

Appendix E – Discharge Calculations

Design Rainfall

In accordance with the Wallingford Procedure:

Location of catchment area	Anglesey
Storm duration	D = 2 hr
Return Period	Period = 5 yr
Ratio 60 min to 2-day rainfall of 5 yr return period	r = 0.300
5-year return period rainfall of 60 mins' duration	M5_60min = 16.0 mm
Increase of rainfall intensity	p _{climate} = 0%
Factor Z1 (Wallingford Procedure)	Z1 = 1.24
Rainfall for 2-hour storm with 5-year return period	M5-2hr _i = Z1 x M5_60min = 19.84 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.03
Rainfall for 2-hour storm with 5-year return period	M5-2hr = Z2 x M5_2hr _i = 20.44 mm
Design Rainfall Intensity	I _{max} = M5_2hr / D = 10.22 mm/hr

Maximum Surface Water Runoff

Excavation Catchment Area Field 13	A _{catch} = 300 m ²
Excavation Catchment Area Field 15	A _{catch} = 300 m ²
Excavation Catchment Area Field 9A	A _{catch} = 300 m ²
Excavation Catchment Area Field 19	A _{catch} = 300 m ²

Given the construction programme allows for a number of areas to be left open for long periods of time, it is not planned to require pumping in any more than 2No. locations at any given time:

Total Catchment	A _{catchtotal} = 1200 m ²
Percentage of area that is impermeable (CLAY)	p = 50%
Maximum surface water run-off to control	Q _{max} = A _{catchtotal} x p x I _{max} = 1.703 l/s
1.703 l/s x 60 seconds x 120 minutes = 12261.6 ltrs	= 12.262 m ³

Maximum Groundwater Ingress

Average Groundwater depth	Gw _{Depth} = 2.201m bgl
Average Depth of Excavation	Ex _{Depth} = 2.500m bgl
Total Volume - V _{sw+gw} _{dewatertotal}	= 191.662m ³
= 12.262m ³ + (0.299m x 1200m ³ x 50%ingress)	

Maximum Water Discharge Calculation

2x 4 inch pumps dewatering 2 excavations = 12.777 l/s

- (191.662/60*2)*2 = 12.777 l/s

Therefore, in one day the maximum would be;

- 12.777 l/s (using two pumps)
- 12.777*60*60 = 45,997.2 litres per hour

- $45,997.2 \times 24 = 1,103,932.8$ litres per day (assumption that continuous pumping operating at full capacity over the course of a 24-hr day at two excavation locations... the pumps will only be running during working hours (maximum 8 hours per day)
- $1,103,932.8 / 1000 = 1103.933\text{m}^3$

Siltbuster Output Calculation

Typical operating capacity of a Siltbuster is $40\text{m}^3/\text{hr}$.

- $1103.933\text{m}^3/\text{day}$ of discharge over a 24hour pumping period = $45.997\text{m}^3/\text{hr}$
- $45,997.2/60/60 = 12.777$ l/s

Water Management Parameters

Costain provide the following information as a justification to request a prescribed permit detail:

- The recorded groundwater level is approximately 2m bgl in relation to our proposed works, however our excavations go beneath this water bearing stratum/groundwater table to a max depth of 2.5m bgl.
- The maximum discharge calculations provided take account of the working area/exposed excavations and take account for any lateral migrations of water run-off from the remainder of the site, which may make its way into the working area.
- The calculations take account of groundwater which will be encountered during excavations. At this stage, it is extremely difficult to predict the groundwater ingress into the excavations. Actual ingress will only be realised once excavation starts.
- With there being 4 areas of dewatering and a maximum of 2 areas being dewatered at any given time there will be 183.989m^3 / day maximum discharge. The pumps will be used for a maximum of 8 hours per day this would equate to a continuous flow rate of $22.999\text{m}^3/\text{hr}$

Proposed Permit Parameters

Schedule 1 – Operations

Table S1.1 Activities		
Activity reference	Description of activity	Limits of specified activity
A1	Discharge of trade effluent consisting of settled site drainage, settled groundwater via various outlets	N/A

Schedule 3 – Emissions and monitoring

Table S3.1 Point Source emissions to water (other than sewer) – emission limits and monitoring requirements

Effluent(s) and discharge point(s)	Parameter	Limit (including unit)	Reference Period	Limit of effective range	Monitoring frequency	Compliance Statistic
A1 Trade effluent consisting of settled site drainage, settled groundwater and settled concrete wash water via Outlet 1	Maximum daily discharge volume	183.989m ³	Total daily volume	N/A	N/A	Maximum
	Maximum continuous flow rate	22.999m ³ /hr	Total hourly flow volume	N/A	N/A	Maximum
	pH	6 to 9	Instantaneous (spot sample)	N/A	N/A	Minimum and maximum
	Visible oil or grease	No significant trace present so far as is reasonably practicable	Instantaneous (visual examination)	N/A	N/A	No significant trace

Table S3.2 Discharge points

Effluent Name	Discharge Point	Discharge point NGR	Receiving water/Environment
A1 Trade effluent consisting of settled site drainage, settled groundwater and discharged to ground	Discharge point 1 Discharge point 2 Discharge point 3	SH 35428 93453 SH 35692 9310 SH 35517 92622	Ground – Nothing is within 10m of any watercourses