Appendix F Causeway Stormwater Drainage Calculations

a) **Causeway Surface Water Drainage Design Calculations (Ground Level Drainage)**
b) **Causeway Basement Surface Water Drainage Design Calculations (Basement Level Drainage)**

a. Causeway Surface Water Drainage Design Calculations (Ground Level Drainage)

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.200
Ratio-R	0.277	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Blue Roof Block D	0.106	5.00	64.070	1200	713407.132	729838.884	0.400
SIC2-0			48.000	450	713423.178	729831.775	0.700
S1-0	0.042	5.00	48.000	1350	713435.101	729813.393	1.275
S1-1	0.035	5.00	48.000	1350	713427.769	729833.453	1.346
S1-2	0.126	5.00	48.100	1350	713416.150	729865.222	1.615
S3-0	0.081	5.00	47.800	1350	713359.684	729844.585	1.575
S1-3	0.138	5.00	47.950	1350	713382.006	729852.742	1.906
S1-4	0.058	5.00	48.050	1350	713398.352	729808.019	2.123
S1-5	0.008	5.00	48.400	1350	713415.461	729769.948	2.576
Blue Roof Block C	0.074	5.00	64.670	1200	713393.266	729771.647	0.400
SIC4-0			48.400	450	713404.463	729758.394	0.900
S1-6	0.117	5.00	48.400	1350	713404.828	729752.697	2.626
Blue Roof Block B	0.074	5.00	64.670	1200	713350.242	729761.388	0.400
SIC5-0			48.000	450	713368.453	729744.395	0.575
S1-7	0.008	5.00	48.000	1350	713370.063	729739.991	2.317
S1-8	0.012	5.00	48.250	1350	713378.176	729717.791	2.625
S1-9	0.117	5.00	48.500	1350	713347.795	729706.687	2.955
S1-10	0.019	5.00	48.800	1350	713315.708	729694.960	3.339
S1-11			48.800	1350	713310.471	729705.229	3.368
Blue Roof Block A	0.172	5.00	58.220	1200	713299.649	729778.605	0.400
SIC6-0			48.300	450	713290.082	729779.423	1.175
S1-12	0.017	5.00	48.100	1500	713276.879	729776.306	2.936
S1-13	0.008	5.00	47.800	1500	713264.028	729802.420	2.695
S7-0	0.128	5.00	48.300	1350	713350.703	729813.442	2.100
S7-1	0.079	5.00	47.800	1350	713341.709	729838.050	1.920
S7-2	0.102	5.00	47.800	1350	713315.716	729828.640	2.058
S8-0	0.170	5.00	48.300	1350	713304.186	729805.955	2.200
S7-3	0.049	5.00	47.800	1350	713298.230	729822.249	2.151
S7-4	0.044	5.00	47.800	1350	713279.505	729815.409	2.217
S7-5	0.073	5.00	47.800	1350	713265.749	729815.680	2.550
S1-14			47.670	1500	713257.999	729813.882	2.592
EXT MH4			47.800	1500	713247.849	729820.963	2.755

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S2.000	Blue Roof Block D	SIC2-0	17.550	0.600	63.670	47.300	16.370	1.1	150	5.03	50.0
S2.001	SIC2-0	S1-1	4.888	0.600	47.300	47.239	0.061	80.0	150	5.10	50.0
S1.000	S1-0	S1-1	21.358	0.600	46.725	46.654	0.071	300.0	375	5.34	50.0
S1.001	S1-1	S1-2	33.827	0.600	46.654	46.485	0.169	200.0	375	5.78	50.0
S1.002	S1-2	S1-3	36.353	0.600	46.485	46.303	0.182	200.0	375	6.26	50.0
S3.000	S3-0	S1-3	23.766	0.600	46.225	46.119	0.106	225.0	375	5.33	50.0
S1.003	S1-3	S1-4	47.617	0.600	46.044	45.927	0.117	407.0	450	7.05	50.0
S1.004	S1-4	S1-5	41.739	0.600	45.927	45.824	0.103	405.2	450	7.74	50.0
S1.005	S1-5	S1-6	20.265	0.600	45.824	45.774	0.050	405.3	450	8.08	50.0
S4.000	Blue Roof Block C	SIC4-0	17.350	0.600	64.270	47.500	16.770	1.0	150	5.03	50.0
S4.001	SIC4-0	S1-6	5.709	0.600	47.500	47.429	0.071	80.0	150	5.11	50.0
S1.006	S1-6	S1-7	37.014	0.600	45.774	45.683	0.091	406.7	450	8.70	50.0
S5.000	Blue Roof Block B	SIC5-0	24.908	0.600	64.270	47.425	16.845	1.5	225	5.04	50.0
S5.001	SIC5-0	S1-7	4.689	0.600	47.425	47.366	0.059	80.0	225	5.09	50.0
S1.007	S1-7	S1-8	23.636	0.600	45.683	45.625	0.058	407.5	450	9.09	50.0
S1.008	S1-8	S1-9	32.347	0.600	45.625	45.545	0.080	404.3	450	9.63	50.0
S1.009	S1-9	S1-10	34.163	0.600	45.545	45.461	0.084	406.7	450	10.19	50.0
S1.010	S1-10	S1-11	11.527	0.600	45.461	45.432	0.029	397.5	450	10.38	50.0
S1.011	S1-11	S1-12	78.615	0.600	45.432	45.239	0.193	407.3	450	11.69	48.4
S6.000	Blue Roof Block A	SIC6-0	9.602	0.600	57.820	47.200	10.620	0.9	150	5.01	50.0
S6.001	SIC6-0	S1-12	13.566	0.600	47.125	46.955	0.170	80.0	225	5.17	50.0
S1.012	S1-12	S1-13	29.105	0.600	45.164	45.105	0.059	493.3	525	12.18	47.4
S1.013	S1-13	S1-14	12.951	0.600	45.105	45.078	0.027	480.0	525	12.39	47.0
S7.000	S7-0	S7-1	26.200	0.600	46.200	46.069	0.131	200.0	375	5.34	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S2.000	9.814	173.4	14.4	0.250	0.550	0.106	0.0	29	5.962
S2.001	1.125	19.9	14.4	0.550	0.611	0.106	0.0	95	1.223
S1.000	1.041	114.9	5.8	0.900	0.971	0.042	0.0	57	0.551
S1.001	1.277	141.1	24.9	0.971	1.240	0.184	0.0	106	0.970
S1.002	1.277	141.1	42.1	1.240	1.272	0.310	0.0	140	1.121
S3.000	1.204	132.9	11.0	1.200	1.456	0.081	0.0	72	0.736
S1.003	1.001	159.3	71.8	1.456	1.673	0.530	0.0	211	0.976
S1.004	1.003	159.6	79.7	1.673	2.126	0.588	0.0	225	1.003
S1.005	1.003	159.6	80.7	2.126	2.176	0.595	0.0	226	1.006
S4.000	9.990	176.5	10.0	0.250	0.750	0.074	0.0	24	5.455
S4.001	1.125	19.9	10.0	0.750	0.821	0.074	0.0	75	1.126
S1.006	1.002	159.3	106.6	2.176	1.867	0.786	0.0	270	1.071
S5.000	10.843	431.1	10.0	0.175	0.350	0.074	0.0	23	4.521
S5.001	1.463	58.2	10.0	0.350	0.409	0.074	0.0	63	1.100
S1.007	1.001	159.1	117.6	1.867	2.175	0.868	0.0	289	1.091
S1.008	1.005	159.8	119.2	2.175	2.505	0.879	0.0	290	1.097
S1.009	1.002	159.3	135.0	2.505	2.889	0.996	0.0	319	1.118
S1.010	1.013	161.2	137.6	2.889	2.918	1.015	0.0	321	1.132
S1.011	1.001	159.2	133.2	2.918	2.411	1.015	0.0	316	1.115
S6.000	10.688	188.9	23.3	0.250	0.950	0.172	0.0	35	7.303
S6.001	1.463	58.2	23.3	0.950	0.920	0.172	0.0	99	1.384
S1.012	1.001	216.8	154.8	2.411	2.170	1.204	0.0	329	1.084
S1.013	1.015	219.8	154.5	2.170	2.067	1.211	0.0	325	1.096
S7.000	1.277	141.1	17.4	1.725	1.356	0.128	0.0	88	0.877

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S7.001	S7-1	S7-2	27.644	0.600	45.880	45.742	0.138	200.0	375	5.70	50.0
S7.002	S7-2	S7-3	18.617	0.600	45.742	45.649	0.093	200.0	375	5.95	50.0
S8.000	S8-0	S7-3	17.348	0.600	46.100	46.042	0.058	300.0	375	5.28	50.0
S7.003	S7-3	S7-4	19.935	0.600	45.649	45.583	0.066	300.0	375	6.26	50.0
S7.004	S7-4	S7-5	13.759	0.600	45.583	45.537	0.046	300.0	375	6.49	50.0
S7.005	S7-5	S1-14	7.956	0.600	45.250	45.223	0.027	300.0	375	6.61	50.0
S1.014	S1-14	EXT MH4	12.376	0.600	45.078	45.045	0.033	375.0	525	12.57	46.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S7.001	1.277	141.1	28.1	1.545	1.683	0.207	0.0	113	1.005
S7.002	1.277	141.1	42.0	1.683	1.776	0.310	0.0	140	1.118
S8.000	1.041	114.9	23.0	1.825	1.383	0.170	0.0	113	0.818
S7.003	1.041	114.9	71.6	1.776	1.842	0.528	0.0	215	1.096
S7.004	1.041	114.9	77.6	1.842	1.888	0.572	0.0	226	1.114
S7.005	1.041	114.9	87.4	2.175	2.072	0.645	0.0	246	1.141
S1.014	1.150	249.0	235.5	2.067	2.230	1.856	0.0	409	1.300

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S2.000	17.550	1.1	150	Circular	64.070	63.670	0.250	48.000	47.300	0.550
S2.001	4.888	80.0	150	Circular	48.000	47.300	0.550	48.000	47.239	0.611
S1.000	21.358	300.0	375	Circular	48.000	46.725	0.900	48.000	46.654	0.971
S1.001	33.827	200.0	375	Circular	48.000	46.654	0.971	48.100	46.485	1.240
S1.002	36.353	200.0	375	Circular	48.100	46.485	1.240	47.950	46.303	1.272
S3.000	23.766	225.0	375	Circular	47.800	46.225	1.200	47.950	46.119	1.456
S1.003	47.617	407.0	450	Circular	47.950	46.044	1.456	48.050	45.927	1.673
S1.004	41.739	405.2	450	Circular	48.050	45.927	1.673	48.400	45.824	2.126
S1.005	20.265	405.3	450	Circular	48.400	45.824	2.126	48.400	45.774	2.176
S4.000	17.350	1.0	150	Circular	64.670	64.270	0.250	48.400	47.500	0.750
S4.001	5.709	80.0	150	Circular	48.400	47.500	0.750	48.400	47.429	0.821
S1.006	37.014	406.7	450	Circular	48.400	45.774	2.176	48.000	45.683	1.867
S5.000	24.908	1.5	225	Circular	64.670	64.270	0.175	48.000	47.425	0.350

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S2.000	Blue Roof Block D	1200	Manhole	Adoptable	SIC2-0	450	Manhole	Adoptable
S2.001	SIC2-0	450	Manhole	Adoptable	S1-1	1350	Manhole	Adoptable
S1.000	S1-0	1350	Manhole	Adoptable	S1-1	1350	Manhole	Adoptable
S1.001	S1-1	1350	Manhole	Adoptable	S1-2	1350	Manhole	Adoptable
S1.002	S1-2	1350	Manhole	Adoptable	S1-3	1350	Manhole	Adoptable
S3.000	S3-0	1350	Manhole	Adoptable	S1-3	1350	Manhole	Adoptable
S1.003	S1-3	1350	Manhole	Adoptable	S1-4	1350	Manhole	Adoptable
S1.004	S1-4	1350	Manhole	Adoptable	S1-5	1350	Manhole	Adoptable
S1.005	S1-5	1350	Manhole	Adoptable	S1-6	1350	Manhole	Adoptable
S4.000	Blue Roof Block C	1200	Manhole	Adoptable	SIC4-0	450	Manhole	Adoptable
S4.001	SIC4-0	450	Manhole	Adoptable	S1-6	1350	Manhole	Adoptable
S1.006	S1-6	1350	Manhole	Adoptable	S1-7	1350	Manhole	Adoptable
S5.000	Blue Roof Block B	1200	Manhole	Adoptable	SIC5-0	450	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S5.001	4.689	80.0	225	Circular	48.000	47.425	0.350	48.000	47.366	0.409
S1.007	23.636	407.5	450	Circular	48.000	45.683	1.867	48.250	45.625	2.175
S1.008	32.347	404.3	450	Circular	48.250	45.625	2.175	48.500	45.545	2.505
S1.009	34.163	406.7	450	Circular	48.500	45.545	2.505	48.800	45.461	2.889
S1.010	11.527	397.5	450	Circular	48.800	45.461	2.889	48.800	45.432	2.918
S1.011	78.615	407.3	450	Circular	48.800	45.432	2.918	48.100	45.239	2.411
S6.000	9.602	0.9	150	Circular	58.220	57.820	0.250	48.300	47.200	0.950
S6.001	13.566	80.0	225	Circular	48.300	47.125	0.950	48.100	46.955	0.920
S1.012	29.105	493.3	525	Circular	48.100	45.164	2.411	47.800	45.105	2.170
S1.013	12.951	480.0	525	Circular	47.800	45.105	2.170	47.670	45.078	2.067
S7.000	26.200	200.0	375	Circular	48.300	46.200	1.725	47.800	46.069	1.356
S7.001	27.644	200.0	375	Circular	47.800	45.880	1.545	47.800	45.742	1.683
S7.002	18.617	200.0	375	Circular	47.800	45.742	1.683	47.800	45.649	1.776
S8.000	17.348	300.0	375	Circular	48.300	46.100	1.825	47.800	46.042	1.383
S7.003	19.935	300.0	375	Circular	47.800	45.649	1.776	47.800	45.583	1.842
S7.004	13.759	300.0	375	Circular	47.800	45.583	1.842	47.800	45.537	1.888
S7.005	7.956	300.0	375	Circular	47.800	45.250	2.175	47.670	45.223	2.072
S1.014	12.376	375.0	525	Circular	47.670	45.078	2.067	47.800	45.045	2.230

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S5.001	SIC5-0	450	Manhole	Adoptable	S1-7	1350	Manhole	Adoptable
S1.007	S1-7	1350	Manhole	Adoptable	S1-8	1350	Manhole	Adoptable
S1.008	S1-8	1350	Manhole	Adoptable	S1-9	1350	Manhole	Adoptable
S1.009	S1-9	1350	Manhole	Adoptable	S1-10	1350	Manhole	Adoptable
S1.010	S1-10	1350	Manhole	Adoptable	S1-11	1350	Manhole	Adoptable
S1.011	S1-11	1350	Manhole	Adoptable	S1-12	1500	Manhole	Adoptable
S6.000	Blue Roof Block A	1200	Manhole	Adoptable	SIC6-0	450	Manhole	Adoptable
S6.001	SIC6-0	450	Manhole	Adoptable	S1-12	1500	Manhole	Adoptable
S1.012	S1-12	1500	Manhole	Adoptable	S1-13	1500	Manhole	Adoptable
S1.013	S1-13	1500	Manhole	Adoptable	S1-14	1500	Manhole	Adoptable
S7.000	S7-0	1350	Manhole	Adoptable	S7-1	1350	Manhole	Adoptable
S7.001	S7-1	1350	Manhole	Adoptable	S7-2	1350	Manhole	Adoptable
S7.002	S7-2	1350	Manhole	Adoptable	S7-3	1350	Manhole	Adoptable
S8.000	S8-0	1350	Manhole	Adoptable	S7-3	1350	Manhole	Adoptable
S7.003	S7-3	1350	Manhole	Adoptable	S7-4	1350	Manhole	Adoptable
S7.004	S7-4	1350	Manhole	Adoptable	S7-5	1350	Manhole	Adoptable
S7.005	S7-5	1350	Manhole	Adoptable	S1-14	1500	Manhole	Adoptable
S1.014	S1-14	1500	Manhole	Adoptable	EXT MH4	1500	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	Scotland and Ireland	Skip Steady State	x
M5-60 (mm)	18.500	Drain Down Time (mins)	240
Ratio-R	0.277	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	20	0	0
100	20	0	0

Node S1-14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	45.078	Product Number	CTL-SHE-0152-1220-1500-1220
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.2	Min Node Diameter (mm)	1500

Node Blue Roof Block A Online Head/Flow Control

Flap Valve	x	Invert Level (m)	57.820	Design Flow (l/s)
Replaces Downstream Link	✓	Design Depth (m)	0.100	

Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.010	1.400	0.040	3.700	0.070	4.400	0.100	5.100	0.130	5.600	0.160	6.100	0.190	6.700
0.020	3.000	0.050	3.900	0.080	4.600	0.110	5.300	0.140	5.800	0.170	6.300	0.200	6.800
0.030	3.400	0.060	4.200	0.090	4.900	0.120	5.500	0.150	6.000	0.180	6.500		

Node Blue Roof Block B Online Head/Flow Control

Flap Valve	x	Invert Level (m)	64.270	Design Flow (l/s)
Replaces Downstream Link	✓	Design Depth (m)	0.100	

Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.010	0.300	0.040	0.500	0.070	0.700	0.100	0.800	0.130	0.900	0.160	1.000	0.190	1.100
0.020	0.400	0.050	0.600	0.080	0.700	0.110	0.800	0.140	0.900	0.170	1.000	0.200	1.100
0.030	0.500	0.060	0.700	0.090	0.800	0.120	0.900	0.150	1.000	0.180	1.100		

Node Blue Roof Block C Online Head/Flow Control

Flap Valve	x	Invert Level (m)	64.270	Design Flow (l/s)
Replaces Downstream Link	✓	Design Depth (m)	0.100	

Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.010	0.300	0.040	0.500	0.070	0.700	0.100	0.800	0.130	0.900	0.160	1.000	0.190	1.100
0.020	0.400	0.050	0.600	0.080	0.700	0.110	0.800	0.140	0.900	0.170	1.000	0.200	1.100
0.030	0.500	0.060	0.700	0.090	0.800	0.120	0.900	0.150	1.000	0.180	1.100		

Node Blue Roof Block D Online Head/Flow Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	63.670

Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.010	1.600	0.040	3.100	0.070	3.700	0.100	4.200	0.130	4.700	0.160	5.100	0.190	5.500
0.020	2.600	0.050	3.300	0.080	3.900	0.110	4.400	0.140	4.800	0.170	5.300	0.200	5.700
0.030	2.900	0.060	3.500	0.090	4.100	0.120	4.500	0.150	5.000	0.180	5.400		

Node S1-10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 45.461
Side Inf Coefficient (m/hr) 0.00000 | Porosity 0.95 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	600.0	0.0	1.200	600.0	0.0	1.201	0.0	0.0

Node S1-13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 45.105
Side Inf Coefficient (m/hr) 0.00000 | Porosity 0.95 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	130.0	0.0	1.200	130.0	0.0	1.201	0.0	0.0

Node Blue Roof Block A Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 57.820
Side Inf Coefficient (m/hr) 0.00000 | Porosity 0.95 | Time to half empty (mins) 144

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	571.9	0.0	0.100	571.9	0.0	0.101	0.0	0.0

Node Blue Roof Block B Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 64.270
Side Inf Coefficient (m/hr) 0.00000 | Porosity 0.95 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	547.5	0.0	0.100	547.5	0.0	0.101	0.0	0.0

Node Blue Roof Block C Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 64.270
Side Inf Coefficient (m/hr) 0.00000 | Porosity 0.95 | Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	547.5	0.0	0.100	547.5	0.0	0.101	0.0	0.0

Node Blue Roof Block D Depth/Area Storage Structure

Base Inf Coefficient (m/hr) 0.00000 | Safety Factor 2.0 | Invert Level (m) 63.670
Side Inf Coefficient (m/hr) 0.00000 | Porosity 0.95 | Time to half empty (mins) 86

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	314.3	0.0	0.100	314.3	0.0	0.101	0.0	0.0

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Blue Roof Block D	92	63.742	0.072	13.1	22.0659	0.0000	OK
120 minute winter	SIC2-0	92	47.348	0.048	3.7	0.0076	0.0000	OK
15 minute winter	S1-0	10	46.815	0.090	14.5	0.1895	0.0000	OK
15 minute winter	S1-1	13	46.783	0.129	29.1	0.2518	0.0000	OK
15 minute winter	S1-2	12	46.804	0.319	71.5	0.9567	0.0000	OK
15 minute winter	S3-0	12	46.769	0.544	27.8	1.3377	0.0000	SURCHARGED
15 minute winter	S1-3	11	46.809	0.765	149.8	2.2075	0.0000	SURCHARGED
15 minute winter	S1-4	12	46.630	0.703	148.4	1.3903	0.0000	SURCHARGED
15 minute winter	S1-5	12	46.566	0.742	147.5	1.1068	0.0000	SURCHARGED
960 minute winter	Blue Roof Block C	705	64.327	0.057	2.2	30.1793	0.0000	OK
960 minute winter	SIC4-0	705	47.519	0.019	0.7	0.0031	0.0000	OK
15 minute summer	S1-6	12	46.525	0.751	161.8	1.7467	0.0000	SURCHARGED
960 minute winter	Blue Roof Block B	705	64.327	0.057	2.2	30.1793	0.0000	OK
960 minute winter	SIC5-0	705	47.443	0.018	0.7	0.0028	0.0000	OK
15 minute summer	S1-7	11	46.482	0.799	172.7	1.1964	0.0000	SURCHARGED
15 minute winter	S1-8	10	46.447	0.822	183.9	1.2510	0.0000	SURCHARGED
15 minute winter	S1-9	10	46.303	0.758	210.7	1.6835	0.0000	SURCHARGED
720 minute winter	S1-10	690	46.302	0.841	35.3	480.4960	0.0000	SURCHARGED
720 minute winter	S1-11	690	46.302	0.870	11.5	1.2444	0.0000	SURCHARGED
180 minute winter	Blue Roof Block A	136	57.895	0.075	16.1	41.7389	0.0000	OK
180 minute winter	SIC6-0	136	47.169	0.044	4.5	0.0069	0.0000	OK
720 minute winter	S1-12	690	46.301	1.137	13.1	2.1405	0.0000	SURCHARGED
720 minute winter	S1-13	690	46.301	1.196	11.9	149.9151	0.0000	SURCHARGED
15 minute winter	S7-0	10	46.350	0.150	44.0	0.3970	0.0000	OK
15 minute winter	S7-1	11	46.345	0.465	71.4	1.0484	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	Blue Roof Block D	Head/Flow	SIC2-0	3.7				
120 minute winter	SIC2-0	S2.001	S1-1	3.7	0.824	0.189	0.0222	
15 minute winter	S1-0	S1.000	S1-1	14.3	0.596	0.124	0.5340	
15 minute winter	S1-1	S1.001	S1-2	34.9	0.686	0.247	2.2197	
15 minute winter	S1-2	S1.002	S1-3	68.0	1.237	0.482	3.8221	
15 minute winter	S3-0	S3.000	S1-3	49.1	0.625	0.370	2.6213	
15 minute winter	S1-3	S1.003	S1-4	133.2	0.993	0.837	7.5446	
15 minute winter	S1-4	S1.004	S1-5	146.4	0.971	0.917	6.6133	
15 minute winter	S1-5	S1.005	S1-6	151.0	0.953	0.946	3.2109	
960 minute winter	Blue Roof Block C	Head/Flow	SIC4-0	0.7				
960 minute winter	SIC4-0	S4.001	S1-6	0.7	0.514	0.034	0.0075	
15 minute summer	S1-6	S1.006	S1-7	170.4	1.075	1.069	5.8646	
960 minute winter	Blue Roof Block B	Head/Flow	SIC5-0	0.7				
960 minute winter	SIC5-0	S5.001	S1-7	0.7	0.486	0.012	0.0065	
15 minute summer	S1-7	S1.007	S1-8	168.4	1.066	1.058	3.7450	
15 minute winter	S1-8	S1.008	S1-9	187.8	1.207	1.176	5.1252	
15 minute winter	S1-9	S1.009	S1-10	222.2	2.400	1.395	3.0139	
720 minute winter	S1-10	S1.010	S1-11	11.5	0.570	0.071	1.8264	
720 minute winter	S1-11	S1.011	S1-12	10.8	0.493	0.068	12.4560	
180 minute winter	Blue Roof Block A	Head/Flow	SIC6-0	4.5				
180 minute winter	SIC6-0	S6.001	S1-12	4.5	0.859	0.078	0.0712	
720 minute winter	S1-12	S1.012	S1-13	11.1	0.284	0.051	6.2876	
720 minute winter	S1-13	S1.013	S1-14	10.7	-0.247	0.049	2.7978	
15 minute winter	S7-0	S7.000	S7-1	44.4	1.061	0.315	1.6613	
15 minute winter	S7-1	S7.001	S7-2	66.8	0.819	0.474	3.0491	

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S7-2	11	46.308	0.566	97.8	1.3735	0.0000	SURCHARGED
720 minute winter	S8-0	690	46.301	0.201	6.2	0.5985	0.0000	OK
720 minute winter	S7-3	690	46.302	0.653	18.9	1.2322	0.0000	SURCHARGED
720 minute winter	S7-4	690	46.301	0.718	20.2	1.3140	0.0000	SURCHARGED
720 minute winter	S7-5	690	46.302	1.052	22.5	2.1053	0.0000	SURCHARGED
720 minute winter	S1-14	690	46.301	1.223	22.3	2.1610	0.0000	SURCHARGED
30 minute winter	EXT MH4	20	45.116	0.071	12.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S7-2	S7.002	S7-3	97.8	0.887	0.693	2.0534	
720 minute winter	S8-0	S8.000	S7-3	6.2	0.579	0.054	1.2288	
720 minute winter	S7-3	S7.003	S7-4	18.6	0.660	0.162	2.1988	
720 minute winter	S7-4	S7.004	S7-5	19.8	0.737	0.172	1.5176	
720 minute winter	S7-5	S7.005	S1-14	22.3	0.532	0.194	0.8775	
720 minute winter	S1-14	S1.014	EXT MH4	12.2	0.633	0.049	0.2385	539.3

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Blue Roof Block D	94	63.768	0.098	16.8	29.9980	0.0000	OK
120 minute winter	SIC2-0	94	47.351	0.051	4.2	0.0080	0.0000	OK
15 minute winter	S1-0	12	47.259	0.534	83.1	1.1204	0.0000	SURCHARGED
15 minute winter	S1-1	13	47.204	0.550	40.3	1.0748	0.0000	SURCHARGED
15 minute winter	S1-2	12	47.267	0.782	92.6	2.3442	0.0000	SURCHARGED
15 minute winter	S3-0	12	47.194	0.969	36.1	2.3847	0.0000	SURCHARGED
15 minute winter	S1-3	12	47.184	1.140	157.8	3.2892	0.0000	SURCHARGED
15 minute winter	S1-4	12	47.035	1.108	170.5	2.1913	0.0000	SURCHARGED
15 minute winter	S1-5	12	46.872	1.048	169.7	1.5627	0.0000	SURCHARGED
720 minute winter	Blue Roof Block C	570	64.344	0.074	3.3	38.7111	0.0000	OK
180 minute winter	SIC4-0	144	47.520	0.020	0.7	0.0032	0.0000	OK
15 minute winter	S1-6	11	46.809	1.035	207.3	2.4059	0.0000	SURCHARGED
720 minute winter	Blue Roof Block B	570	64.344	0.074	3.3	38.7111	0.0000	OK
180 minute winter	SIC5-0	144	47.443	0.018	0.7	0.0028	0.0000	OK
960 minute winter	S1-7	900	46.652	0.969	25.3	1.4512	0.0000	SURCHARGED
960 minute winter	S1-8	900	46.652	1.027	24.8	1.5615	0.0000	SURCHARGED
960 minute winter	S1-9	900	46.652	1.107	28.3	2.4587	0.0000	SURCHARGED
960 minute winter	S1-10	900	46.651	1.190	36.6	680.3342	0.0000	SURCHARGED
960 minute winter	S1-11	900	46.651	1.219	11.3	1.7447	0.0000	SURCHARGED
180 minute winter	Blue Roof Block A	136	57.948	0.128	20.5	55.8420	0.0000	OK
180 minute winter	SIC6-0	136	47.173	0.048	5.6	0.0077	0.0000	OK
960 minute winter	S1-12	900	46.651	1.487	12.4	2.7986	0.0000	SURCHARGED
960 minute winter	S1-13	885	46.650	1.545	12.1	151.0820	0.0000	SURCHARGED
15 minute winter	S7-0	11	46.654	0.454	57.2	1.2056	0.0000	SURCHARGED
960 minute winter	S7-1	900	46.651	0.771	7.7	1.7371	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	Blue Roof Block D	Head/Flow	SIC2-0	4.2				
120 minute winter	SIC2-0	S2.001	S1-1	4.2	0.847	0.211	0.0241	
15 minute winter	S1-0	S1.000	S1-1	-65.3	-0.644	-0.568	2.3557	
15 minute winter	S1-1	S1.001	S1-2	52.4	0.744	0.372	3.7310	
15 minute winter	S1-2	S1.002	S1-3	104.4	1.255	0.740	4.0096	
15 minute winter	S3-0	S3.000	S1-3	65.0	0.622	0.489	2.6213	
15 minute winter	S1-3	S1.003	S1-4	150.3	1.009	0.944	7.5446	
15 minute winter	S1-4	S1.004	S1-5	167.7	1.059	1.051	6.6133	
15 minute winter	S1-5	S1.005	S1-6	174.3	1.100	1.092	3.2109	
720 minute winter	Blue Roof Block C	Head/Flow	SIC4-0	0.7				
180 minute winter	SIC4-0	S4.001	S1-6	0.7	0.520	0.035	0.0077	
15 minute winter	S1-6	S1.006	S1-7	212.5	1.341	1.334	5.8646	
720 minute winter	Blue Roof Block B	Head/Flow	SIC5-0	0.7				
180 minute winter	SIC5-0	S5.001	S1-7	0.7	0.491	0.012	0.0067	
960 minute winter	S1-7	S1.007	S1-8	24.4	0.682	0.153	3.7450	
960 minute winter	S1-8	S1.008	S1-9	24.0	0.633	0.150	5.1252	
960 minute winter	S1-9	S1.009	S1-10	28.1	0.786	0.176	5.4129	
960 minute winter	S1-10	S1.010	S1-11	11.3	0.560	0.070	1.8264	
960 minute winter	S1-11	S1.011	S1-12	11.3	0.492	0.071	12.4560	
180 minute winter	Blue Roof Block A	Head/Flow	SIC6-0	5.6				
180 minute winter	SIC6-0	S6.001	S1-12	5.6	0.912	0.096	0.0829	
960 minute winter	S1-12	S1.012	S1-13	12.0	0.198	0.055	6.2876	
960 minute winter	S1-13	S1.013	S1-14	12.4	-0.225	0.057	2.7978	
15 minute winter	S7-0	S7.000	S7-1	54.6	1.062	0.387	2.8898	
960 minute winter	S7-1	S7.001	S7-2	7.6	0.583	0.054	3.0491	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	S7-2	900	46.651	0.909	11.3	2.2053	0.0000	SURCHARGED
960 minute winter	S8-0	900	46.651	0.551	6.3	1.6380	0.0000	SURCHARGED
960 minute winter	S7-3	900	46.651	1.002	18.6	1.8921	0.0000	SURCHARGED
960 minute winter	S7-4	900	46.652	1.069	19.8	1.9543	0.0000	SURCHARGED
960 minute winter	S7-5	885	46.650	1.400	22.4	2.8035	0.0000	SURCHARGED
960 minute winter	S1-14	900	46.651	1.573	22.2	2.7804	0.0000	SURCHARGED
15 minute summer	EXT MH4	217	45.116	0.071	12.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	S7-2	S7.002	S7-3	10.6	0.536	0.075	2.0534	
960 minute winter	S8-0	S8.000	S7-3	6.3	0.581	0.055	1.9134	
960 minute winter	S7-3	S7.003	S7-4	18.2	0.636	0.158	2.1988	
960 minute winter	S7-4	S7.004	S7-5	19.7	0.697	0.171	1.5176	
960 minute winter	S7-5	S7.005	S1-14	22.2	0.520	0.193	0.8775	
960 minute winter	S1-14	S1.014	EXT MH4	12.2	0.633	0.049	0.2385	735.1

b. Causeway Basement Surface Water Drainage Design Calculations (Basement Drainage)

Design Settings

Frequency of use (kDU)	0.00	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	4000	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.200
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	0.600
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
F20-0	45.200	1 STANDARD	713391.957	729770.168	0.750
F21-0	45.200	1 STANDARD	713357.876	729768.119	0.750
F21-1	45.200	1 STANDARD	713361.230	729758.939	0.848
F20-1	45.200	1 STANDARD	713368.330	729761.534	1.002
F22-0	45.200	1 STANDARD	713326.403	729766.314	0.750
F22-1	45.200	1 STANDARD	713343.729	729772.478	0.934
F23-0	45.200	1 STANDARD	713379.130	729785.408	0.750
F20-2	45.200	1 STANDARD	713361.905	729779.117	1.189
F24-0	45.200	1 STANDARD	713376.623	729802.038	0.750
F20-3	45.200	1 STANDARD	713356.242	729794.585	1.354
F20-4 (Petrol Interceptor)	45.200	1 STANDARD	713325.991	729783.530	1.676
F20-5 (Pumping Station)	45.200	1 STANDARD	713323.951	729782.785	1.698

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
F20.000	F20-0	F20-1	25.155	1.500	44.450	44.198	0.252	100.0	150
F21.000	F21-0	F21-1	9.774	1.500	44.450	44.352	0.098	100.0	150
F21.001	F21-1	F20-1	7.559	1.500	44.352	44.276	0.076	100.0	150
F20.001	F20-1	F20-2	18.720	1.500	44.198	44.011	0.187	100.0	150
F22.000	F22-0	F22-1	18.390	1.500	44.450	44.266	0.184	100.0	150
F22.001	F22-1	F20-2	19.351	1.500	44.266	44.072	0.194	100.0	150
F23.000	F23-0	F20-2	18.338	1.500	44.450	44.267	0.183	100.0	150
F20.002	F20-2	F20-3	16.472	1.500	44.011	43.846	0.165	100.0	150
F24.000	F24-0	F20-3	21.701	1.500	44.450	44.233	0.217	100.0	150
F20.003	F20-3	F20-4 (Petrol Interceptor)	32.208	1.500	43.846	43.524	0.322	100.0	150
F20.004	F20-4 (Petrol Interceptor)	F20-5 (Pumping Station)	2.172	1.500	43.524	43.502	0.022	100.0	150

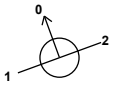
Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
F20.000	0.000	0.876	15.5	0.0	0.600	0.852	0.000	0	0.0	0.0	0	0.000
F21.000	0.000	0.876	15.5	0.0	0.600	0.698	0.000	0	0.0	0.0	0	0.000
F21.001	0.000	0.876	15.5	0.0	0.698	0.774	0.000	0	0.0	0.0	0	0.000
F20.001	0.000	0.876	15.5	0.0	0.852	1.039	0.000	0	0.0	0.0	0	0.000
F22.000	0.000	0.876	15.5	0.0	0.600	0.784	0.000	0	0.0	0.0	0	0.000
F22.001	0.000	0.876	15.5	0.0	0.784	0.978	0.000	0	0.0	0.0	0	0.000
F23.000	0.000	0.876	15.5	0.0	0.600	0.783	0.000	0	0.0	0.0	0	0.000
F20.002	0.000	0.876	15.5	0.0	1.039	1.204	0.000	0	0.0	0.0	0	0.000
F24.000	0.000	0.876	15.5	0.0	0.600	0.817	0.000	0	0.0	0.0	0	0.000
F20.003	0.000	0.876	15.5	0.0	1.204	1.526	0.000	0	0.0	0.0	0	0.000
F20.004	0.000	0.876	15.5	0.0	1.526	1.548	0.000	0	0.0	0.0	0	0.000

Pipeline Schedule

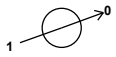
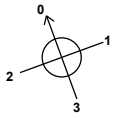
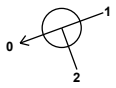
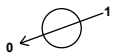
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
F20.000	25.155	100.0	150	1 STANDARD	45.200	44.450	0.600	45.200	44.198	0.852
F21.000	9.774	100.0	150	1 STANDARD	45.200	44.450	0.600	45.200	44.352	0.698
F21.001	7.559	100.0	150	1 STANDARD	45.200	44.352	0.698	45.200	44.276	0.774
F20.001	18.720	100.0	150	1 STANDARD	45.200	44.198	0.852	45.200	44.011	1.039
F22.000	18.390	100.0	150	1 STANDARD	45.200	44.450	0.600	45.200	44.266	0.784
F22.001	19.351	100.0	150	1 STANDARD	45.200	44.266	0.784	45.200	44.072	0.978
F23.000	18.338	100.0	150	1 STANDARD	45.200	44.450	0.600	45.200	44.267	0.783
F20.002	16.472	100.0	150	1 STANDARD	45.200	44.011	1.039	45.200	43.846	1.204
F24.000	21.701	100.0	150	1 STANDARD	45.200	44.450	0.600	45.200	44.233	0.817
F20.003	32.208	100.0	150	1 STANDARD	45.200	43.846	1.204	45.200	43.524	1.526
F20.004	2.172	100.0	150	1 STANDARD	45.200	43.524	1.526	45.200	43.502	1.548

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
F20.000	F20-0	1200	Manhole	1 STANDARD	F20-1	1200	Manhole	1 STANDARD
F21.000	F21-0	1200	Manhole	1 STANDARD	F21-1	1200	Manhole	1 STANDARD
F21.001	F21-1	1200	Manhole	1 STANDARD	F20-1	1200	Manhole	1 STANDARD
F20.001	F20-1	1200	Manhole	1 STANDARD	F20-2	1200	Manhole	1 STANDARD
F22.000	F22-0	1200	Manhole	1 STANDARD	F22-1	1200	Manhole	1 STANDARD
F22.001	F22-1	1200	Manhole	1 STANDARD	F20-2	1200	Manhole	1 STANDARD
F23.000	F23-0	1200	Manhole	1 STANDARD	F20-2	1200	Manhole	1 STANDARD
F20.002	F20-2	1200	Manhole	1 STANDARD	F20-3	1200	Manhole	1 STANDARD
F24.000	F24-0	1200	Manhole	1 STANDARD	F20-3	1200	Manhole	1 STANDARD
F20.003	F20-3	1200	Manhole	1 STANDARD	F20-4 (Petrol Interceptor)	1350	Manhole	1 STANDARD
F20.004	F20-4 (Petrol Interceptor)	1350	Manhole	1 STANDARD	F20-5 (Pumping Station)	1350	Manhole	1 STANDARD

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
F20-0	713391.957	729770.168	45.200	0.750	1200	 0	F20.000	44.450	150
F21-0	713357.876	729768.119	45.200	0.750	1200	 0	F21.000	44.450	150
F21-1	713361.230	729758.939	45.200	0.848	1200	 1	F21.000	44.352	150
						0	F21.001	44.352	150
F20-1	713368.330	729761.534	45.200	1.002	1200	 1	F21.001	44.276	150
						2	F20.000	44.198	150
						0	F20.001	44.198	150
F22-0	713326.403	729766.314	45.200	0.750	1200	 0	F22.000	44.450	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
F22-1	713343.729	729772.478	45.200	0.934	1200	1	F22.000	44.266	150
									
						0	F22.001	44.266	150
F23-0	713379.130	729785.408	45.200	0.750	1200				
									
						0	F23.000	44.450	150
F20-2	713361.905	729779.117	45.200	1.189	1200		F23.000	44.267	150
						1	F22.001	44.072	150
						2	F20.001	44.011	150
						3	F20.002	44.011	150
						0			
F24-0	713376.623	729802.038	45.200	0.750	1200				
									
						0	F24.000	44.450	150
F20-3	713356.242	729794.585	45.200	1.354	1200	1	F24.000	44.233	150
						2	F20.002	43.846	150
									
						0	F20.003	43.846	150
F20-4 (Petrol Interceptor)	713325.991	729783.530	45.200	1.676	1350	1	F20.003	43.524	150
									
						0	F20.004	43.524	150
F20-5 (Pumping Station)	713323.951	729782.785	45.200	1.698	1350	1	F20.004	43.502	150
									

Simulation Settings

Analysis Speed	Normal	Drain Down Time (mins)	240
Skip Steady State	x	Foul Event Duration (mins)	

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Appendix G Causeway Foul Water Drainage Design Calculation

Design Settings

Frequency of use (kDU)	0.00	Minimum Velocity (m/s)	1.00
Flow per dwelling per day (l/day)	446	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.200
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	0.750
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Dwellings	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
F1-0	20	48.400	Adoptable	713416.245	729766.199	0.725
F1-1		48.250	Adoptable	713409.538	729754.226	0.804
F1-2		48.200	Adoptable	713400.948	729746.037	0.833
F1-3	38	48.000	Adoptable	713367.354	729734.320	0.870
F1-4		48.250	Adoptable	713371.228	729721.627	1.186
F1-5		48.000	Adoptable	713359.924	729713.895	1.004
F1-6		48.400	Adoptable	713341.881	729716.969	1.496
F1-7		48.800	Adoptable	713314.643	729707.015	2.041
F1-8	18	48.300	Adoptable	713299.773	729734.336	1.697
F1-9		48.300	Adoptable	713283.123	729768.541	1.887
F1-10	26	48.000	Adoptable	713284.588	729776.099	1.625
F1-11	20	48.000	Adoptable	713274.403	729806.374	1.785
F2-0	41	48.000	Adoptable	713436.018	729816.980	0.775
F2-1	25	48.100	Adoptable	713417.554	729867.577	1.144
F3-0	19	48.200	Adoptable	713403.294	729787.375	0.775
F2-2	39	47.950	Adoptable	713379.116	729853.529	1.199
F4-0	33	48.300	Adoptable	713354.512	729807.721	1.300
F2-3	5	47.800	Adoptable	713342.643	729840.196	1.243
F5-0		48.300	Adoptable	713304.299	729800.963	1.550
F2-4	6	47.800	Adoptable	713295.949	729823.116	1.492
F2-5	2	47.800	Adoptable	713281.244	729817.751	1.570
F1-12	3	47.800	Adoptable	713260.160	729816.938	1.675
F1-13_OUT		47.690	Adoptable	713246.424	729810.905	1.640

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
F1.000	F1-0	F1-1	13.724	1.500	47.675	47.446	0.229	60.0	225
F1.001	F1-1	F1-2	11.868	1.500	47.446	47.367	0.079	150.2	225
F1.002	F1-2	F1-3	35.579	1.500	47.367	47.130	0.237	150.1	225
F1.003	F1-3	F1-4	13.271	1.500	47.130	47.064	0.066	201.1	225
F1.004	F1-4	F1-5	13.695	1.500	47.064	46.996	0.068	200.0	225
F1.005	F1-5	F1-6	18.303	1.500	46.996	46.904	0.092	200.0	225

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
F1.000	0.188	1.483	59.0	0.1	0.500	0.579	0.000	20	0.0	0.0	7	0.265
F1.001	0.134	0.935	37.2	0.1	0.579	0.608	0.000	20	0.0	0.0	9	0.194
F1.002	0.134	0.936	37.2	0.1	0.608	0.645	0.000	20	0.0	0.0	9	0.194
F1.003	0.168	0.810	32.2	0.3	0.645	0.961	0.000	58	0.0	0.0	15	0.243
F1.004	0.168	0.810	32.2	0.3	0.961	0.779	0.000	58	0.0	0.0	15	0.243
F1.005	0.168	0.810	32.2	0.3	0.779	1.271	0.000	58	0.0	0.0	15	0.243

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
F1.006	F1-6	F1-7	29.000	1.500	46.904	46.759	0.145	200.0	225
F1.007	F1-7	F1-8	31.106	1.500	46.759	46.603	0.156	200.0	225
F1.008	F1-8	F1-9	38.042	1.500	46.603	46.413	0.190	200.0	225
F1.009	F1-9	F1-10	7.699	1.500	46.413	46.375	0.038	200.0	225
F1.010	F1-10	F1-11	31.942	1.500	46.375	46.215	0.160	200.0	225
F1.011	F1-11	F1-12	17.733	1.500	46.215	46.126	0.089	200.0	225
F2.000	F2-0	F2-1	53.862	1.500	47.225	46.956	0.269	200.0	225
F2.001	F2-1	F2-2	40.925	1.500	46.956	46.751	0.205	200.0	225
F3.000	F3-0	F2-2	70.434	1.500	47.425	46.955	0.470	150.0	225
F2.002	F2-2	F2-3	38.834	1.500	46.751	46.557	0.194	200.0	225
F4.000	F4-0	F2-3	34.576	1.500	47.000	46.769	0.231	150.0	225
F2.003	F2-3	F2-4	49.720	1.500	46.557	46.308	0.249	200.0	225
F5.000	F5-0	F2-4	23.674	1.500	46.750	46.592	0.158	150.0	225
F2.004	F2-4	F2-5	15.653	1.500	46.308	46.230	0.078	200.0	225
F2.005	F2-5	F1-12	21.100	1.500	46.230	46.125	0.105	200.0	225
F1.012	F1-12	F1-13_OUT	15.005	1.500	46.125	46.050	0.075	200.0	225

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
F1.006	0.168	0.810	32.2	0.3	1.271	1.816	0.000	58	0.0	0.0	15	0.243
F1.007	0.168	0.810	32.2	0.3	1.816	1.472	0.000	58	0.0	0.0	15	0.243
F1.008	0.191	0.810	32.2	0.4	1.472	1.662	0.000	76	0.0	0.0	18	0.272
F1.009	0.191	0.810	32.2	0.4	1.662	1.400	0.000	76	0.0	0.0	18	0.272
F1.010	0.202	0.810	32.2	0.5	1.400	1.560	0.000	102	0.0	0.0	21	0.299
F1.011	0.223	0.810	32.2	0.6	1.560	1.449	0.000	122	0.0	0.0	22	0.316
F2.000	0.155	0.810	32.2	0.2	0.550	0.919	0.000	41	0.0	0.0	14	0.223
F2.001	0.179	0.810	32.2	0.3	0.919	0.974	0.000	66	0.0	0.0	16	0.253
F3.000	0.134	0.936	37.2	0.1	0.550	0.770	0.000	19	0.0	0.0	9	0.194
F2.002	0.223	0.810	32.2	0.6	0.974	1.018	0.000	124	0.0	0.0	22	0.316
F4.000	0.150	0.936	37.2	0.2	1.075	0.806	0.000	33	0.0	0.0	11	0.221
F2.003	0.243	0.810	32.2	0.8	1.018	1.267	0.000	162	0.0	0.0	25	0.340
F5.000	0.000	0.936	37.2	0.0	1.325	0.983	0.000	0	0.0	0.0	0	0.000
F2.004	0.243	0.810	32.2	0.9	1.267	1.345	0.000	168	0.0	0.0	26	0.348
F2.005	0.243	0.810	32.2	0.9	1.345	1.450	0.000	170	0.0	0.0	26	0.348
F1.012	0.290	0.810	32.2	1.5	1.450	1.415	0.000	295	0.0	0.0	34	0.415

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
F1.000	13.724	60.0	225	Circular	48.400	47.675	0.500	48.250	47.446	0.579
F1.001	11.868	150.2	225	Circular	48.250	47.446	0.579	48.200	47.367	0.608
F1.002	35.579	150.1	225	Circular	48.200	47.367	0.608	48.000	47.130	0.645
F1.003	13.271	201.1	225	Circular	48.000	47.130	0.645	48.250	47.064	0.961

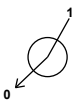
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
F1.000	F1-0	1200	Manhole	Adoptable	F1-1	1200	Manhole	Adoptable
F1.001	F1-1	1200	Manhole	Adoptable	F1-2	1200	Manhole	Adoptable
F1.002	F1-2	1200	Manhole	Adoptable	F1-3	1200	Manhole	Adoptable
F1.003	F1-3	1200	Manhole	Adoptable	F1-4	1200	Manhole	Adoptable

Pipeline Schedule

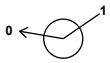
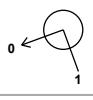
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
F1.004	13.695	200.0	225	Circular	48.250	47.064	0.961	48.000	46.996	0.779
F1.005	18.303	200.0	225	Circular	48.000	46.996	0.779	48.400	46.904	1.271
F1.006	29.000	200.0	225	Circular	48.400	46.904	1.271	48.800	46.759	1.816
F1.007	31.106	200.0	225	Circular	48.800	46.759	1.816	48.300	46.603	1.472
F1.008	38.042	200.0	225	Circular	48.300	46.603	1.472	48.300	46.413	1.662
F1.009	7.699	200.0	225	Circular	48.300	46.413	1.662	48.000	46.375	1.400
F1.010	31.942	200.0	225	Circular	48.000	46.375	1.400	48.000	46.215	1.560
F1.011	17.733	200.0	225	Circular	48.000	46.215	1.560	47.800	46.126	1.449
F2.000	53.862	200.0	225	Circular	48.000	47.225	0.550	48.100	46.956	0.919
F2.001	40.925	200.0	225	Circular	48.100	46.956	0.919	47.950	46.751	0.974
F3.000	70.434	150.0	225	Circular	48.200	47.425	0.550	47.950	46.955	0.770
F2.002	38.834	200.0	225	Circular	47.950	46.751	0.974	47.800	46.557	1.018
F4.000	34.576	150.0	225	Circular	48.300	47.000	1.075	47.800	46.769	0.806
F2.003	49.720	200.0	225	Circular	47.800	46.557	1.018	47.800	46.308	1.267
F5.000	23.674	150.0	225	Circular	48.300	46.750	1.325	47.800	46.592	0.983
F2.004	15.653	200.0	225	Circular	47.800	46.308	1.267	47.800	46.230	1.345
F2.005	21.100	200.0	225	Circular	47.800	46.230	1.345	47.800	46.125	1.450
F1.012	15.005	200.0	225	Circular	47.800	46.125	1.450	47.690	46.050	1.415

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
F1.004	F1-4	1200	Manhole	Adoptable	F1-5	1200	Manhole	Adoptable
F1.005	F1-5	1200	Manhole	Adoptable	F1-6	1200	Manhole	Adoptable
F1.006	F1-6	1200	Manhole	Adoptable	F1-7	1200	Manhole	Adoptable
F1.007	F1-7	1200	Manhole	Adoptable	F1-8	1200	Manhole	Adoptable
F1.008	F1-8	1200	Manhole	Adoptable	F1-9	1200	Manhole	Adoptable
F1.009	F1-9	1200	Manhole	Adoptable	F1-10	1200	Manhole	Adoptable
F1.010	F1-10	1200	Manhole	Adoptable	F1-11	1200	Manhole	Adoptable
F1.011	F1-11	1200	Manhole	Adoptable	F1-12	1200	Manhole	Adoptable
F2.000	F2-0	1200	Manhole	Adoptable	F2-1	1200	Manhole	Adoptable
F2.001	F2-1	1200	Manhole	Adoptable	F2-2	1200	Manhole	Adoptable
F3.000	F3-0	1200	Manhole	Adoptable	F2-2	1200	Manhole	Adoptable
F2.002	F2-2	1200	Manhole	Adoptable	F2-3	1200	Manhole	Adoptable
F4.000	F4-0	1200	Manhole	Adoptable	F2-3	1200	Manhole	Adoptable
F2.003	F2-3	1200	Manhole	Adoptable	F2-4	1200	Manhole	Adoptable
F5.000	F5-0	1200	Manhole	Adoptable	F2-4	1200	Manhole	Adoptable
F2.004	F2-4	1200	Manhole	Adoptable	F2-5	1200	Manhole	Adoptable
F2.005	F2-5	1200	Manhole	Adoptable	F1-12	1200	Manhole	Adoptable
F1.012	F1-12	1200	Manhole	Adoptable	F1-13_OUT	1200	Manhole	Adoptable

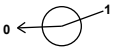
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
F1-0	713416.245	729766.199	48.400	0.725	1200	 0	F1.000	47.675	225
F1-1	713409.538	729754.226	48.250	0.804	1200	1	F1.000	47.446	225
						 0	F1.001	47.446	225

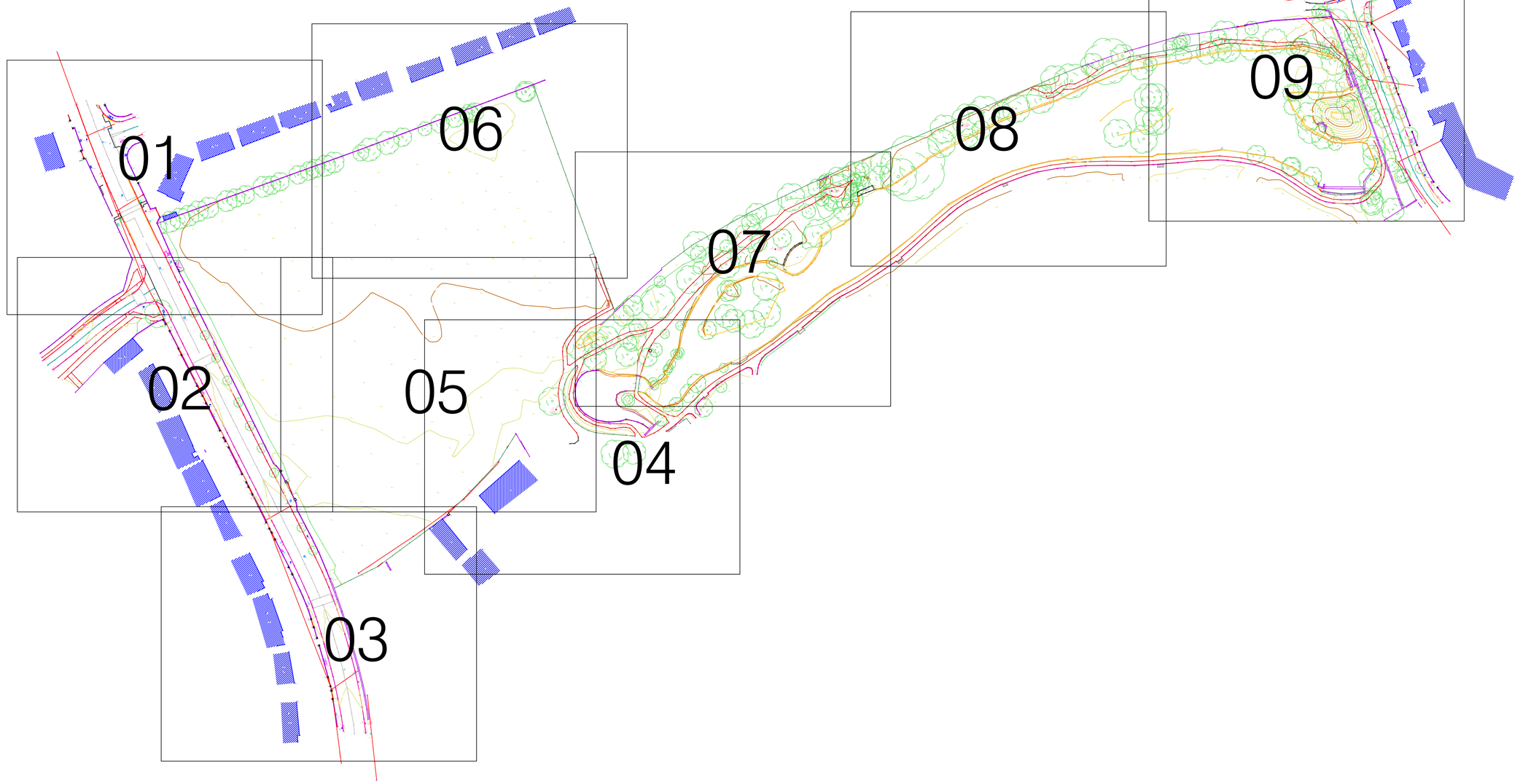
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
F1-2	713400.948	729746.037	48.200	0.833	1200		1	F1.001	47.367	225
							0	F1.002	47.367	225
F1-3	713367.354	729734.320	48.000	0.870	1200		1	F1.002	47.130	225
							0	F1.003	47.130	225
F1-4	713371.228	729721.627	48.250	1.186	1200		1	F1.003	47.064	225
							0	F1.004	47.064	225
F1-5	713359.924	729713.895	48.000	1.004	1200		1	F1.004	46.996	225
							0	F1.005	46.996	225
F1-6	713341.881	729716.969	48.400	1.496	1200		1	F1.005	46.904	225
							0	F1.006	46.904	225
F1-7	713314.643	729707.015	48.800	2.041	1200		1	F1.006	46.759	225
							0	F1.007	46.759	225
F1-8	713299.773	729734.336	48.300	1.697	1200		1	F1.007	46.603	225
							0	F1.008	46.603	225
F1-9	713283.123	729768.541	48.300	1.887	1200		1	F1.008	46.413	225
							0	F1.009	46.413	225
F1-10	713284.588	729776.099	48.000	1.625	1200		1	F1.009	46.375	225
							0	F1.010	46.375	225
F1-11	713274.403	729806.374	48.000	1.785	1200		1	F1.010	46.215	225
							0	F1.011	46.215	225
F2-0	713436.018	729816.980	48.000	0.775	1200		0	F2.000	47.225	225
F2-1	713417.554	729867.577	48.100	1.144	1200		1	F2.000	46.956	225
							0	F2.001	46.956	225
F3-0	713403.294	729787.375	48.200	0.775	1200		0	F3.000	47.425	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
F2-2	713379.116	729853.529	47.950	1.199	1200	1	F3.000	46.955	225
						 2	F2.001	46.751	225
						0	F2.002	46.751	225
F4-0	713354.512	729807.721	48.300	1.300	1200				
						0	F4.000	47.000	225
F2-3	713342.643	729840.196	47.800	1.243	1200	1	F4.000	46.769	225
						 2	F2.002	46.557	225
						0	F2.003	46.557	225
F5-0	713304.299	729800.963	48.300	1.550	1200				
						0	F5.000	46.750	225
F2-4	713295.949	729823.116	47.800	1.492	1200	1	F5.000	46.592	225
						 2	F2.003	46.308	225
						0	F2.004	46.308	225
F2-5	713281.244	729817.751	47.800	1.570	1200	1	F2.004	46.230	225
									
						0	F2.005	46.230	225
F1-12	713260.160	729816.938	47.800	1.675	1200	1	F2.005	46.125	225
						 2	F1.011	46.126	225
						0	F1.012	46.125	225
F1-13_OUT	713246.424	729810.905	47.690	1.640	1200	1	F1.012	46.050	225
									

Appendix H Murphy Geospatial Topographic Survey



LEGEND

Street furniture & Services

Over Head Wires (LUAS) - Pylon ESB
Flowerbed
Pipe
Lift
Barrier
Pump
Trial Pit
Bus/Tram Shelter
Postbox
Valve - General
Water Valve
Gas Valve
Sluice Valve
Air Valve
Stop Cock
C P Post
Marker Post
Traffic light
Parking Meter
Plane Aerial Mark
Smart Card Validator
Unknown Valve
Bus Stop
Bollard
Beacon
Coalhole Cover
Bore Hole
Electricity Pole
Telegraph pole
OCS Pole
CCTV Camera Pole
Lamp Post
Foul Manhole
Surface Water MH
Manholes
Air Conditioning Vents
Services Inspection Cover
Traffic Inspection Cover
Cable TV Inspection Cover
ESAT Inspection Cover
NTL Inspection Cover
Eircom Inspection Cover
Rodding Eye
Road Sign
Bench Seat
Kiosk
Gully
Coalhole Cover
Bore Hole
Electricity Pole
Telegraph pole
OCS Pole
CCTV Camera Pole
Lamp Post
Foul Manhole
Surface Water MH
Manholes
Air Conditioning Vents
Services Inspection Cover
Traffic Inspection Cover
Cable TV Inspection Cover
ESAT Inspection Cover
NTL Inspection Cover
Eircom Inspection Cover
Rodding Eye
Phone Box
Duct
Gas Cover
C P Box
U/G Car Park Vent
Waste Bin
Hydrant
Fire Hydrant
ESB Box
ESB Inspection Cover
Traffic Control Box
LUAS Technical Cubicle
Ticket Vending Machine
Water Meter Cover
Telecom Inspection Cover
Monument / Toilets
Tank Storage
Basement: MH, Cover & Pipe
Disfned Aerial Mark
Stay for pole
Pipe Protection
Washout

Natural Features

Surface Change
Land Drain
Bottom of Slope
Top of Slope
Ditch
Water Edge / Lake / Pond
Hedge / Trees Drip Line / Vegetation
Tree Coniferous
Tree Deciduous
Water Level
Crown Level
Invert level
Bed Level
Spotheight
Top of Tree

Golf

Fair Way
Green
Tee Box

Other

Survey Station
Photo point

Built Features

Roads & Road Markings

Building
Edge of Road
Kerb Bottom
Kerb Top
Bridge Abutment
Bridge Deck
Bridge Parapet
Bridge Façade
Footpath / Platform Train & Tram
Damp Proof Course / Verge
Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
Cycleway / Private Landing Area
Fence
Gate
Road Centreline
Top of Wall
Hoarding
Property Line
Road Scar
Top of Fence
Floor Level
Apex Height
Eaves Height
Parapet Height
Soffit Elevation
Step Level
Concrete Pad
Track
Wall / Retaining Wall
Railway / Tram Rail / Grating / Ramp
Building Canopy / Roof / Overhang

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North

Site Location

Map Sheet Layout:

Surveyed by :	MGS	Date: February 2022	Datum: Malin Head
Drawn by :	JF	Date: February 2022	Grid System:
Checked by :	PK	Date: 28/02/2022	Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	28/02/2022	First Drawing.

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Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping, Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography

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Kilcullen Business Campus
Kilcullen Co. Kildare
Ireland

Phone: (+353) 045 484040
Fax: (+353) 045 484004
Email: info@murphysurveys.ie

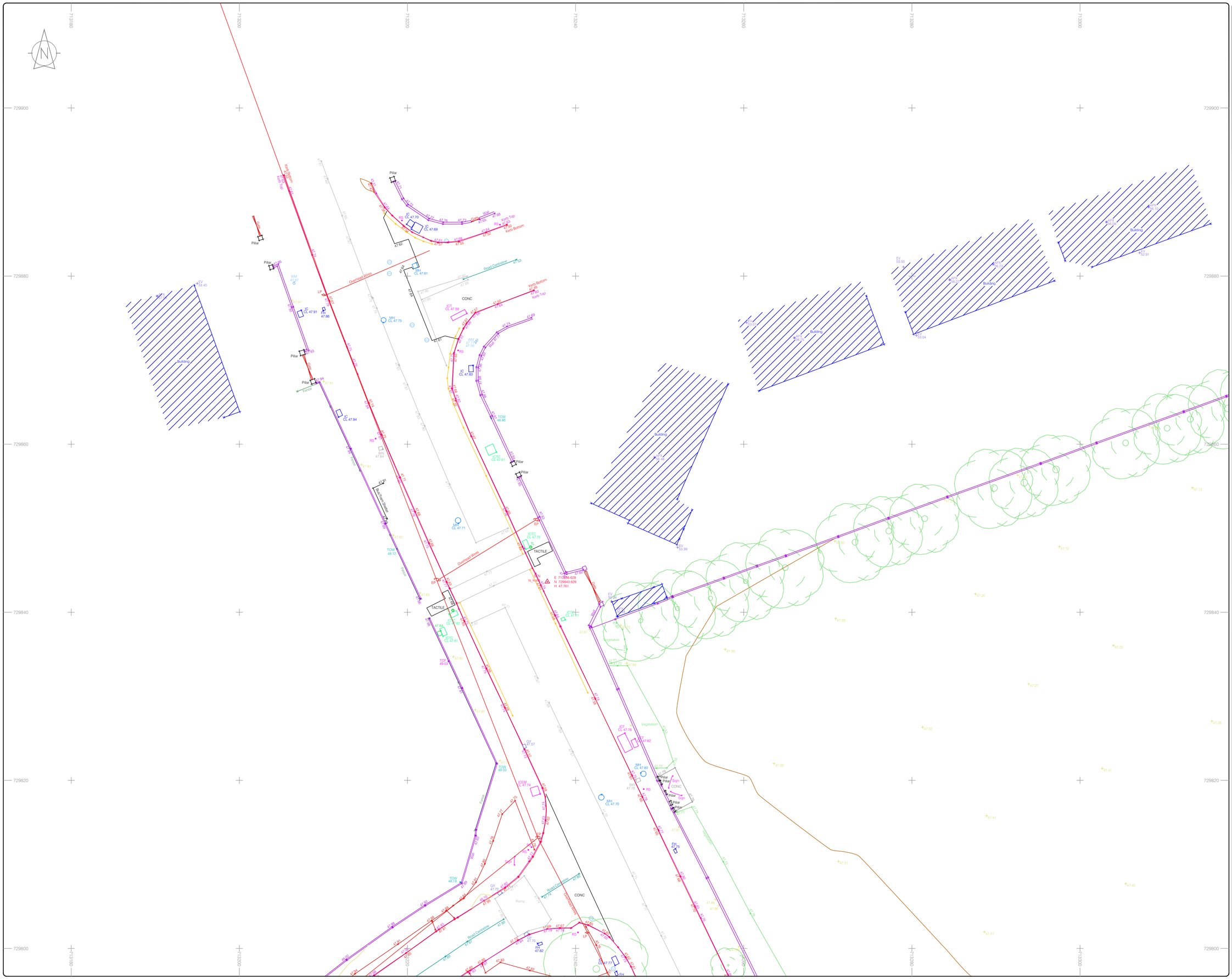
Client : Lioncor Developments

Project : Lakelands Terenure

Date : 28/02/2022 **Scale :** NTS@A1

Description : Topographical Survey

Drawing Number : **MGS45842_T_Overall**



LEGEND

Street furniture & Services

- Over Head Wires (LUAS) - Pylon ESB
- Flowerbed
- Pipe
- Lift
- Barrier
- Pump
- Trial Pit
- Bus/Tram Shelter
- Postbox
- Valve - General
- Water Valve
- Gas Valve
- Sluice Valve
- Air Valve
- Stop Cock
- C P Post
- Marker Post
- Traffic light
- Parking Meter
- Plane Aerial Mark
- Smart Card Validator
- Unknown Valve
- Bus Stop
- Bollard
- Beacon
- Coalhole Cover
- Bore Hole
- Electricity Pole
- Telegraph pole
- OCS Pole
- CCTV Camera Pole
- Lamp Post
- Foul Manhole
- Surface Water MH
- Manholes
- Air Conditioning Vents
- Services Inspection Cover
- Traffic Inspection Cover
- Cable TV Inspection Cover
- ESAT Inspection Cover
- NTL Inspection Cover
- Eircom Inspection Cover
- Rodding Eye
- Road Sign
- Bench Seat
- Kiosk
- Gully
- U/G Vent
- Waste Bin
- Hydrant
- Fire Hydrant
- ESB Box
- ESB Inspection Cover
- Traffic Control Box
- LUAS Technical Cubicle
- Ticket Vending Machine
- Water Meter Cover
- Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- Dished Aerial Mark
- Stay for pole
- Pipe Protection
- Washout

Natural Features

- Surface Change
- Land Drain
- Bottom of Slope
- Top of Slope
- Ditch
- Water Edge / Lake / Pond
- Hedge / Trees Drip Line / Vegetation
- Tree Coniferous
- Water Level
- Crown Level
- Invert level
- Bed Level
- Spotheight
- Tree Deciduous

Golf

- Fair Way
- Green
- Tee Box

Other

- Survey Station
- Photo point
- Top of Tree

Built Features

Roads & Road Markings

- Building
- Edge of Road
- Kerb Bottom
- Kerb Top
- Bridge Abutment
- Bridge Deck
- Bridge Parapet
- Building Façade
- Footpath / Platform Train & Tram
- Damp Proof Course / Verge
- Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
- Cycleway / Private Landing Area
- Fence
- Gate
- Road Centreline
- Top of Wall
- Hoarding
- Property Line
- Road Scar
- Top of Fence
- Wall / Retaining Wall
- Railway / Tram Rail / Grating / Ramp
- Building Canopy / Roof / Overhang
- Floor Level
- Apex Height
- Eaves Height
- Parapet Height
- Soffit Elevation
- Step Level
- Concrete Pad
- Track

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Surveyed by :	MGS	Date:	February 2022
Drawn by :	JF	Date:	February 2022
Checked by :	PK	Date:	28/02/2022

Datum: Malin Head
Grid System:
Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	28/02/2022	First Drawing.

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Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping, Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography

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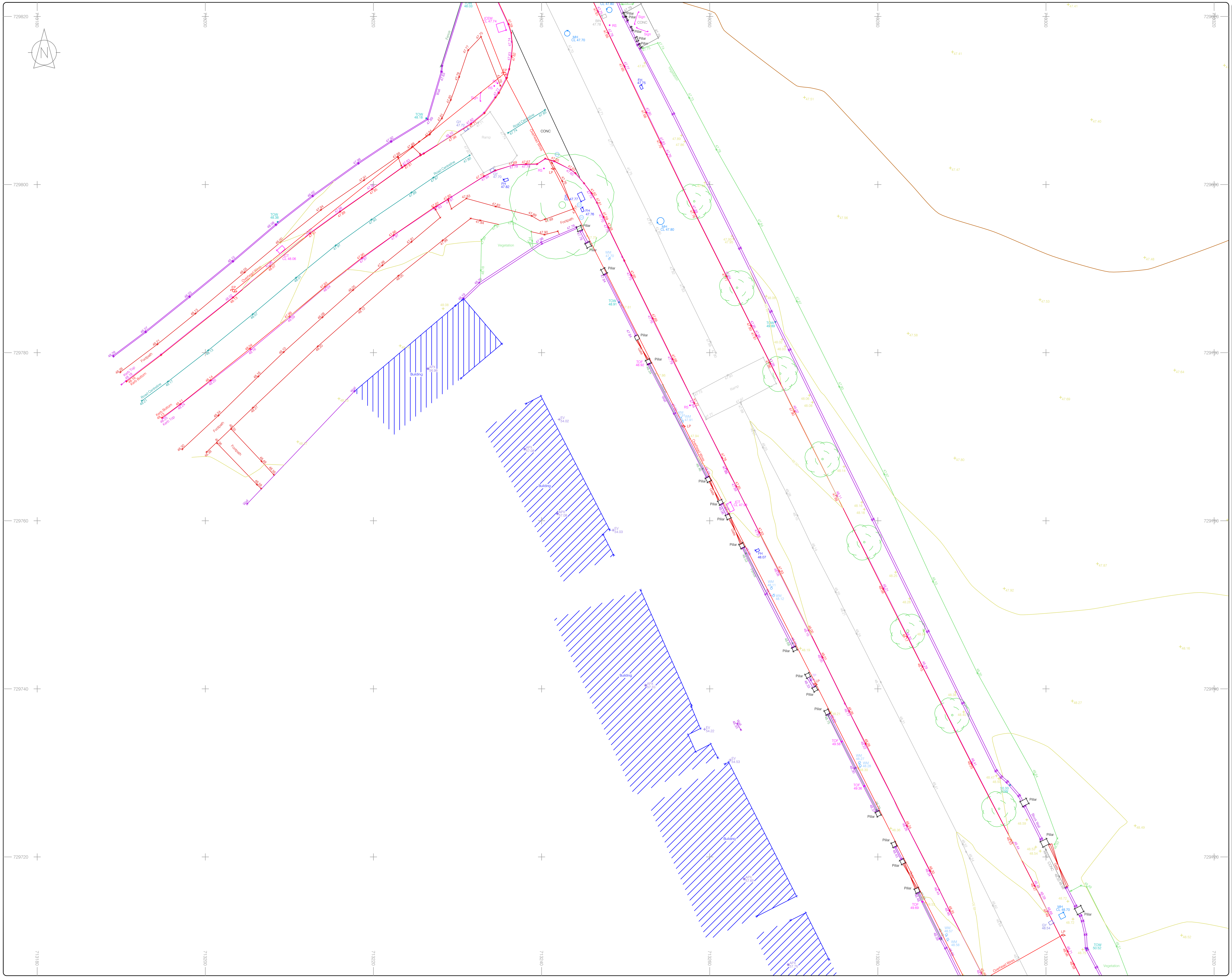
Kilcullen Business Campus
Kilcullen Co. Kildare
Ireland

Phone: (+353) 045 484040
Fax: (+353) 045 484004
Email: info@murphysurveys.ie

Client :	Lioncor Developments
Project :	Lakelands Terenure
Date : 28/02/2022	**Scale :** 1:200@A1
Description :	Topographical Survey
Drawing Number :	**MGS45842_T_01**



LEGEND

Street furniture & Services

Over Head Wires (LUAS) - Pylon ESB
Flowerbed
Pipe
Lift
Barrier
Pump
Trial Pit
Bus/Tram Shelter
Postbox
Valve - General
Water Valve
Gas Valve
Sluice Valve
Air Valve
Stop Cock
CPP C P Post
MK Marker Post
TL Traffic light
PM Parking Meter
PAM Plane Aerial Mark
SCV Smart Card Validator
Unknown Valve

BS Bus Stop
BD Bollard
BEA Beacon
CH Coalhole Cover
BH Bore Hole
EP Electricity Pole
TP Telegraph pole
OCS OCS Pole
CP CCTV Camera Pole
LP Lamp Post
FMH or Foul Manhole
SMH or Surface Water MH
MH or Manholes
AC Air Conditioning Vents
ICU Services Inspection Cover
ICTC Traffic Inspection Cover
ICTV Cable TV Inspection Cover
ICES ESAT Inspection Cover
ICNC NTL Inspection Cover
ICEM Eircom Inspection Cover
RE Rodding Eye

Sign RS Road Sign
Bench Seat
Kiosk
GY Gully
BIN Waste Bin
HY Hydrant
FH Fire Hydrant
EBOX ESB Box
ICE ESB Inspection Cover
TFB Traffic Control Box
LUAS LUAS Technical Cubicle
Ticket Vending Machine
WM Water Meter Cover
ICT Telecom Inspection Cover
Monument / Toilets
Tank Storage
Basement: MH, Cover & Pipe
DAM Dished Aerial Mark
STAY Stay for pole
PP Pipe Protection
WO Washout
PBOX Phone Box
Duct
GAS Gas Cover
CPBox C P Box
U/G Vent U/G Car Park Vent

Natural Features

Surface Change
Land Drain
Bottom of Slope
Top of Slope
Ditch
Water Edge / Lake / Pond
Hedge / Trees Drip Line / Vegetation
Tree Coniferous
Tree Deciduous
WLVL Water Level
CRWN Crown Level
IL Invert level
BL Bed Level
S Spotheight
TOT Top of Tree

Golf

FWAY Fair Way
GREE Green
TBOX Tee Box

Other

S1 Survey Station
Photo point

Built Features
Roads & Road Markings

Building
Edge of Road
Kerb Bottom
Kerb Top
Bridge Abutment
Bridge Deck
Bridge Parapet
Building Façade
Footpath / Platform Train & Tram
Damp Proof Course / Verge
Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
Cycleway / Private Landing Area
Fence
Gate
Road Centreline
Top of Wall
Hoarding
Property Line
Road Scar
Top of Fence
Wall / Retaining Wall
Railway / Tram Rail / Grating / Ramp
Building Canopy / Roof / Overhang
FL Floor Level
APX Apex Height
EV Eaves Height
PAR Parapet Height
SOFF Soffit Elevation
STPL Step Level
CONC Concrete Pad
Track

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North

Site Location

Map Sheet Layout:

Surveyed by : MGS	Date: February 2022	Datum : Malin Head
Drawn by : JF	Date: February 2022	Grid System:
Checked by : PK	Date: 28/02/2022	Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	28/02/2022	First Drawing

Society of Chartered Surveyors Ireland — The Survey Association Full Member — European GPR Association — RICS the mark of property professionalism worldwide

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Ireland
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Fax: (+353) 045 484004
Email: info@murphysurveys.ie

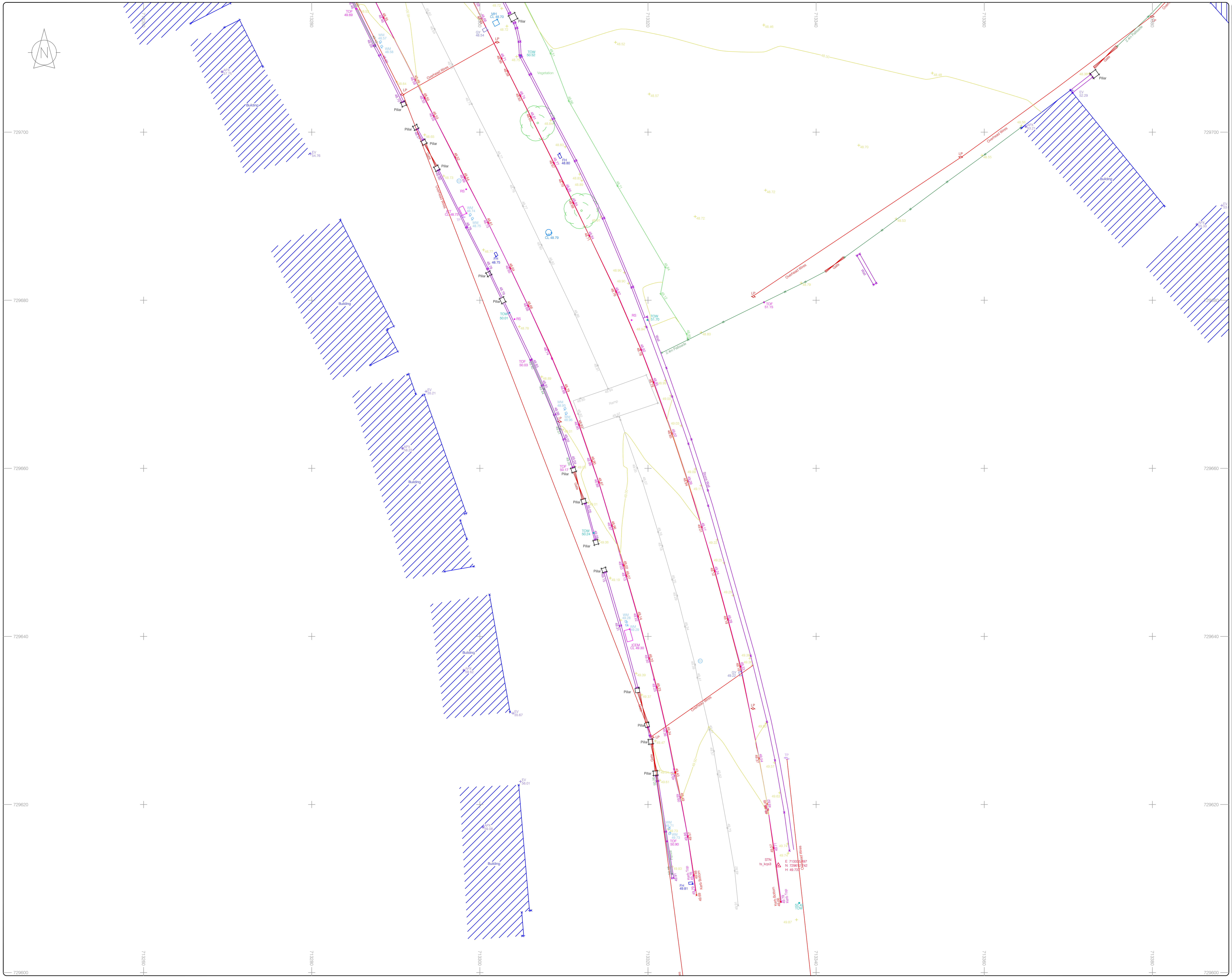
Client : Lioncor Developments

Project : Lakelands Terenure

Date : 28/02/2022 **Scale :** 1:200@A1

Description : Topographical Survey

Drawing Number : MGS45842_T_02



LEGEND

Street furniture & Services

Over Head Wires (LUAS) - Pylon ESB	Sign / RS Road Sign	PBOX Phone Box
Flowerbed	BS Bus Stop	Bench Seat
Pipe	BD Bollard	Duct
Lift	BEA Beacon	Kiosk
Barrier	CH Coalhole Cover	GAS Gas Cover
Pump	BH Bore Hole	GY Gully
Trial Pit	EP Electricity Pole	CPBox C P Box
Bus/Tram Shelter	TP Telegraph pole	U/G Vent U/G Car Park Vent
Postbox	OCS OCS Pole	BIN Waste Bin
Valve - General	CP CCTV Camera Pole	HY Hydrant
Water Valve	LP Lamp Post	FH Fire Hydrant
Gas Valve	FMH or Foul Manhole	EBOX ESB Box
Sluice Valve	SMH or Surface Water MH	ICE ESB Inspection Cover
Air Valve	MH or Manholes	TFB Traffic Control Box
Stop Cock	AC Air Conditioning Vents	LUAS LUAS Technical Cubicle
CPP C P Post	ICU Services Inspection Cover	Ticket Vending Machine
MK Marker Post	ICTC Traffic Inspection Cover	WM Water Meter Cover
TL Traffic light	ICTV Cable TV Inspection Cover	ICT Telecom Inspection Cover
PM Parking Meter	ICES ESAT Inspection Cover	Monument / Toilets
PAM Plane Aerial Mark	ICNC NTL Inspection Cover	Tank Storage
SCV Smart Card Validator	ICEM Eircom Inspection Cover	Basement: MH, Cover & Pipe
Unknown Valve	RE Rodding Eye	DAM Dished Aerial Mark
		STAY Stay for pole
		PP Pipe Protection
		WO Washout

Natural Features

Surface Change	WLVL Water Level
Land Drain	CRWN Crown Level
Bottom of Slope	IL Invert level
Top of Slope	BL Bed Level
Ditch	S Spotheight
Water Edge / Lake / Pond	
Hedge / Trees Drip Line / Vegetation	
Tree Coniferous	Tree Deciduous

Golf

- FWAY Fair Way
- GREE Green
- TBOX Tee Box

Other

- S1 Survey Station
- Photo point
- TOT Top of Tree

Built Features
Roads & Road Markings

Building	Fence	FL Floor Level
Edge of Road	Gate	APX Apex Height
Kerb Bottom	Road Centreline	EV Eaves Height
Kerb Top	Top of Wall	PAR Parapet Height
Bridge Abutment	Hoarding	SOFF Soffit Elevation
Bridge Deck	Property Line	STPL Step Level
Bridge Parapet	Road Scar	CONC Concrete Pad
Building Façade	Top of Fence	Track
Footpath / Platform Train & Tram	Wall / Retaining Wall	
Damp Proof Course / Verge	Railway / Tram Rail / Grating / Ramp	
Bridge Pier / Wall & Gate Pillar / LUAS Trackbed	Building Canopy / Roof / Overhang	
Cycleway / Private Landing Area		

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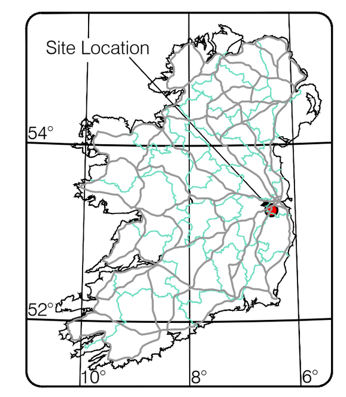
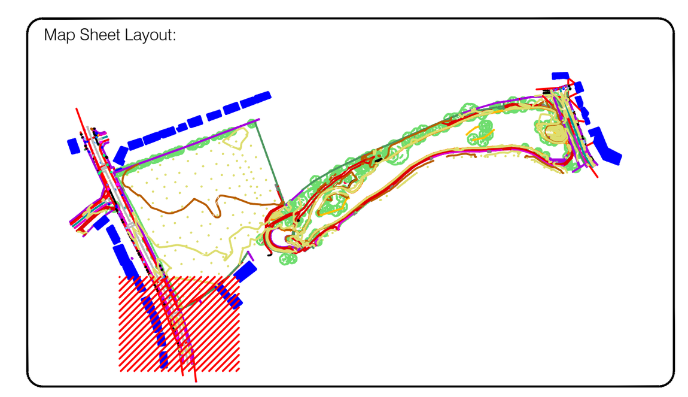
North





Surveyed by : MGS	Date: February 2022	Datum : Malin Head
Drawn by : JF	Date: February 2022	Grid System:
Checked by : PK	Date: 28/02/2022	Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	28/02/2022	First Drawing

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Phone: (+353) 045 484040
Fax: (+353) 045 484004
Email: info@murphysurveys.ie

Client : Lioncor Developments	
Project : Lakelands Terenure	
Date : 28/02/2022	**Scale :** 1:200@A1
Description : Topographical Survey	
Drawing Number : MGS45842_T_03	

LEGEND

Street furniture & Services

- Over Head Wires (LUAS) - Pylon ESB
- Flowerbed
- Pipe
- Lift
- Barrier
- Pump
- Trial Pit
- Bus/Tram Shelter
- Postbox
- Valve - General
- Water Valve
- Gas Valve
- Sluice Valve
- Air Valve
- Stop Cock
- C P Post
- Marker Post
- Traffic light
- Parking Meter
- Plane Aerial Mark
- Smart Card Validator
- Unknown Valve
- Road Sign
- Bus Stop
- Bollard
- Beacon
- Coalhole Cover
- Bore Hole
- Electricity Pole
- Telegraph pole
- OCS Pole
- CCTV Camera Pole
- Lamp Post
- Foul Manhole
- Surface Water MH
- Manholes
- Air Conditioning Vents
- Services Inspection Cover
- Traffic Inspection Cover
- Cable TV Inspection Cover
- ESAT Inspection Cover
- NTL Inspection Cover
- Eircom Inspection Cover
- Rodding Eye
- Phone Box
- Bench Seat
- Kiosk
- Gully
- Waste Bin
- Hydrant
- Fire Hydrant
- ESB Box
- ESB Inspection Cover
- Traffic Control Box
- LUAS Technical Cubicle
- Ticket Vending Machine
- Water Meter Cover
- Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- Dished Aerial Mark
- Stay for pole
- Pipe Protection
- Washout

Natural Features

- Surface Change
- Land Drain
- Bottom of Slope
- Top of Slope
- Ditch
- Water Edge / Lake / Pond
- Hedge / Trees Drip Line / Vegetation
- Tree Coniferous
- Water Level
- Crown Level
- Invert level
- Bed Level
- Spotheight
- Tree Deciduous

Golf

- Fair Way
- Green
- Tee Box

Other

- Survey Station
- Photo point
- Top of Tree

Built Features

Roads & Road Markings

- Building
- Edge of Road
- Kerb Bottom
- Kerb Top
- Bridge Abutment
- Bridge Deck
- Bridge Parapet
- Building Façade
- Footpath / Platform Train & Tram
- Damp Proof Course / Verge
- Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
- Cycleway / Private Landing Area
- Fence
- Gate
- Road Centreline
- Top of Wall
- Hoarding
- Property Line
- Road Scar
- Top of Fence
- Floor Level
- Apex Height
- Eaves Height
- Parapet Height
- Soffit Elevation
- Step Level
- Concrete Pad
- Track
- Wall / Retaining Wall
- Railway / Tram Rail / Grating / Ramp
- Building Canopy / Roof / Overhang

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North

Site Location

Map Sheet Layout:

Surveyed by : MGS	Date: Feburary 2022
Drawn by : JF	Date: Feburary 2022
Checked by : PK	Date: 28/02/2022
Datum	Main Head
Grid System:	Irish National Grid ☐ ITM ☒

Revisions

No	Date	Description
0	28/02/2022	First Drawing

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Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping, Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography

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Kilcullen Business Campus
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Phone: (+353) 045 484040
Fax: (+353) 045 484004
Email: info@murphysurveys.ie

Client :	Lioncor Developments
Project :	Lakelands Terenure
Date : 28/02/2022	**Scale :** 1:200@A1
Description :	Topographical Survey
Drawing Number :	MGS45842_T_04

LEGEND

Street furniture & Services

- Over Head Wires (LUAS) - Pylon ESB
- Flowerbed
- Pipe
- Lift
- Barrier
- Pump
- Trial Pit
- Bus/Tram Shelter
- Postbox
- Valve - General
- Water Valve
- Gas Valve
- Sluice Valve
- Air Valve
- Stop Cock
- C P Post
- Marker Post
- Traffic light
- Parking Meter
- Plane Aerial Mark
- Smart Card Validator
- Unknown Valve
- Sign
- Bus Stop
- Bollard
- Beacon
- Coalhole Cover
- Bore Hole
- Electricity Pole
- Telegraph pole
- OCS Pole
- CCTV Camera Pole
- Lamp Post
- Foul Manhole
- Surface Water MH
- Manholes
- Air Conditioning Vents
- Services Inspection Cover
- Traffic Inspection Cover
- Cable TV Inspection Cover
- ESAT Inspection Cover
- NTL Inspection Cover
- Eircom Inspection Cover
- Rodding Eye
- Road Sign
- Bench Seat
- Kiosk
- Gully
- Waste Bin
- Hydrant
- Fire Hydrant
- ESB Box
- ESB Inspection Cover
- Traffic Control Box
- LUAS Technical Cubicle
- Ticket Vending Machine
- Water Meter Cover
- Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- Dished Aerial Mark
- Stay for pole
- Pipe Protection
- Washout

Natural Features

- Surface Change
- Land Drain
- Bottom of Slope
- Top of Slope
- Ditch
- Water Edge / Lake / Pond
- Hedge / Trees Drip Line / Vegetation
- Tree Coniferous
- Tree Deciduous
- Water Level
- Crown Level
- Invert level
- Bed Level
- Spotheight

Golf

- Fair Way
- Green
- Tee Box

Other

- Survey Station
- Photo point
- Top of Tree

Built Features

Roads & Road Markings

- Building
- Edge of Road
- Kerb Bottom
- Kerb Top
- Bridge Abutment
- Bridge Deck
- Bridge Parapet
- Building Façade
- Footpath / Platform Train & Tram
- Damp Proof Course / Verge
- Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
- Cycleway / Private Landing Area
- Fence
- Gate
- Road Centreline
- Top of Wall
- Hoarding
- Property Line
- Road Scar
- Top of Fence
- Floor Level
- Apex Height
- Eaves Height
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- Soffit Elevation
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- Track
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North

Site Location

Map Sheet Layout:

Surveyed by :	MGS	Date: Februrary 2022	Datum Main Head
Drawn by :	JF	Date: Februrary 2022	Grid System:
Checked by :	PK	Date: 28/02/2022	Irish National Grid ☐ ITM ☒

Revisions

No	Date	Description
0	28/02/2022	First Drawing

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Kilcullen Co. Kildare
Ireland

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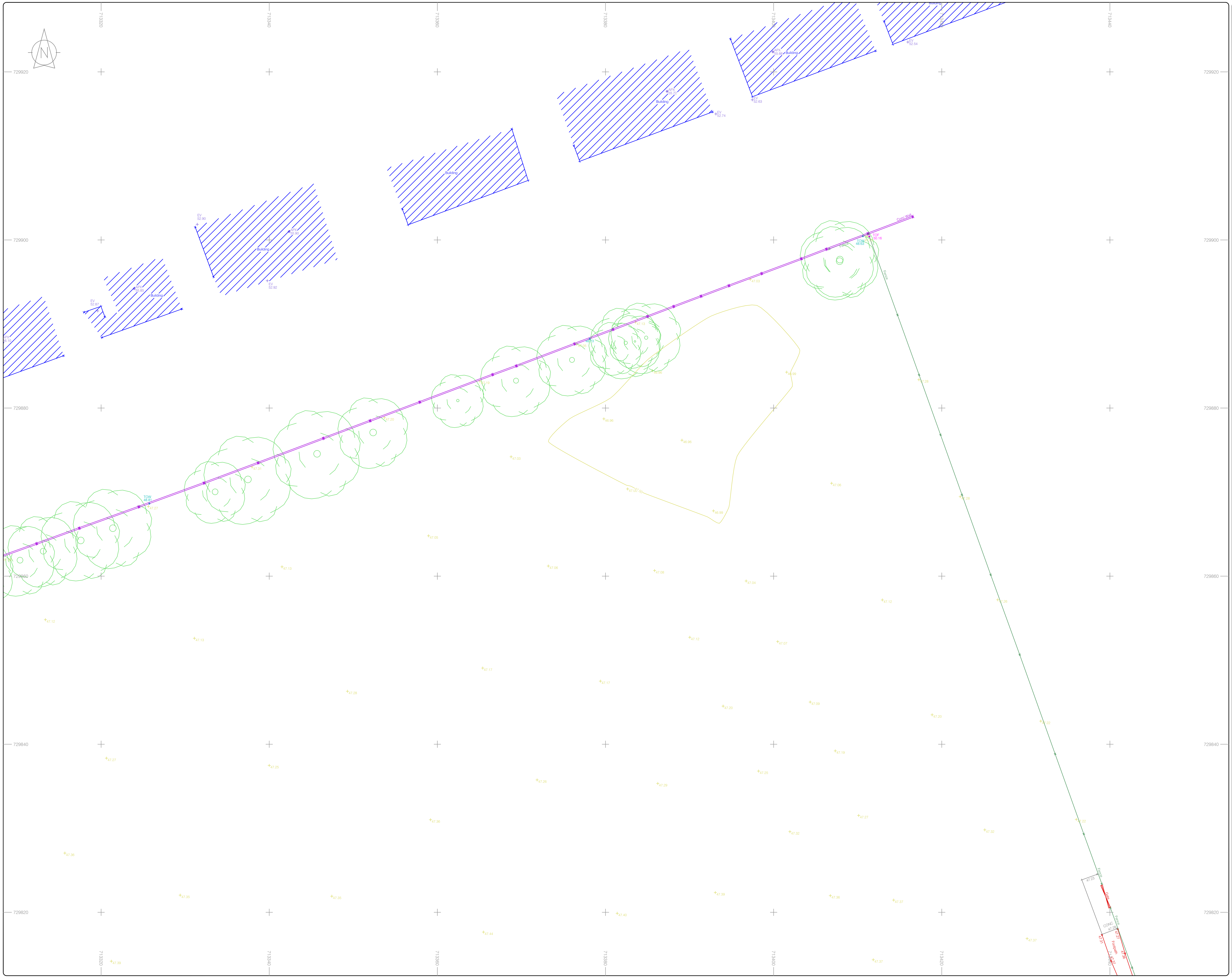
Fax: (+353) 045 484004
Email: info@murphysurveys.ie

Client :	Lioncor Developments
Project :	Lakelands Terenure
Date :	28/02/2022
Scale :	1:200@A1
Description :	Topographical Survey
Drawing Number :	MGS45842_T_05



LEGEND

Street furniture & Services

Over Head Wires (LUAS) - Pylon ESB
Flowerbed
Pipe
Lift
Barrier
Pump
Trial Pit
Bus/Tram Shelter
Postbox
Valve - General
Water Valve
Gas Valve
Sluice Valve
Air Valve
Stop Cock
CPP C P Post
MK Marker Post
TL Traffic light
PM Parking Meter
PAM Plane Aerial Mark
SCV Smart Card Validator
Unknown Valve
BS Bus Stop
BD Bollard
BEA Beacon
CH Coalhole Cover
BH Bore Hole
EP Electricity Pole
TP Telegraph pole
OCS OCS Pole
CP CCTV Camera Pole
LP Lamp Post
FMH or Foul Manhole
SMH or Surface Water MH
MH or Manholes
AC Air Conditioning Vents
ICU Services Inspection Cover
ICTC Traffic Inspection Cover
ICTV Cable TV Inspection Cover
ICES ESAT Inspection Cover
ICNC NTL Inspection Cover
ICEM Eircom Inspection Cover
RE Rodding Eye
Sign RS Road Sign
Bench Seat
Kiosk
GY Gully
U/G Vent U/G Car Park Vent
BIN Waste Bin
HY Hydrant
FH Fire Hydrant
EBOX ESB Box
ICE ESB Inspection Cover
TFB Traffic Control Box
LUAS LUAS Technical Cubicle
Ticket Vending Machine
WM Water Meter Cover
ICT Telecom Inspection Cover
Monument / Toilets
Tank Storage
Basement: MH, Cover & Pipe
DAM Dished Aerial Mark
STAY Stay for pole
PP Pipe Protection
WO Washout
PBOX Phone Box
Duct
GAS Gas Cover
CPBox C P Box

Natural Features

Surface Change
Land Drain
Bottom of Slope
Top of Slope
Ditch
Water Edge / Lake / Pond
Hedge / Trees Drip Line / Vegetation
Tree Coniferous
WLVL Water Level
CRWN Crown Level
IL Invert level
BL Bed Level
S Spotheight
Tree Deciduous

Golf

FWAY Fair Way
GREE Green
TBOX Tee Box

Other

S1 Survey Station
Photo point
TOT Top of Tree

Built Features
Roads & Road Markings

Building
Edge of Road
Kerb Bottom
Kerb Top
Bridge Abutment
Bridge Deck
Bridge Parapet
Building Façade
Footpath / Platform Train & Tram
Damp Proof Course / Verge
Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
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Road Centreline
Top of Wall
Hoarding
Property Line
Road Scar
Top of Fence
Wall / Retaining Wall
Railway / Tram Rail / Grating / Ramp
Building Canopy / Roof / Overhang
FL Floor Level
APX Apex Height
EV Eaves Height
PAR Parapet Height
SOFF Soffit Elevation
STPL Step Level
CONC Concrete Pad
Track

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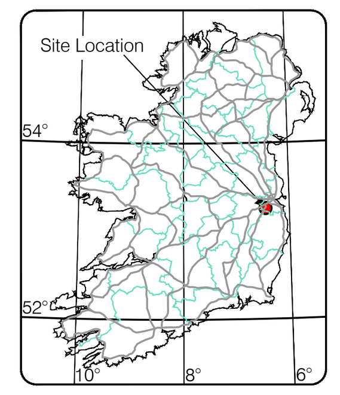
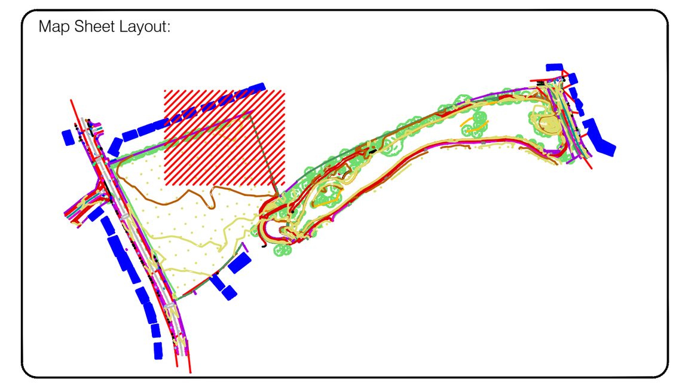
North





Surveyed by : MGS Date: February 2022
Drawn by : JF Date: February 2022
Checked by : PK Date: 28/02/2022
Datum : Malin Head
Grid System:
Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	28/02/2022	First Drawing

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EUROPEAN GPR ASSOCIATION
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Fax: (+353) 045 484004
Email: info@murphysurveys.ie

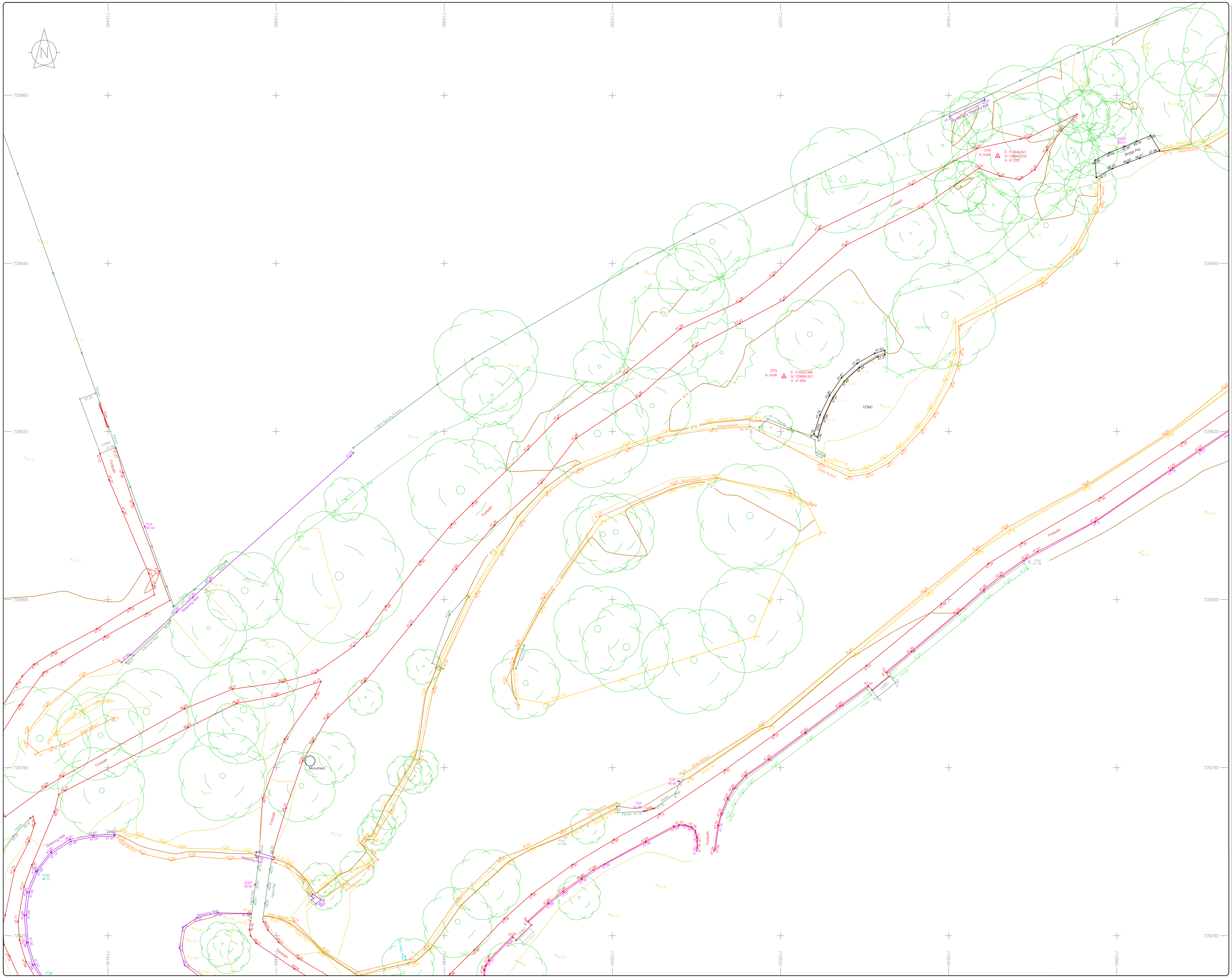
Client : Lioncor Developments

Project : Lakelands Terenure

Date : 28/02/2022 **Scale :** 1:200@A1

Description : Topographical Survey

Drawing Number : MGS45842_T_06



LEGEND

Street furniture & Services

Over Head Wires (LUAS) - Pylon ESB; Flowerbed; Pipe; Lift; Barrier; Pump; Trial Pit; Bus/Tram Shelter; Postbox; Valve - General; Water Valve; Gas Valve; Sluice Valve; Air Valve; Stop Cock; CPP C P Post; MK Marker Post; TL Traffic light; PM Parking Meter; PAM Plane Aerial Mark; SCV Smart Card Validator; Unknown Valve

Sign RS Road Sign; BS Bus Stop; BD Bollard; BEA Beacon; CH Coalhole Cover; BH Bore Hole; EP Electricity Pole; TP Telegraph pole; OCS OCS Pole; CP CCTV Camera Pole; LP Lamp Post; FMH Foul Manhole; SMH Surface Water MH; MH Manholes; AC Air Conditioning Vents; ICU Services Inspection Cover; ICTC Traffic Inspection Cover; ICTV Cable TV Inspection Cover; ICES ESAT Inspection Cover; ICNC NTL Inspection Cover; ICEM Eircom Inspection Cover; RE Rodding Eye

PBOX Phone Box; Duct; Bench Seat; Kiosk; GAS Gas Cover; GY Gully; CPBox C P Box; U/G Vent U/G Car Park Vent; BIN Waste Bin; HY Hydrant; FH Fire Hydrant; EBOX ESB Box; ICE ESB Inspection Cover; TFB Traffic Control Box; LUAS LUAS Technical Cubicle; Ticket Vending Machine; WM Water Meter Cover; ICT Telecom Inspection Cover; Monument / Toilets; Tank Storage; Basement: MH, Cover & Pipe; DAM Dished Aerial Mark; STAY Stay for pole; PP Pipe Protection; WO Washout

Natural Features

Surface Change; Land Drain; Bottom of Slope; Top of Slope; Ditch; Water Edge / Lake / Pond; Hedge / Trees Drip Line / Vegetation; Tree Coniferous; Tree Deciduous

WLVL Water Level; CRWN Crown Level; IL Invert level; BL Bed Level; S Spotheight

Golf

FWAY Fair Way; GREE Green; TBOX Tee Box

Other

S1 Survey Station; Photo point; TOT Top of Tree

Built Features
Roads & Road Markings

Building; Edge of Road; Kerb Bottom; Kerb Top; Bridge Abutment; Bridge Deck; Bridge Parapet; Building Façade; Footpath / Platform Train & Tram; Damp Proof Course / Verge; Bridge Pier / Wall & Gate Pillar / LUAS Trackbed; Cycleway / Private Landing Area

Fence; Gate; Road Centreline; Top of Wall; Hoarding; Property Line; Road Scar; Top of Fence; Wall / Retaining Wall; Railway / Tram Rail / Grating / Ramp; Building Canopy / Roof / Overhang

FL Floor Level; APX Apex Height; EV Eaves Height; PAR Parapet Height; SOFF Soffit Elevation; STPL Step Level; CONC Concrete Pad; Track

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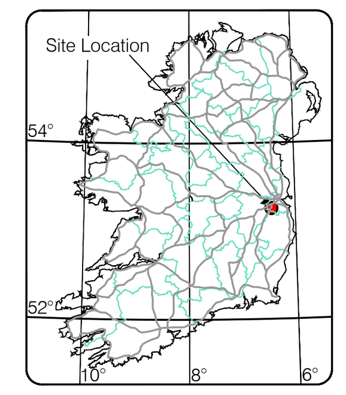
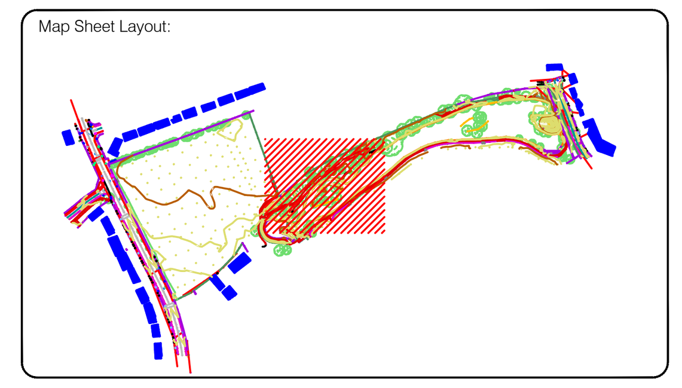
North





Surveyed by : MGS	Date: February 2022	Datum : Malin Head
Drawn by : JF	Date: February 2022	Grid System:
Checked by : PK	Date: 28/02/2022	Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	28/02/2022	First Drawing

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European GPR Association
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Email: info@murphysurveys.ie

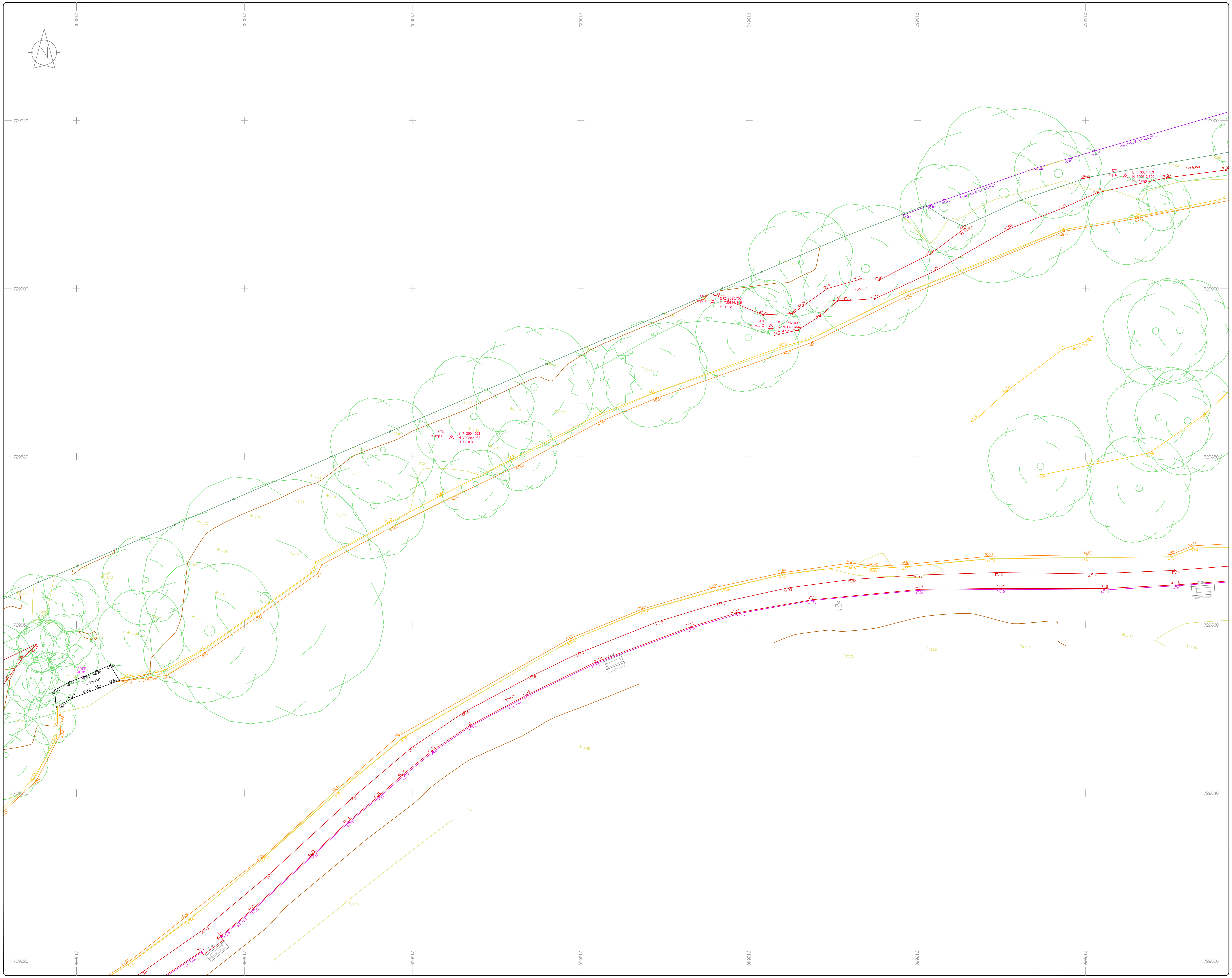
Client : Lioncor Developments

Project : Lakelands Terenure

Date : 28/02/2022 **Scale :** 1:200@A1

Description : Topographical Survey

Drawing Number : **MGS45842_T_07**



LEGEND

Street furniture & Services

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- Flowerbed
- Pipe
- Lift
- Barrier
- Pump
- Trial Pit
- Bus/Tram Shelter
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- Air Valve
- Stop Cock
- CPP C P Post
- MK Marker Post
- TL Traffic light
- PM Parking Meter
- PAM Plane Aerial Mark
- SCV Smart Card Validator
- Unknown Valve
- BS Bus Stop
- BD Bollard
- BEA Beacon
- CH Coalhole Cover
- BH Bore Hole
- EP Electricity Pole
- TP Telegraph pole
- OCS OCS Pole
- CP CCTV Camera Pole
- LP Lamp Post
- FMH or Foul Manhole
- SMH or Surface Water MH
- MH or Manholes
- AC Air Conditioning Vents
- ICU Services Inspection Cover
- ICTC Traffic Inspection Cover
- ICTV Cable TV Inspection Cover
- ICES ESAT Inspection Cover
- ICNC NTL Inspection Cover
- ICEM Eircom Inspection Cover
- RE Rodding Eye
- Sign RS Road Sign
- Bench Seat
- Kiosk
- GY Gully
- U/G Vent U/G Car Park Vent
- BIN Waste Bin
- HY Hydrant
- FH Fire Hydrant
- EBOX ESB Box
- ICE ESB Inspection Cover
- TFB Traffic Control Box
- LUAS LUAS Technical Cubicle
- Ticket Vending Machine
- WM Water Meter Cover
- ICT Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- DAM Dished Aerial Mark
- STAY Stay for pole
- PP Pipe Protection
- WO Washout
- PBOX Phone Box
- Duct
- GAS Gas Cover
- CPBox C P Box

Natural Features

- Surface Change
- Land Drain
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Other

- S1 Survey Station
- Photo point
- TOT Top of Tree

Built Features
Roads & Road Markings

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- Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
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- Road Scar
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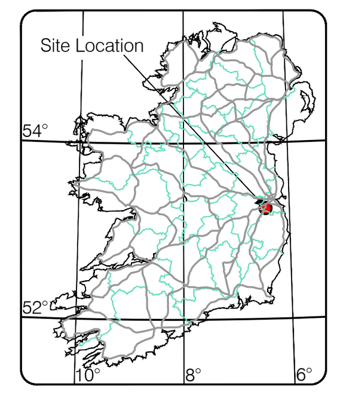
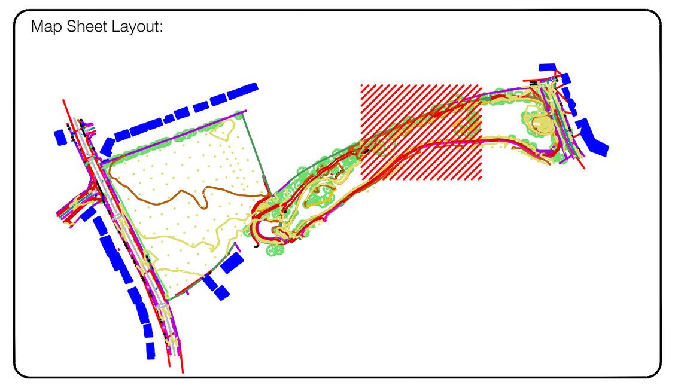
North



Map Sheet Layout:



Surveyed by : MGS	Date: February 2022	Datum : Malin Head
Drawn by : JF	Date: February 2022	Grid System:
Checked by : PK	Date: 28/02/2022	Irish National Grid ☐ ITM ☒

Revisions

No.	Date	Description
0	28/02/2022	First Drawing

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EUROPEAN GPR ASSOCIATION

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Email: info@murphysurveys.ie

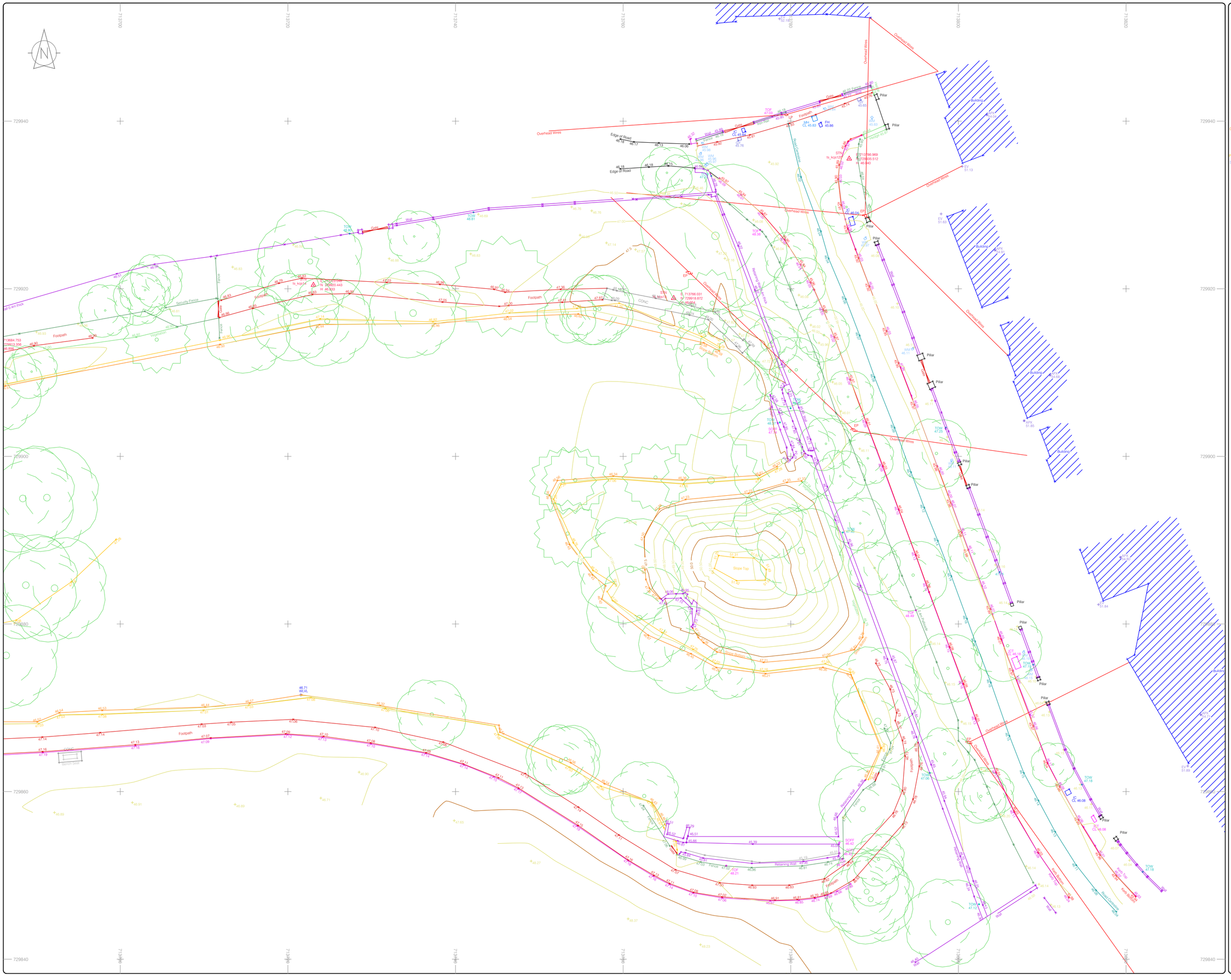
Client : Lioncor Developments

Project : Lakelands Terenure

Date : 28/02/2022 **Scale :** 1:200@A1

Description : Topographical Survey

Drawing Number : MGS45842_T_08



LEGEND

Street furniture & Services

- Over Head Wires (LUAS) - Pylon ESB
- Flowerbed
- Pipe
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- Barrier
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- C P Post
- Marker Post
- Traffic light
- Parking Meter
- Plane Aerial Mark
- Smart Card Validator
- Unknown Valve
- Road Sign
- Bench Seat
- Bollard
- Beacon
- Coalhole Cover
- Bore Hole
- Electricity Pole
- Telegraph pole
- OCS Pole
- CCTV Camera Pole
- Lamp Post
- Foul Manhole
- Surface Water MH
- Manholes
- Air Conditioning Vents
- Services Inspection Cover
- Traffic Inspection Cover
- Cable TV Inspection Cover
- ESAT Inspection Cover
- NTL Inspection Cover
- Eircom Inspection Cover
- Rodding Eye
- Bus Stop
- Kiosk
- Gully
- Coalhole Cover
- Waste Bin
- Hydrant
- Fire Hydrant
- ESB Box
- ESB Inspection Cover
- Traffic Control Box
- LUAS Technical Cubicle
- Ticket Vending Machine
- Water Meter Cover
- Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- Dished Aerial Mark
- Stay for pole
- Pipe Protection
- Washout
- Phone Box
- Duct
- Gas Cover
- C P Box
- LUAS Car Park Vent
- Waste Bin
- Hydrant
- Fire Hydrant
- ESB Box
- ESB Inspection Cover
- Traffic Control Box
- LUAS Technical Cubicle
- Ticket Vending Machine
- Water Meter Cover
- Telecom Inspection Cover
- Monument / Toilets
- Tank Storage
- Basement: MH, Cover & Pipe
- Dished Aerial Mark
- Stay for pole
- Pipe Protection
- Washout

Natural Features

- Surface Change
- Land Drain
- Bottom of Slope
- Top of Slope
- Ditch
- Water Edge / Lake / Pond
- Hedge / Trees Drip Line / Vegetation
- Tree Coniferous
- Water Level
- Crown Level
- Invert level
- Bed Level
- Spotheight
- Tree Deciduous

Golf

- Fair Way
- Green
- Tee Box

Other

- Survey Station
- Photo point
- Top of Tree

Built Features

Roads & Road Markings

- Building
- Edge of Road
- Kerb Bottom
- Kerb Top
- Bridge Abutment
- Bridge Deck
- Bridge Parapet
- Building Façade
- Footpath / Platform Train & Tram
- Damp Proof Course / Verge
- Bridge Pier / Wall & Gate Pillar / LUAS Trackbed
- Cycleway / Private Landing Area
- Fence
- Gate
- Road Centreline
- Top of Wall
- Hoarding
- Property Line
- Road Scar
- Top of Fence
- Floor Level
- Apex Height
- Eaves Height
- Parapet Height
- Soffit Elevation
- Step Level
- Concrete Pad
- Track
- Wall / Retaining Wall
- Railway / Tram Rail / Grating / Ramp
- Building Canopy / Roof / Overhang

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North

Site Location

Map Sheet Layout:

Surveyed by :	MGS	Date: February 2022	Datum: Main Head
Drawn by :	JF	Date: February 2022	Grid System: Irish National Grid ☐ ITM ☒
Checked by :	PK	Date: 28/02/2022	

Revisions

No	Date	Description
0	28/02/2022	First Drawing.

Murphy GEOSPATIAL

Topographic surveys, Measured Building Surveys, Setting-Out, As-Built Surveys, Hydrographic Surveys, Legal Mapping, Pipeline Surveys, Services Location, Ground Penetrating Radar, Laser Scanning, Rectified Photography

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Client :	Lioncor Developments
Project :	Lakelands Terenure
Date : 28/02/2022	**Scale :** 1:200@A1
Description :	Topographical Survey
Drawing Number :	**MGS45842_T_09**