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	$M5\text{-}2hr_i$ = Z1xM5_60min = 19.84 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.03
Rainfall for 2-hour storm with 5-year return period	$M5\text{-}2hr = Z2xM5\_2hr_i$ = 20.44 mm
Design Rainfall Intensity	I_{max} = M5_2hr / D = 10.22 mm/hr

Maximum Surface Water Runoff

Excavation Catchment Area Field 1	A_{catch} = 180 m^2
Excavation Catchment Area Field 2	A_{catch} = 30 m^2
Excavation Catchment Area Field 6	A_{catch} = 39 m^2
Excavation Catchment Area Field 5	A_{catch} = 34 m^2
Excavation Catchment Area Field 9	A_{catch} = 30 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	$A_{catchtotal}$ = 313 m^2
Percentage of area that is impermeable (CLAY)	p = 50%
Maximum surface water run-off to control	$Q_{max} = A_{catchtotal} \times p \times I_{max}$ = 0.444 l/s
0.444 l/s x 60 seconds x 120 minutes = 3197.858 ltrs	= 3.198m^3

Maximum Groundwater Ingress

Average Groundwater depth	GW_{Depth} = 2.201m bgl
Average Depth of Excavation	Ex_{Depth} = 2.500m bgl
Total Volume - $Vsw+gw_{dewatertotal}$	= 81.448m^3
= 3.198m^3 + (0m x 313m^3 x 50%ingress)	

Maximum Water Discharge Calculation

2x 4 inch pumps dewatering 2 excavations = 5.430 l/s

- (81.448/60*2)*2 = 5.430 l/s

Therefore, in one day the maximum would be;

- 5.430 /s (using two pumps)
- 5.430*60*60 = 19,548 litres per hour

- 19,548 *24 = 469,152 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
- 469,152 /1000 = 469.152m^3

Siltbuster Output Calculation

Typical operating capacity of a Siltbuster is 40m^3/hr.

- 469.152m^3/day of discharge over a 24hour pumping period = 19.548m^3/hr
- 19,548 /60/60 = 5.43l/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 6 areas of dewatering and a maximum of 2 areas being dewatered at any given time there will be 52.128m^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 2.172m^3/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	52.128m^3	Total daily volume	N/A	N/A	Maximum
	Maximum continuous flow rate	2.172m^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 Discharge point 4 Discharge point 5 Discharge point 6	SH 35503 92461 SH 35627 92362 SH 35785 92279 SH 35785 92279 SH 35909 92257 SH 36019 92150	Ground – Nothing is within 10m of any watercourses