Conditions 3+4 - see LPA letter dated 17 July 08

DRAINAGE DESIGN STATEMENT

DEVELOPMENT SERVICES
12 JUN 2008
RECEIVED

Coventry Road, Hinckley

for

Tungsten Properties Ltd

June 2008

Architects
Consulting Engineers
Project Managers
Surveyors

PICK EVERARD

Halford House
Charles Street
Leicester
LE1 1HA
Phone 0116 223 4400
Fax 0116 223 4411/22/33
consultants@pickeverard.co.uk
www.pickeverard.co.uk

CONTENTS

1.0 INTRODUCTION 1

2.0 EXISTING DRAINAGE 1

3.0 PROPOSED SURFACE WATER DRAINAGE 1
3.1 Discharge to the Harrow Brook is via two sources; 1
3.1.1 Adopted highway at the site boundary 1
3.1.2 Pumped storm outfall from the development 1
3.2 Storm sewer network 1
3.3 Pond 2
3.4 Design for exceedance/pump failure 2
3.5 Pollution control 2

4.0 PROPOSED FOUL WATER DRAINAGE 2

APPENDIX A
Proposed drainage layout

APPENDIX B
Microdrainage results - sewer design

APPENDIX C
Microdrainage results - Storage lagoon

APPENDIX D
Overland flood routing

Revision B
Checked by: W Savage **Date: 11 June 2008**

1.0 INTRODUCTION

This drainage statement relates to development proposals for land off Coventry Road, Hinckley, OS grid reference 440650, 293372.

The site is bounded by Coventry Road to the south, the Harrow Brook to the north, the Harrow Brook Industrial Estate to the west and the Ashby-de-la-Zouch canal to the east. The development proposals are for a series of light industrial and commercial units.

The proposed development is for a private road with private surface water sewer system, and an adopted foul network.

2.0 EXISTING DRAINAGE

The existing greenfield site has no drainage infrastructure. Public foul and surface water sewers exist within Coventry Road to the south, and the Harrow Brook Industrial Estate to the west.

The site slopes from south to north, down towards the Harrow Brook and currently it is anticipated that greenfield runoff from the site flows towards the Brook.

3.0 PROPOSED SURFACE WATER DRAINAGE

The development will include a SuDS scheme to attenuate the increased surface water flows generated by the 4.77 hectare impermeable area. A lagoon is proposed at the north of the site, shown on drawing 060629/C/500 (Appendix A). The lagoon is designed as an off-line 'wet' pond with storage volume provided in the form of freeboard. The discharge from the off-line lagoon shall be limited to 5 lit/sec per hectare as per the Environment Agency's requirements set out in their letter dated 14th May 2007. The maximum design flow discharging from the site to the Harrow Brook is 23.85 lit/sec.

3.1 Discharge to the Harrow Brook is via two sources;

3.1.1 Adopted highway at the site boundary

An area of approximately 860m² at the highway boundary will be adopted by the highway authority, and as such cannot discharge runoff to the private road (refer to Drg 060629/C/500). Runoff from this area will be discharged to the Harrow Brook, via an existing riparian drain. The total estimated flow from this small area is 11.4 lit/sec, with no flow control.

3.1.2 Pumped storm outfall from the development

Due to the topography of the site, it is not possible to discharge to the Harrow Brook by gravity. Furthermore Severn Trent water are unable to adopt the SuDS pond, as such the whole storm system will be privately owned and maintained. The flow from this part of the development will be balanced using the pond, and the total discharge to the Brook will be 12 lit/sec, achieved using a private pumping station.

An outfall structure will be constructed in close proximity to the Harrow Brook with a flap valve installed to prevent reverse flows.

3.2 Storm sewer network

The surface water sewer network has been designed to the Sewers for Adoption 30 year standard. Microdrainage calculations are included in Appendix B for the 1 in 2, 1 in 30

and 1 in 100 (+20%) year storms. The system is designed not to flood during the 1 in 30 year storm event. In extreme cases during the 1 in 100 (+20%) event, a total volume of 1.157m^3 will flood from two manholes. This small volume will be contained within the private road network and will not affect floor levels, as shown on Drg 060629/C/502.

3.3 **Pond**

The lagoon will be sized to accommodate the 1 in 100 year storm, with a 20% allowance made for future climate change. Microdrainage results are included in Appendix C showing a maximum water level of 90.166m. The ground level is typically 90.90m in this area. Storms that exceed the 1 in 100 year + 20% event will be retained on site within the lagoon and bunding will be constructed where necessary to prevent overland flows entering the watercourse.

3.4 **Design for exceedance/pump failure**

Drawing 060629/C/502 shows the anticipated overland flood path should either the storm event exceed the 1 in 100 (+20%) design storm, or the pumps should fail. Additional MicroDrainage calculations estimate the total excess flood volume to be 1028.6m3 during pump failure. Drg 060629/C/502 shows this volume of water dispersed across the site at a depth of 100mm. The lowest plot level is 91.10m. Drg 060629/C/502 shows a predicted overland flood path, indicating that plot levels should not be affected. This storm water would be contained on site by the 300mm height bund created around the south of the site.

3.5 **Pollution control**

The anticipated runoff entering the surface water sewers will be from roads and roof areas. At this stage it is not anticipated that any pollutants will enter the system and as such the main trunk sewers will not include any oil separators. However provision will be made within individual plots for suitable oil separators as required. All runoff from road areas will enter the system through trapped gullies.

4.0 PROPOSED FOUL WATER DRAINAGE

Foul water drainage from the proposed development will be discharged into the existing public foul sewer network. Foul flows from the development will gravitate to a foul pumping station, from which it will be pumped to a receiving manhole as shown on Drg 060629/C/500. The foul sewer network will be offered for adoption under a S104 agreement.

APPENDIX A

Proposed drainage layout

Drg 060629/C/500

APPENDIX B

Microdrainage results - sewer design

- Microdrainage results for 1 in 2, 1 in 30 and 1 in 100 (+20%)

Global Variables

Region	FSR - England & Wales
Return Period (yrs)	100
M5-60 (mm)	19.900
Ratio R	0.408
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	0

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.008		90.900	88.322	1200	0

(c)1982-2006 Micro Drainage

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
9.000	4.65	0.103	45.3	0.206	5.00	1	0.600	o	225
1.007	42.57	0.122	349.0	0.060	0.00	1	0.600	o	900
10.000	16.00	0.068	235.3	0.330	5.00	1	0.600	o	300
1.008	57.11	0.143	400.0	0.115	0.00	1	0.600	o	900

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
9.000	15	90.815	89.364	1.226	90.715	89.261	1.229		1050
1.007	16	90.715	88.586	1.229	91.009	88.464	1.645		1800
10.000	19	91.075	89.575	1.200	91.009	89.507	1.202		1050
1.008	17	91.009	88.464	1.645	90.900	88.322	1.678		1800

(c)1982-2006 Micro Drainage

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	Depth (m)	MH DIAM., L*W (mm)
8.000	o	225	14	90.815	89.390	1.200	1050
9.000	o	225	15	90.815	89.364	1.226	1050
1.007	o	900	16	90.715	88.586	1.229	1800
10.000	o	300	19	91.075	89.575	1.200	1050
1.008	o	900	17	91.009	88.464	1.645	1800

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	Depth (m)	MH DIAM., L*W (mm)
8.000	16.77	130.4	16	90.715	89.261	1.229	1800
9.000	4.65	45.3	16	90.715	89.261	1.229	1800
1.007	42.57	349.0	17	91.009	88.464	1.645	1800
10.000	16.00	235.3	17	91.009	89.507	1.202	1800
1.008	57.11	400.0		90.900	88.322	1.678	1200

(c)1982-2006 Micro Drainage

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Level)
Results for Design Storms

Margin for Flood Risk warning (mm) 0 Inertia Status OFF
DVD Status OFF Analysis Time Step Fine

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 20, 20

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Winter	2	0%	1	100/15 Summer			
2.000	15 Winter	2	0%	1	30/15 Summer			
1.001	15 Winter	2	0%	1	30/15 Summer			
3.000	15 Winter	2	0%	1	30/15 Summer	100/15 Winter		
1.002	15 Winter	2	0%	1	30/15 Summer			
4.000	15 Winter	2	0%	1	30/15 Summer			
1.003	15 Winter	2	0%	1	30/15 Summer			
5.000	15 Winter	2	0%	1	30/15 Summer	100/15 Winter		
1.004	15 Winter	2	0%	1	30/15 Summer			
6.000	15 Winter	2	0%	1	30/15 Summer			
1.005	15 Winter	2	0%	1	30/15 Summer			
7.000	15 Winter	2	0%	1	30/15 Summer			
1.006	15 Winter	2	0%	1	30/15 Summer			
8.000	15 Winter	2	0%	1	30/15 Summer			
9.000	15 Winter	2	0%	1	30/15 Summer			
1.007	15 Winter	2	0%	1	30/15 Summer			
10.000	15 Winter	2	0%	1	30/15 Summer			
1.008	15 Winter	2	0%	1	30/15 Winter			

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m^3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	91.727	-0.093	0.000	0.30	0	9	O K
	2.000	90.995	-0.145	0.000	0.68	0	72	O K
	1.001	90.892	-0.188	0.000	0.49	0	86	O K
	3.000	90.738	-0.085	0.000	0.84	0	45	O K
	1.002	90.598	-0.191	0.000	0.62	0	140	O K
	4.000	90.200	-0.075	0.000	0.97	0	69	O K
	1.003	90.053	-0.201	0.000	0.71	0	210	O K
1	5.000	90.165	-0.067	0.000	0.94	0	67	O K
	1.004	89.940	-0.210	0.000	0.82	0	275	O K
	6.000	89.743	-0.057	0.000	1.00	0	75	O K
	1.005	89.583	-0.199	0.000	0.82	0	340	O K
	7.000	89.454	-0.246	0.000	0.42	0	70	O K
	1.006	89.339	-0.279	0.000	0.71	0	390	O K
	8.000	89.557	-0.058	0.000	0.88	0	35	O K
	9.000	89.522	-0.067	0.000	0.82	0	37	O K
	1.007	89.075	-0.411	0.000	0.52	0	437	O K
	10.000	89.812	-0.063	0.000	0.96	0	59	O K
	1.008	88.958	-0.406	0.000	0.57	0	474	O K

(c)1982-2006 Micro Drainage

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Level)
Results for Design Storms

Margin for Flood Risk warning (mm) 0 Inertia Status OFF
DVD Status OFF Analysis Time Step Fine

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 20, 20

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Winter	30	20%	1	100/15 Summer			
2.000	15 Winter	30	20%	1	30/15 Summer			
1.001	15 Winter	30	20%	1	30/15 Summer			
3.000	15 Winter	30	20%	1	30/15 Summer	100/15 Winter		
1.002	15 Winter	30	20%	1	30/15 Summer			
4.000	15 Winter	30	20%	1	30/15 Summer			
1.003	15 Winter	30	20%	1	30/15 Summer			
5.000	15 Winter	30	20%	1	30/15 Summer	100/15 Winter		
1.004	15 Winter	30	20%	1	30/15 Summer			
6.000	15 Winter	30	20%	1	30/15 Summer			
1.005	15 Winter	30	20%	1	30/15 Summer			
7.000	15 Winter	30	20%	1	30/15 Summer			
1.006	15 Winter	30	20%	1	30/15 Summer			
8.000	15 Winter	30	20%	1	30/15 Summer			
9.000	15 Winter	30	20%	1	30/15 Summer			
1.007	15 Winter	30	20%	1	30/15 Summer			
10.000	15 Winter	30	20%	1	30/15 Summer			
1.008	15 Winter	30	20%	1	30/15 Winter			

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m^3)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	91.763	-0.057	0.000	0.69	0	20	O K
	2.000	91.490	0.350	0.000	1.41	0	151	SURCH'ED
	1.001	91.350	0.270	0.000	1.02	0	179	SURCH'ED
	3.000	91.185	0.362	0.000	1.76	0	94	SURCH'ED
	1.002	91.062	0.273	0.000	1.28	0	288	SURCH'ED
	4.000	90.755	0.480	0.000	2.02	0	144	SURCH'ED
	1.003	90.659	0.405	0.000	1.38	0	406	SURCH'ED
1	5.000	90.694	0.462	0.000	1.98	0	142	SURCH'ED
	1.004	90.461	0.311	0.000	1.62	0	544	SURCH'ED
	6.000	90.389	0.589	0.000	2.01	0	150	SURCH'ED
	1.005	90.282	0.500	0.000	1.64	0	679	SURCH'ED
	7.000	89.859	0.159	0.000	0.90	0	151	SURCH'ED
	1.006	89.835	0.217	0.000	1.45	0	799	SURCH'ED
	8.000	89.978	0.363	0.000	1.97	0	80	SURCH'ED
	9.000	89.838	0.249	0.000	1.84	0	83	SURCH'ED
	1.007	89.544	0.058	0.000	1.09	0	916	SURCH'ED
	10.000	90.128	0.253	0.000	2.19	0	133	SURCH'ED
	1.008	89.397	0.033	0.000	1.22	0	1007	SURCH'ED

(c)1982-2006 Micro Drainage

Summary Wizard of "CRITICAL BY RETURN PERIOD"(Rank 1 by Max Level)
Results for Design Storms

Margin for Flood Risk warning (mm) 0 Inertia Status OFF
DVD Status OFF Analysis Time Step Fine

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 20, 20

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Winter	100	20%	1	100/15 Summer			
2.000	15 Winter	100	20%	1	30/15 Summer			
1.001	15 Winter	100	20%	1	30/15 Summer			
3.000	15 Winter	100	20%	1	30/15 Summer	100/15 Winter		
1.002	15 Winter	100	20%	1	30/15 Summer			
4.000	15 Winter	100	20%	1	30/15 Summer			
1.003	15 Winter	100	20%	1	30/15 Summer			
5.000	15 Winter	100	20%	1	30/15 Summer	100/15 Winter		
1.004	15 Winter	100	20%	1	30/15 Summer			
6.000	15 Winter	100	20%	1	30/15 Summer			
1.005	15 Winter	100	20%	1	30/15 Summer			
7.000	15 Winter	100	20%	1	30/15 Summer			
1.006	15 Winter	100	20%	1	30/15 Summer			
8.000	15 Winter	100	20%	1	30/15 Summer			
9.000	15 Winter	100	20%	1	30/15 Summer			
1.007	15 Winter	100	20%	1	30/15 Summer			
10.000	15 Winter	100	20%	1	30/15 Summer			
1.008	15 Winter	100	20%	1	30/15 Winter			

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	92.502	0.682	0.000	0.78	0	22	SURCH'ED
	2.000	92.330	1.190	0.000	1.57	0	167	SURCH'ED
	1.001	92.178	1.098	0.000	1.08	0	190	SURCH'ED
	3.000	92.023	1.200	0.302	1.93	0	103	FLOOD
	1.002	91.861	1.072	0.000	1.38	0	309	SURCH'ED
	4.000	91.468	1.193	0.000	2.30	0	163	SURCH'ED
	1.003	91.346	1.092	0.000	1.58	0	463	SURCH'ED
1	5.000	91.433	1.201	0.855	2.27	0	163	FLOOD
	1.004	91.091	0.941	0.000	1.87	0	630	SURCH'ED
	6.000	90.992	1.192	0.000	2.37	0	176	SURCH'ED
	1.005	90.847	1.065	0.000	1.93	0	800	SURCH'ED
	7.000	90.275	0.575	0.000	1.11	0	187	SURCH'ED
	1.006	90.234	0.616	0.000	1.76	0	967	SURCH'ED
	8.000	90.416	0.801	0.000	2.36	0	95	SURCH'ED
	9.000	90.198	0.609	0.000	2.30	0	104	SURCH'ED
	1.007	89.811	0.325	0.000	1.36	0	1147	SURCH'ED
	10.000	90.348	0.473	0.000	2.82	0	172	SURCH'ED
	1.008	89.546	0.182	0.000	1.55	0	1286	SURCH'ED

(c)1982-2006 Micro Drainage

APPENDIX C

Microdrainage results - Storage lagoon

- Microdrainage results

Summary of Results for 100 year Return Period (+20%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	12.4	12.4	88.8537	1.4537	774.9	O K
30 Summer	12.4	12.4	89.1337	1.7337	1013.3	O K
60 Summer	12.4	12.4	89.3877	1.9877	1254.7	O K
120 Summer	12.4	12.4	89.6102	2.2102	1485.7	O K
180 Summer	12.4	12.4	89.7207	2.3207	1606.8	O K
240 Summer	12.4	12.4	89.7857	2.3857	1680.1	O K
360 Summer	12.4	12.4	89.8631	2.4631	1769.8	O K
480 Summer	12.4	12.4	89.9051	2.5051	1819.6	O K
600 Summer	12.4	12.4	89.9271	2.5271	1845.6	O K
720 Summer	12.4	12.4	89.9356	2.5356	1856.0	O K
960 Summer	12.4	12.4	89.9281	2.5281	1847.1	O K
1440 Summer	12.4	12.4	89.8726	2.4726	1780.9	O K
2160 Summer	12.4	12.4	89.7817	2.3816	1676.0	O K
2880 Summer	12.4	12.4	89.6882	2.2882	1570.7	O K
4320 Summer	12.4	12.4	89.5167	2.1167	1386.2	O K
5760 Summer	12.4	12.4	89.3592	1.9592	1226.1	O K
7200 Summer	12.4	12.4	89.2092	1.8092	1082.5	O K
8640 Summer	12.4	12.4	89.0657	1.6657	952.7	O K
10080 Summer	12.4	12.4	88.9307	1.5307	837.3	O K
15 Winter	12.4	12.4	88.9687	1.5687	869.4	O K
30 Winter	12.4	12.4	89.2677	1.8677	1137.5	O K
60 Winter	12.4	12.4	89.5392	2.1392	1409.6	O K
120 Winter	12.4	12.4	89.7802	2.3802	1673.9	O K
180 Winter	12.4	12.4	89.9002	2.5002	1813.9	O K
240 Winter	12.4	12.4	89.9722	2.5721	1900.1	O K
360 Winter	12.4	12.4	90.0611	2.6611	2009.4	O K
480 Winter	12.4	12.4	90.1131	2.7131	2074.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	99.22	24
30 Summer	65.14	38
60 Summer	40.72	68
120 Summer	24.58	128
180 Summer	18.04	186
240 Summer	14.40	246
360 Summer	10.46	366
480 Summer	8.34	484
600 Summer	6.99	604
720 Summer	6.04	724
960 Summer	4.80	962
1440 Summer	3.47	1230
2160 Summer	2.50	1588
2880 Summer	1.98	1992
4320 Summer	1.43	2808
5760 Summer	1.13	3584
7200 Summer	0.94	4392
8640 Summer	0.81	5104
10080 Summer	0.71	5848
15 Winter	99.22	24
30 Winter	65.14	38
60 Winter	40.72	68
120 Winter	24.58	126
180 Winter	18.04	184
240 Winter	14.40	242
360 Winter	10.46	360
480 Winter	8.34	476

(c)1982-2006 Micro Drainage

Summary of Results for 100 year Return Period (+20%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
600 Winter	12.4	12.4	90.1431	2.7431	2112.3	O K
720 Winter	12.4	12.4	90.1591	2.7591	2133.0	O K
960 Winter	12.4	12.4	90.1656	2.7656	2141.5	O K
1440 Winter	12.4	12.4	90.1236	2.7236	2087.6	O K
2160 Winter	12.4	12.4	90.0156	2.6156	1953.1	O K
2880 Winter	12.4	12.4	89.9086	2.5086	1823.9	O K
4320 Winter	12.4	12.4	89.6742	2.2741	1555.3	O K
5760 Winter	12.4	12.4	89.4467	2.0467	1314.2	O K
7200 Winter	12.4	12.4	89.2267	1.8267	1099.1	O K
8640 Winter	12.4	12.4	89.0147	1.6147	908.5	O K
10080 Winter	12.4	12.4	88.8177	1.4177	746.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	6.99	592
720 Winter	6.04	706
960 Winter	4.80	934
1440 Winter	3.47	1368
2160 Winter	2.50	1712
2880 Winter	1.98	2164
4320 Winter	1.43	3068
5760 Winter	1.13	3912
7200 Winter	0.94	4688
8640 Winter	0.81	5448
10080 Winter	0.71	6152

(c)1982-2006 Micro Drainage

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	20.100	Shortest Storm (mins)	15	Climate Change %	+20
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 3.536

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	1.151	4	8	2.212	8	12	0.173

(c)1982-2006 Micro Drainage

APPENDIX D

Overland flood routing

- Drg 060629/C/502