	3
775	183	77	11
825	187	73	4
875	163	72	3
925	214	64	18
975	124	44	5
1025	101	49	3
1075	87	34	3
1125	86	26	3
1175	193	82	4
1225	201	95	7
1275	178	76	4
1325	153	73	3
1375	218	87	7
1425	185	92	3
1475	253	88	8
1525	134	56	3

Table A1: L4310 Tynagh Southbound (cont'd)

Chainage	D1	D1-D2	D7
1600	146	75	3
1650	284	105	12
1700	187	103	3
1750	344	134	6
1800	235	92	8
1850	270	109	7
1900	269	97	7
1950	334	95	14
2000	200	85	3
2050	252	86	12
2100	229	89	6
2150	171	91	3
2200	237	85	8
2250	224	94	5
2300	180	78	5
2350	216	93	7
2400	191	73	9
2450	186	70	9
2500	232	84	9
2550	278	90	15
2600	191	77	6
2650	187	81	3
2700	242	92	5
2750	201	68	4
2800	262	105	5
2850	252	104	4
2900	187	70	8
2950	253	93	11
3000	166	68	4
3050	244	60	14
3100	199	92	3

Table A2: L4310 Tynagh Northbound (cont'd)

Chainage	D1	D1-D2	D7
1575	171	75	3
1625	330	122	9
1675	294	127	6
1725	201	102	3
1775	303	129	3
1825	266	132	4
1875	269	127	6
1925	197	58	5
1975	161	84	3
2025	181	77	3
2075	51	10	9
2125	99	50	4
2175	141	61	5
2225	297	109	11
2275	179	83	6
2325	164	77	5
2375	185	83	10
2425	279	112	8
2475	322	122	11
2525	380	137	14
2575	365	140	11
2625	268	126	6
2675	178	90	4
2725	313	137	5
2775	211	84	8
2825	242	107	4
2875	685	250	15
2925	272	121	4
2975	215	95	5
3025	313	123	4
3075	223	87	15

Table A1: L4310 Tynagh Southbound (cont'd)

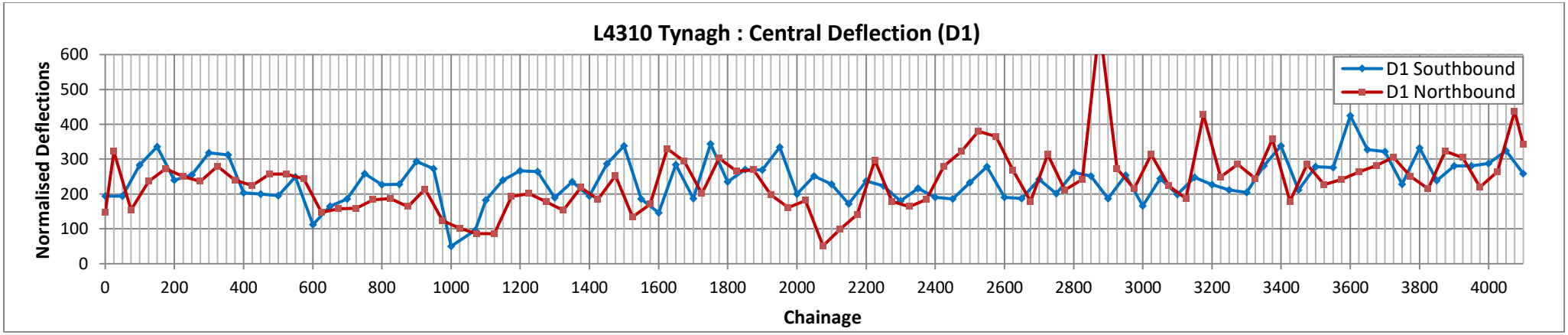
Chainage	D1	D1-D2	D7
3150	247	89	15
3200	227	90	6
3250	212	97	3
3300	204	76	6
3350	281	106	11
3400	338	100	19
3450	212	100	4
3500	278	101	5
3550	276	98	11
3600	425	142	17
3650	328	115	5
3700	322	125	6
3750	228	97	4
3800	333	122	8
3850	238	97	5
3900	281	143	5
3950	281	116	5
4000	288	112	12
4050	324	109	33
4100	259	111	25

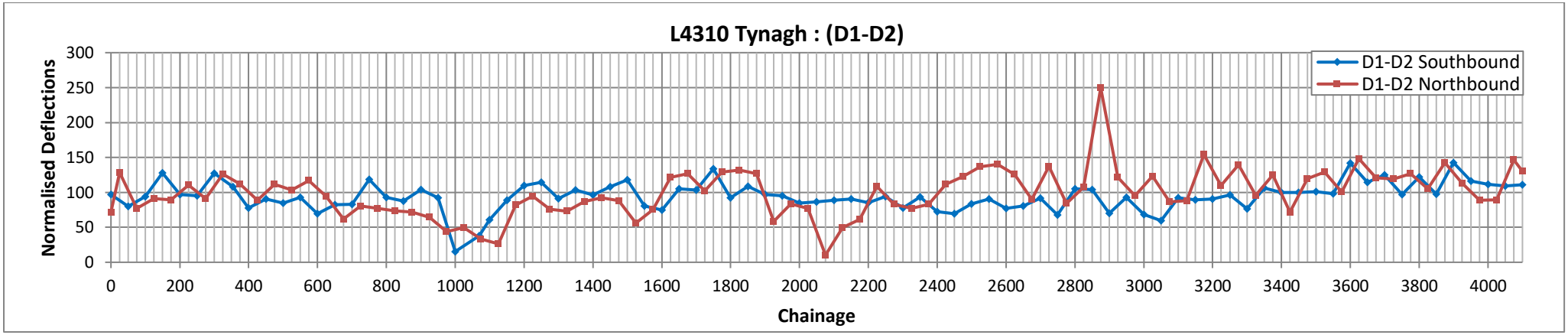
Table A2: L4310 Tynagh Northbound (cont'd)

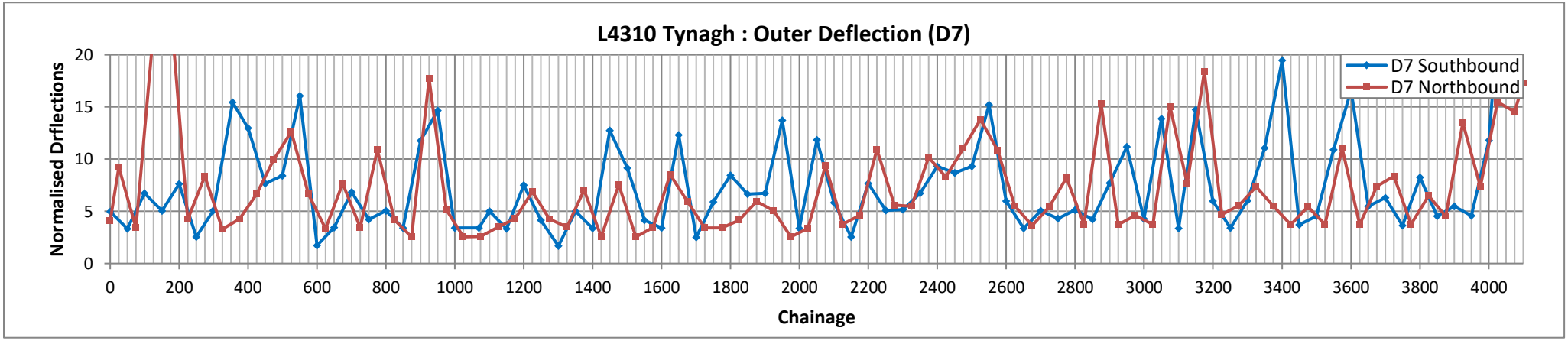
Chainage	D1	D1-D2	D7
3125	186	88	8
3175	427	154	18
3225	249	110	5
3275	285	140	6
3325	244	96	7
3375	358	125	6
3425	178	72	4
3475	285	120	5
3525	227	129	4
3575	242	100	11
3625	263	148	4
3675	282	121	7
3725	305	119	8
3775	250	127	4
3825	215	105	6
3875	323	142	5
3925	304	113	13
3975	220	89	7
4025	265	89	15
4075	438	147	15
4100	343	130	17

Appendix B

Deflection Graphs


L4310 Tynagh : Central Deflection (D1)
Normalised Deflections
Chainage
D1 Southbound
D1 Northbound
0
100
200
300
400
500
600
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000


L4310 Tynagh : (D1-D2)
Normalised Deflections
Chainage
D1-D2 Southbound
D1-D2 Northbound
0
50
100
150
200
250
300
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000


L4310 Tynagh : Outer Deflection (D7)
Normalised Drflections
Chainage
D7 Southbound
D7 Northbound
0
5
10
15
20
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

Appendix C

Training Records

DIPLOMA

TRAINING COURSE
IN
THE USE AND MAINTENANCE OF FALLING WEIGHT
DEFLECTOMETERS

This is to certify that:

Mr Peter Shipp, MILESTONE Pavement Technologies

has completed the training course in the operation and maintenance of Falling Weight Deflectometer (7-150 kN).

The training course was conducted by Sweco Danmark A/S, Pavement Consultants, Kokbjerg 5, 6000 Kolding, Denmark being specialists in operation and maintenance of falling weight deflectometers and in pavement structures, design programs, data interpretation and back-calculation of data.

Time and place of training: 4-7 September 2012

Certificate issued on: 9 September 2012

René Clemen
Production Manager of the FWD Department
Sweco Danmark A/S

OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
TU DUBLIN
TECHNOLOGICAL UNIVERSITY DUBLIN

COLLEGE OF ENGINEERING & BUILT ENVIRONMENT

CONTINUING PROFESSIONAL DEVELOPMENT PROGRAMME

This is to confirm that

Seamus O'Reilly

has successfully completed the following CPD Certificate in

Design & Life Cycle of Road Pavements

[Total Credits Awarded: 5 ECTS at Level 9]

Signed:

Professor Brian Bowe
Head of Academic Affairs &
Assistant Registrar

Dr Avril Behan
Director and Dean
College of Engineering & Built Environment

Date: 8th October 2020

Ref: CPD 20/21-1307

DIPLOMA

TRAINING COURSE IN THE USE OF RoSy DESIGN

This is to certify that:

Mr. Seamus O'Reilly

has completed the training course in the design software RoSy Design for roads.

Mr. Seamus O'Reilly has been trained to use of the design software.

Instructors were specialists from Grontmij A/S, Pavement Consultants, Kokbjerg 5, 6000 Kolding, Denmark, specialised in operation and maintenance of falling weight deflectometers and in pavement structures, design programs, data interpretation and back-calculation of data.

May 2010

Jens P. Pedersen
Project Manager

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