

E.V. Waddington Ltd.

The Oval Plot, Rockingham

Proposed Drainage Strategy

The proposed development comprises the construction of a single, industrial use building and associated vehicle access/parking areas. The developer owns land adjacent to this application site on which a Drive Thru' Starbucks has recently been completed (planning approval 2018/1334). A site location plan Drg. No. 39724/201A and a proposed site layout Drg. No. 39724/202B are appended.

Proposed Surface Water Drainage Strategy

A Drainage Strategy accompanied the application for the Drive Thru' and this outlined the design parameters for the proposed surface water drainage system for the wider site and described off-site works to connect the development to a suitable point of disposal. These off-site works have now been completed and so works for the current application are restricted to within the site boundary.

It was agreed as part of the Drive Thru' application that the surface water discharge rate from the whole of the development site (the Drive Thru' and the current application site) would be restricted to the existing "green-field" run-off rates, which were established as being 3.4 litres/second/hectare for the 1 in 1 year rainfall event, and 8.6 litres/second/hectare for the 1 in 30 year rainfall event. A staged discharge would then be provided, so that run-off from events up to and including the 1 in 30 return period be restricted to the 1 in 1 year discharge rate, with more onerous events up to the 1 in 100 year return period plus an allowance of 30% for climate change restricted to the 1 in 30 year rate. However, as the Drive Thru' had a relatively small impermeable area (approx. 2,000 m²), it was agreed that the permitted discharge rate from this area would be set to ensure that the vortex flow control device had an orifice of 50mm diameter, in order to reduce the risk of frequent blockages. The actual rate would be confirmed at detail design stage to suit the head of water within the system being attenuated. This discharge rate was later established as 1.7 litres/second, as shown on the appended as-built external drainage layout for the Drive Thru', Drg. No. 39724/041F.

As can be seen from the as-built drawing, a 150 dia. pipe has been provided into the current application site to receive surface water. This pipe connects downstream of the flow control device for the Drive Thru' site, meaning that the total flow from the overall site is a sum of the design rates of the existing and proposed flow control devices.

The total permitted discharge rate is obtained by taking the "green-field" run-off rates given earlier and applying these to the impermeable area of the overall site. The impermeable areas of the Drive Thru' and current application site are 2,000 m² and 9,020 m² respectively, a total of 11,020 m² (1.1 Ha). The permitted discharge rates for events up to 1 in 30 year and for the 1 in 100 year plus 30% are therefore 3.7 litres/second (1.1 x 3.4) and 9.4 litres/second (1.1 x 8.6) respectively.

To obtain the permitted discharge rates for the current application site, the existing flow rate from the Drive Thru' site system must be deducted. Therefore, the two discharge rates obtained above must each be reduced by 1.7 litres/second, giving figures of 2.0 litres/second and 7.7 litres/second.

As previously discussed, as a staged discharge is proposed it is necessary to provide two vortex flow control devices within the new surface water drainage system serving the current application site. These two flow controls, Device 1 & Device 2, are to have design flow rates of 2.0 litres/second and 5.7 litres/second (7.7 – 2.0) respectively.

Appended are sheets SW1A, SW2A & SW3A which determine the required storage for the design rainfall events using the rates obtained for the flow control devices.

Sheet SW1A shows that the volume of storage required for the critical duration 1 in 30 year event (1200 minutes) is 375 m³. This storage is to be fed by an overflow from the chamber containing Device 1.

Sheet SW2A shows that the during 1 in 100 year + 30% events the 375m³ of storage is calculated to be fully utilised after a 61 minute duration storm. At this point, exceedance volumes will overflow into the chamber containing Device 2, and will then overflow again into the second block of storage.

Sheet SW3A shows that the volume of storage required for the critical duration 1 in 100 year event plus 30% for climate change (360 minutes) is 490 m³. Therefore, the storage associated with Device 2 will require a volume of 115m³ (490-375).

As outlined above, the volumes of attenuated surface water run-off will be retained on site within two separate off-line blocks of proprietary below ground voided storage units, each being fed by separate overflow pipes from the two flow control device chambers. The below ground pipework is to be arranged in such a way that only when the storage block associated with Device 1 is full, will flows reach Device 2. This ensures that the staged discharge functions within the previously discussed design principles, whereby flows are restricted to the 1 in 1 year rate during events up to 1 in 30 year return period and to the 1 in 30 year rate for more onerous events.

All parking area run-off will pass through a suitably sized Class 1 interceptor with high level alarm.

Proposed Foul Drainage Strategy

As with the surface water, the previously approved Drive Thru' Drainage Strategy discussed the necessary off-site works required to connect the development plot to the public sewer network. These works have now been completed and so works for the current application are restricted to within the site boundary.

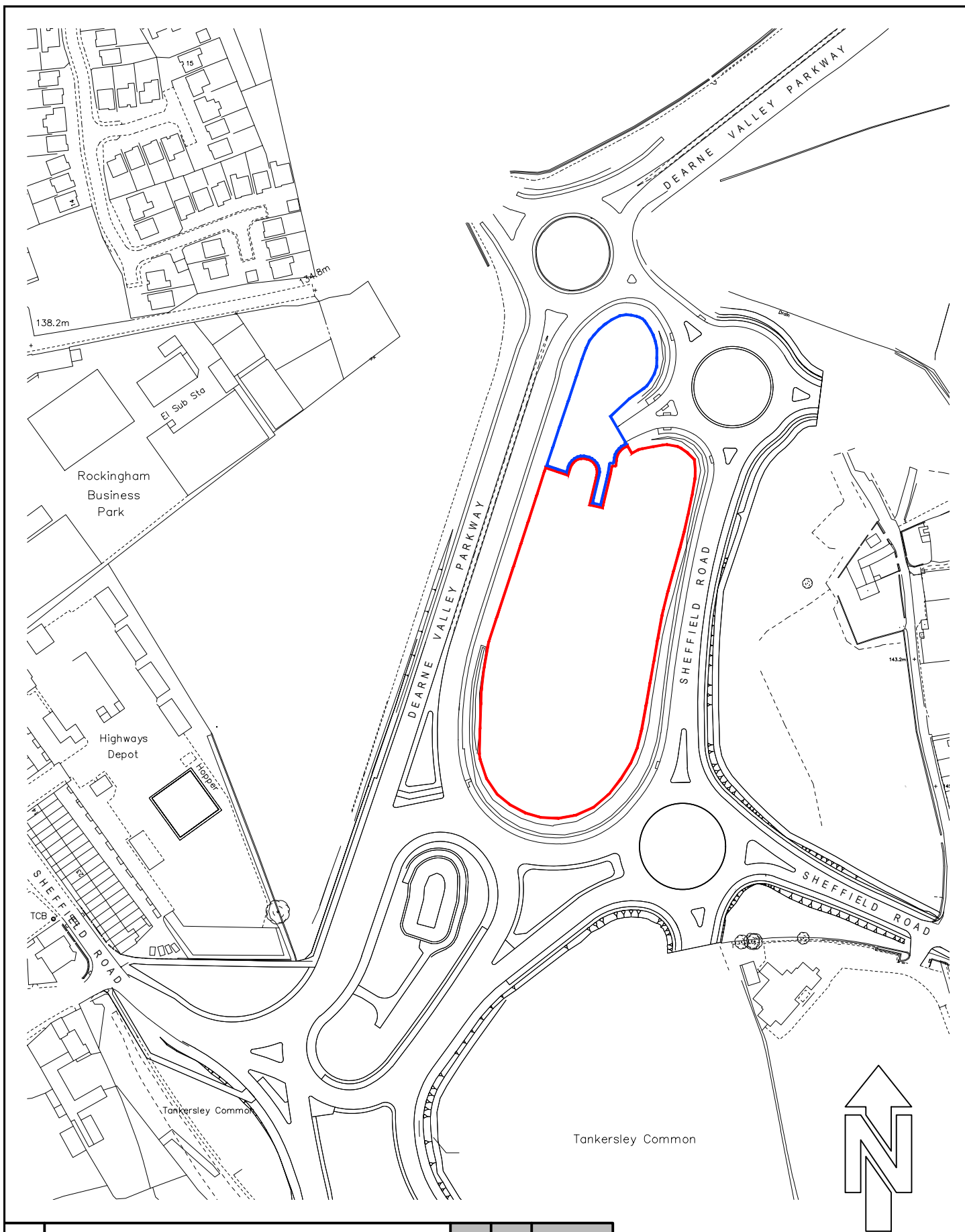
Again, the appended as-built external drainage layout for the Drive Thru', Drg. No. 39724/041F, shows a 150 dia. pipe has been provided into the current application site to receive foul discharge. Therefore, it is proposed that all new foul effluent is drained by gravity and discharged into this existing private foul drainage system, providing conveyance to the public sewer network.

Proposed Drainage Layout

Eastwood & Partners Drg. No. 39724/211B is appended showing the proposed foul and surface water drainage system layouts which are based upon the strategies outlined above.

Proposed Drainage Maintenance

The proposed foul and surface water drainage systems are to remain private and will be maintained by the developer in accordance with the appended maintenance schedule.



A First Issue.

Eastwood & Partners
CONSULTING ENGINEERS



St. Andrew's House
23 Kingfield Road
Sheffield. S11 9AS

Tel 0114 255 4554
Fax 0114 255 4330

DATE
04-08-20

SCALE AT A4
1:2500

E.V WADDINGTON LTD.
ROCKINGHAM
SITE LOCATION PLAN

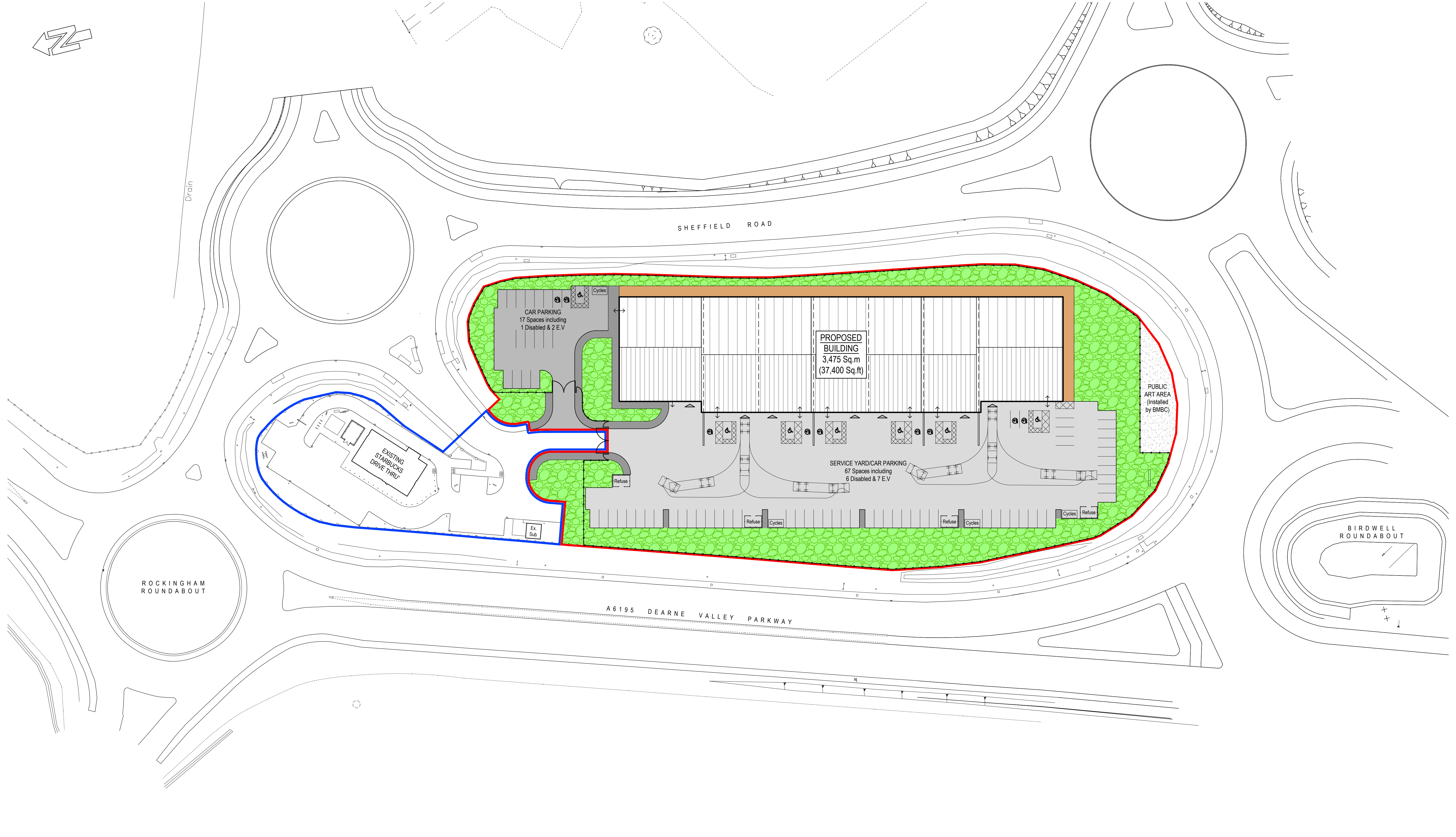
CHECKED
AP

DRAWING STATUS
PRELIMINARY

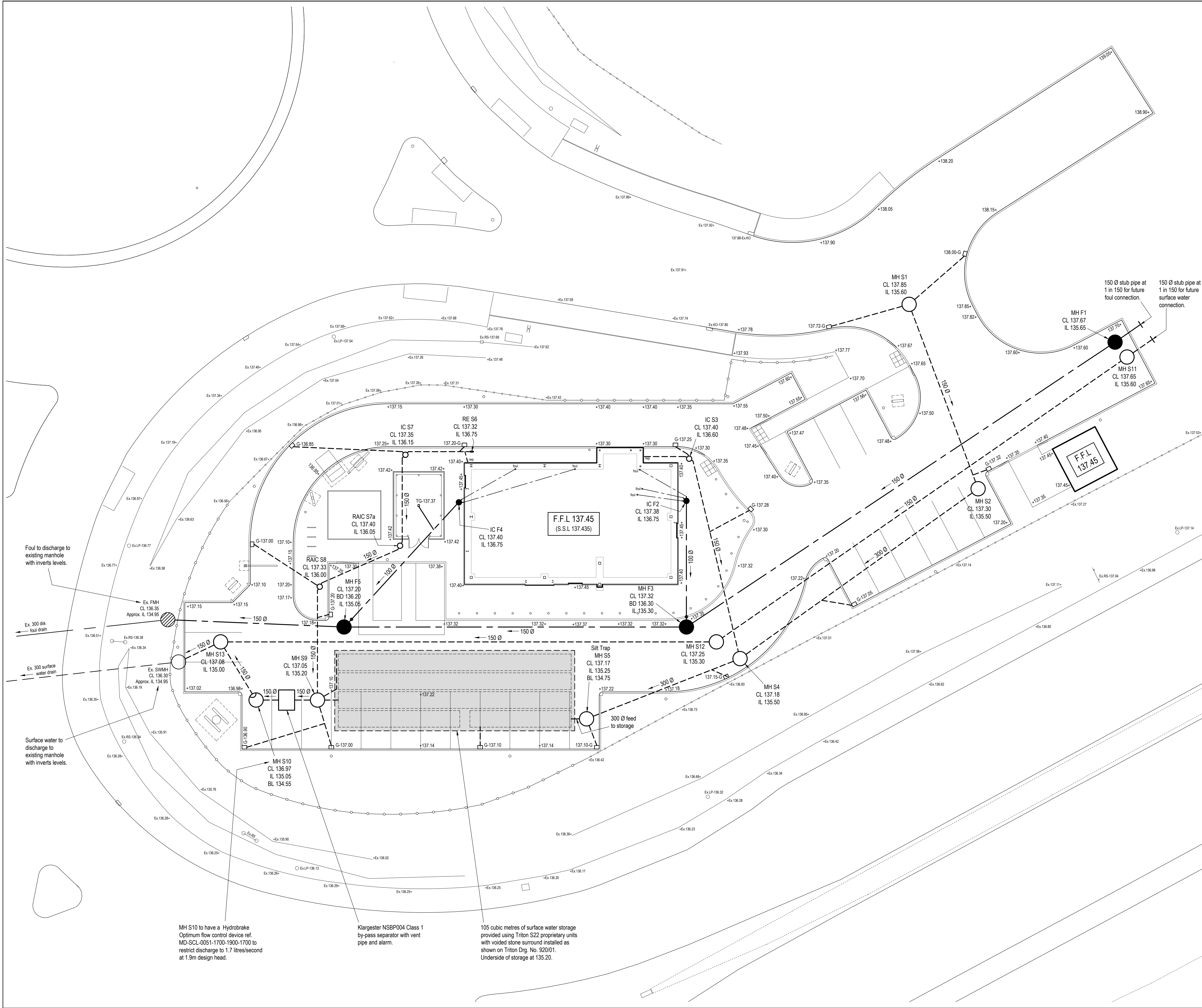
DRAWN
MW

DRAWING NUMBER
39724/201

REV
A



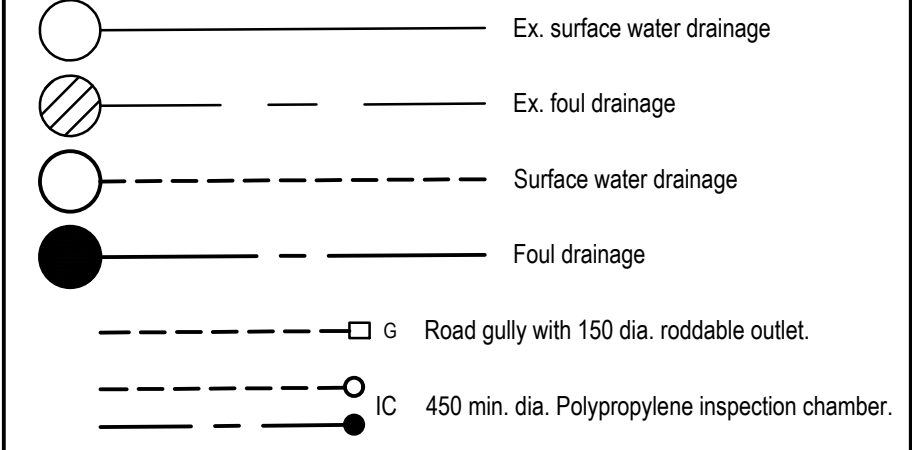
NOTES							REV	DESCRIPTION			SIG	CHK	DATE	E.V WADDINGTON LTD.	Eastwood & Partners CONSULTING ENGINEERS St. Andrew's House 23 Kingfield Road Sheffield S11 9AS Tel 0114 255 4554 Fax 0114 255 4330 mail@eastwoodandpartners.com www.eastwoodandpartners.com E&P				
Concrete Service Yard/Car Parking. Tarmac Access Road. Tarmac footway. Gravel. Landscaping. New 2.4m high black weld mesh fencing with matching gates.							A	First Issue.											
							B	Revised to suit reduced building footprint area granted planning approval.			MW	AP	30.03.21						
														ROCKINGHAM					
														PROPOSED SITE LAYOUT					
												SCALE WHEN PLOTTED AT A1			DRAWING STATUS				
												1:500			PRELIMINARY				
												DRAWN	CHECKED	DATE	DRAWING NUMBER		REV		
												MW	AP	04-08-20	39724/202		B		



INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

- NOTES
- This drawing to be read in conjunction with Eastwood & Partner's drawing number 39724/042.
 - All pipes shall be either :-
 - A - Vitrified clay to BS EN 295 with a minimum crushing strength as follows :-
 - 150 dia. - 40 kN/m
 - 225 dia. - 45 kN/m
 - 300 dia. - 72 kN/m

OR
 - B - Class H concrete to BS 5911. OR
 - C - PVC to have BSI kitemark status (certified to WIS 4-35-01) Wavin or similar approved. Maximum pipe length to be 3m.
 - All pipes are to be laid soffit to soffit at manholes unless noted otherwise.
 - Pipes entering manholes and road gullies shall have a flexible joint within 600 of the inside of the manhole or gully joining with a short Rocker pipe.
 - All pipes to be 100 dia. unless noted otherwise.
 - All works and materials to be in accordance with "Sewers for Adoption" (6th edition), bedded with a Class S granular bed and surround as a minimum requirement. Pipes within highways with cover less than 1200 to have a Class Z concrete bed and surround. Pipes within paved areas with cover less than 600 to have a Class Z concrete bed and surround. Pipes within landscaped areas with cover less than 300 to have a Class Z concrete bed and surround.
 - All trenches in roads and paved areas shall be backfilled with Type 1 DOT granular sub-base material.
 - All cover levels are indicative only. Covers to be set to suit camber/gradient of existing and proposed surfacings.
 - The invert levels at the proposed points of connection to existing drains shall be checked before any new drains are constructed. Any variation to the levels shown on the drawing shall be notified to Eastwood & Partners.



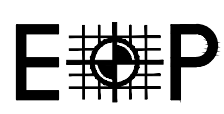
F	As Built Issue.	GB	JEST	18.12.19
E	S5 repositioned & levels amended and underside of storage level amended, all to suit tank supplier's detail proposals.	MW	AP	03.06.19
D	Construction Issue	MW	AP	22.03.19
C	Foul drainage revised to suit required "pop-up" locations. S10 base levels lowered.	MW	AP	18.03.19
B	Waiting Bay and Staff Parking Bay repositioned.	MW	AP	17.02.19
A	First Issue.			
REV	DESCRIPTION	SIG	CHK	DATE

E.V WADDINGTON LTD.

ROCKINGHAM

STARBUCKS
EXTERNAL DRAINAGE LAYOUT

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SCALE WHEN PLOTTED AT A1 1:150		DRAWING STATUS AS BUILT	
DRAWN MW	CHECKED AP	DATE 14-02-19	DRAWING NUMBER 39724/041
			REV F

Project: E.V Waddington - Rockingham Site	Sheet	SW1A
	Job No.	39724
	Date	15/04/2021
Subject: Surface Water Storage - 1 in 30 year	Designed	MW
	Checked	
	Revision	

Site Details :**Information From Wallingford Maps :**

Location :	Barnsley	M5-60	19.0 mm
Grid Ref :		r	0.36
		SAAR	750 mm
Total Site Area	1.317 ha	UCWI	80 (Fig. 9.7)
		Soil Type	4
Roof	ha	SOIL	0.45 (Section 7.4)
Paved	ha		
Other	ha		
Total Impermeable	0.902 ha		
PIMP	68.5%		
PR	53.5	Equation 7.3	
Cv	0.78	Equation 7.21	
Default Cv	0.84	Designer to insert to override calculated Cv	
Design Return Period	30 Years	Max. Branch Length	100
		Approx. Time of Flow	1.7 mins

Percentage Increase For Climate Change:**0%****Details of Restricted Discharge :**

Maximum Permitted Rate of Flow from the System

2.0 Litres/sec

Assumed Average Flow as a Proportion (Estimate)

80 %**Average Rate of Flow****1.6** Litres/sec**Calculation of Critical Duration and Storage Volume Required :**

Trial Durations (mins)	600	720	840	960	1080	1200	1440
Average Point Intensity (mm/hr)	5.5	4.8	4.2	3.8	3.5	3.2	2.8
Volume of Run-off for the period = Area x Cv x i x D (m3)	413.4	432.3	448.8	463.5	476.8	489.0	510.7
With climate change	413.4	432.3	448.8	463.5	476.8	489.0	510.7
Volume of Out-flow for the period = Ave. flow x (D+Tf)(m3)	57.8	69.3	80.8	92.3	103.8	115.4	138.4
Storage Volume for this Duration (m3)	355.7	363.0	368.0	371.2	373.0	373.6	372.3

Storage Volume Required for**30 Year Return Period = 373.6 m3**

Project: E.V Waddington - Rockingham Site	Sheet	SW2A
	Job No.	39724
	Date	15/04/2021
Subject: Duration at which flow control device 2 is first used	Designed	MW
	Checked	
	Revision	

Site Details :**Information From Wallingford Maps :**

Location :	Barnsley	M5-60	19.0 mm
Grid Ref :		r	0.36
		SAAR	750 mm
Total Site Area	1.317 ha	UCWI	80 (Fig. 9.7)
		Soil Type	4
Roof	ha	SOIL	0.45 (Section 7.4)
Paved	ha		
Other	ha		
Total Impermeable	0.902 ha		
PIMP	68.5%		
PR	53.5	Equation 7.3	
Cv	0.78	Equation 7.21	
Default Cv	0.84	Designer to insert to override calculated Cv	
Design Return Period	100 Years	Max. Branch Length	100
		Approx. Time of Flow	1.7 mins

Percentage Increase For Climate Change:**30%****Details of Restricted Discharge :**

Maximum Permitted Rate of Flow from the System

2.0 Litres/sec

Assumed Average Flow as a Proportion (Estimate)

80 %**Average Rate of Flow****1.6** Litres/sec**Calculation of Critical Duration and Storage Volume Required :**

Trial Durations (mins)	15	30	60	61	62	63	64
Average Point Intensity (mm/hr)	89.9	60.2	38.4	38.0	37.6	37.2	36.8
Volume of Run-off for the period = Area x Cv x i x D (m3)	170.3	227.9	291.0	292.6	294.2	295.7	297.2
With climate change	221.4	296.3	378.4	380.4	382.4	384.4	386.4
Volume of Out-flow for the period = Ave. flow x (D+Tf)(m3)	1.6	3.0	5.9	6.0	6.1	6.2	6.3
Storage Volume for this Duration (m3)	219.8	293.2	372.4	374.4	376.3	378.2	380.1

**375 m3 required in storage fed from
flow control Device 1 - See sheet SW1**

Project: E.V Waddington - Rockingham Site	Sheet	SW3A
	Job No.	39724
	Date	15/04/2021
Subject: Surface Water Storage - I in 100 year + 30%	Designed	MW
	Checked	
	Revision	

Site Details :**Information From Wallingford Maps :**

Location :	Barnsley	M5-60	19.0 mm
Grid Ref :		r	0.36
		SAAR	750 mm
Total Site Area	1.317 ha	UCWI	80 (Fig. 9.7)
		Soil Type	4
Roof	ha	SOIL	0.45 (Section 7.4)
Paved	ha		
Other	ha		
Total Impermeable	0.902 ha		
PIMP	68.5%		
PR	53.5	Equation 7.3	
Cv	0.78	Equation 7.21	
Default Cv	0.84	Designer to insert to override calculated Cv	

Design Return Period	100	Years	Max. Branch Length	100
			Approx. Time of Flow	1.7 mins

Percentage Increase For Climate Change: **30%**

Details of Restricted Discharge :

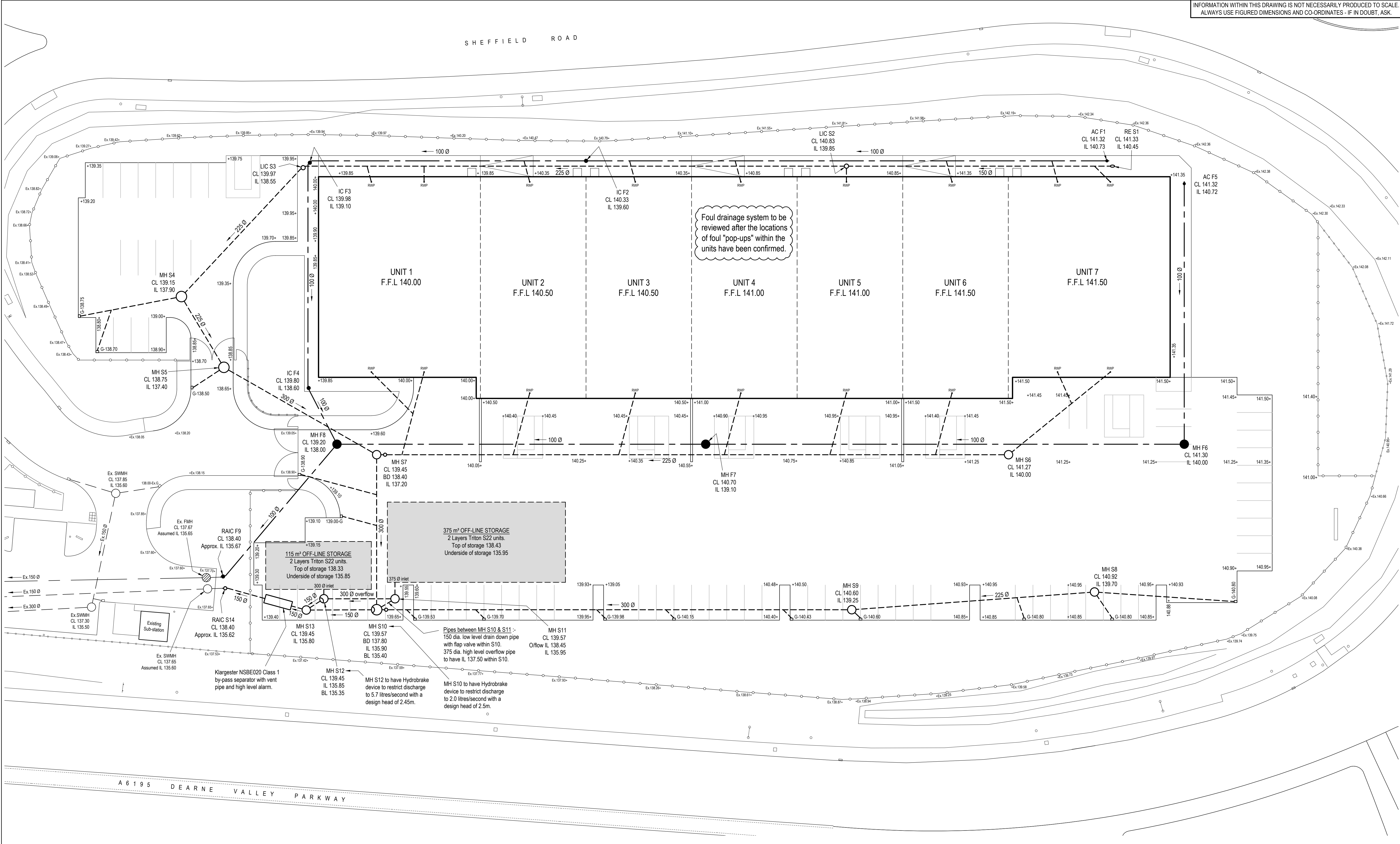
Device 2 design flow	5.7 Litres/sec
Assumed Average Flow as a Proportion (Estimate)	80 %
Device 2 Average Rate of Flow	4.6 Litres/sec

Calculation of Critical Duration and Storage Volume Required :

Trial Durations (mins)	61	90	120	240	360	480	600
Average Point Intensity (mm/hr)	38.0	29.1	23.7	14.2	10.4	8.3	7.0
Volume of Run-off for the period = Area x Cv x i x D (m3)	292.6	330.4	359.1	429.5	472.3	505.2	531.9
With climate change	380.4	429.5	466.9	558.4	614.0	656.8	691.4
Volume of Out-flow for from Device 2 = Ave. flow x (D+Tf)(m3)	0.0	8.4	16.6	49.4	82.3	115.1	147.9
Out-flow from Device 1 at a constant 2.0 l/sec after 61 minutes	6.8	11.0	14.6	29.0	43.4	57.8	72.2
Total Out-Flow =	6.8	19.4	31.2	78.4	125.7	172.9	220.1
Storage Volume for this Duration (m3)	373.6	410.1	435.7	480.0	488.3	483.9	471.3

Storage Volume Required for
100 Year Return Period = 488.3 m3

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NOTES

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 - C - PVC to have BSI kitemark status (certified to WIS 4-35-01) Wavin or similar approved. Maximum pipe length to be 3m.
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- Existing foul drainage
Existing surface water drainage
Proposed surface water drainage
Proposed foul drainage
- LIC 600 min. dia. polypropylene inspection chamber with access restricting cap.
RAIC 450 min. dia. polypropylene inspection chamber with access restricting cap.
IC 450 min. dia. polypropylene inspection chamber.
AC 300 min. dia. polypropylene access chamber.
G Road gully with 150 dia. roddable outlet.

REV	DESCRIPTION	SIG	CHK	DATE
A	First Issue.			
B	Updated following check of existing invert level and receipt of storage unit suppliers proposals.	MW	AP	12.06.21

E.V WADDINGTON LTD.

ROCKINGHAM

EXTERNAL DRAINAGE LAYOUT

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SCALE WHEN PLOTTED AT A1

1:250

DRAWING STATUS

PRELIMINARY

DRAWN
MW

CHECKED
AP

DATE
15-04-21

DRAWING NUMBER
39724/211

REV
B

E.V WADDINGTON LTD.

ROCKINGHAM

EXTERNAL DRAINAGE MAINTENANCE SCHEDULE

<u>CATEGORY</u>	<u>ACTION</u>	<u>FREQUENCY</u>
REGULAR	General removal of litter and debris from external paving and landscaping areas.	Monthly (or more frequently if required)
	Cleaning of gullies to remove debris and silt.	6 monthly, after autumn leaf fall (or more frequently if necessary)
	Cleaning of manholes to remove debris and silt.	Annually, after autumn leaf fall (or more frequently if necessary)
	Inspection of all chambers, manholes and proprietary storage units to identify and make good any defects as necessary, including CCTV survey and jetting/cleaning of pipework if necessary.	Annually and after major rainfall events.
	Removal of trapped oil and silt from proprietary Class 1 surface water separator.	Annually (or more frequently if notified by alarm)
CORRECTIVE	Clear blockages in gully outlets and branch connections.	As required
	Clear blockages in proprietary storage units.	As required