Your Ref: SUD ES 2017 006 relating to LW/789/CM(EIA)
Our Ref: L/PDE/NWH/006.doc/17

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Mr Charlie Cooper,
Sustainable Drainage Advisor,
Flood Risk Management – CET,
East Sussex County Council,
County Hall,
St. Anne's Crescent,
Lewes,
BN7 1UE

31st October 2017

Dear Mr Cooper,

**In response to Detailed Comments from Lead Local Flood Authority (SUD ES 2017 006) relating to Planning Application LW/789/CM(EIA) for Installation and Operation of Asphalt Plant, Concrete Batching Plant and Gully Waste Plant, together with Ancillary Development and Access**

I am responding to the Detailed Comments enclosed with the letter from Edward Sheath (Head of Planning and Environment) dated 13th July 2017 (reference: SUD ES 2017 006).

Connecting to Denton Sewer

Following your advice, the updated drainage proposals involve connecting to Denton Sewer for onward discharge to the tidal reach of the River Ouse (rather than relying upon a pumped outfall). The location, sizing and capacity of the Site's pre-existing inlet pipes are detailed in previous correspondence (email dated 29th September 2017 from Andrew Hack, Estates Manager at F M Conway Ltd). The maximum potential discharge rate in the pre-existing inlet pipes is estimated at 160L/sec. This will be reduced to 80L/sec in order to provide 50% betterment.

Storage calculations have been completed using the IH124 drainage tool designed by HR Wallingford (HR Wallingford 2004) working in conjunction with the Environment Agency to provide a simple, nationally available and consistent methodology for estimating limiting discharges for drainage systems. It complies with the Environment Agency position on site runoff discharge management (the Defra/ Environment Agency document 'Preliminary rainfall runoff management for developments', SC030219 rev. E (2013)).

The calculations are appended: "HRW_UKSuds_Storage_Report: 95 percent paved (IH124, 95 PIMP, 1.4CC, 80L-sec)".

In the IH124 drainage tool, the Site discharge rate has been edited so that it equates to 80L/sec.

Applying this edited rate, the total storage (including treatment storage) is 1,558 $m^3$. This is on the assumption that 95% of the surface area of the Site will be paved. The climate change factor has been increased to 40% in response to the final bullet point in your Detailed Comments.



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Tide Locking

Based upon (i) visual inspection of the invert level at the outfall from Denton Sewer into the River Ouse and (ii) previous liaison with the Environment Agency, it is concluded that the sewer is locked for *circa* 6 hours per tidal cycle. The outfall is set at *circa* 0.00 maOD.

The IH124 drainage tool cannot be used to quantify the impact caused by tide locking; therefore, an alternative approach has been adopted: Runoff calculations have been completed using the Modified Rational Method.

The spreadsheet has been adjusted to reflect the worst-case scenario, where the onset of the 100-year event coincides with the 6-hour period of tide locking *i.e.* the discharge rate of 80L/sec is postponed for 6 hours. In other words, for the first 6 hours, the spreadsheet assumes that there is no discharge from the outfall.

In reality, some flow will occur during tide locking, because the outfall (0.00 maOD) will be subject to a head of up to 3.5 m as a result of the formalised storage infrastructure (see below).

With zero discharge in the first 6 hours, the Modified Rational Method indicates that the attenuation storage requirement is increased to 1,830 $m^3$. The calculations are appended: "Runoff Assessment for the 100-Year Storm Event".

Attenuation Storage Infrastructure

In response to the second paragraph in your Detailed Comments, the proposed layout has been updated to include formalised storage infrastructure to accommodate 1,560 $m^3$ of rainfall runoff. This volume of water is contained below 3.46 maOD within the area highlighted (tinted blue) upon the attached drawing "CWY51-EW-00-004 rev P3 Proposed Surface Levels", which has been circulated to the Council and Environment Agency by previous email (Andrew Hack, 18th October 2017).

In this layout, an additional 270 $m^3$ of storm runoff can be safely contained in the same footprint (tinted blue) by allowing 20 mm depth of standing water in this area. This gives an overall storage volume of 1,830 $m^3$ contained below 3.48 maOD, which is sufficient to accommodate the attenuation storage requirement for the 100-Year Storm Event with Tide Locking.

The containment volume can be increased to 2,060 $m^3$ by allowing standing water up to 3.50 maOD. This will only encroach upon areas of the Site where activities are classed as "Less Vulnerable" (as per Flood Risk Vulnerability Classification in Table 2 "Planning Practice Guidance for Flood Risk and Coastal Change", DCLG, updated 6th March 2014). The finished floor level for more vulnerable operations is maintained dry in this scenario.

The Site will be bunded to give a minimum perimeter level (including the entrance/egress points) of 3.70 maOD. By allowing water to rise from 3.50 maOD up to 3.70 maOD, an additional volume of 3,720 $m^3$ can be contained without risk of overtopping the Site boundary. This brings the total volume contained below 3.70 maOD up to 5,780 $m^3$.

**It should be noted that the current configuration of the Site (in its pre-development brownfield state) provides negligible storage space for rainfall runoff, estimated at only 450 $m^3$.**

**Thus, the development proposal compares very favourably with the existing situation**.

Safe Egress and Access Routes

The drainage proposals have been updated to provide safe containment of runoff in the 100-year event. The question of Safe Egress and Access Routes can be dealt with by signposting to indicate a route that avoids the area tinged blue on drawing "CWY51-EW-00-004 rev P3 Proposed Surface Levels".

The Applicant should register with the Environment Agency's "Floodline Warnings Direct". If the design storm is exceeded (*e.g.* by the 1,000-Year Tidal Surge), the Applicant would be forewarned by the Environment Agency and evacuate the Site in a timely manner.

Hydraulic Calculations for Range of Storm Events

The third paragraph of Detailed Comments was written when the development proposal did not include any formalised storage infrastructure. In light of these design improvements, there is no longer any requirement to assess the implications of storm events with a return period of less than 100 years.

Discharge Rates and Water Quality

The fourth and fifth paragraphs of the Detailed Comments will be addressed by liaison with the Environment Agency.

**David Griggs (Planning Advisor at the Agency) has confirmed by email dated 24th October 2017 that the Agency's environmental management teams will decide upon pollution prevention measures, the implementation of which will be determined "via a planning condition or an environmental permit for trade discharge into the river. Either way, it won't be an obstacle to permission being granted as far as the EA is concerned".**

Climate Change Factor

As outlined earlier, the climate change factor in the IH 124 drainage tool has been increased to 40% in response to the final bullet point in your Detailed Comments.

I trust that the foregoing is suitable for your purposes. Please do not hesitate to contact me on 07773 319271 should you wish to discuss the matter further.

Yours sincerely

Henry Lister
**Senior Hydrogeologist**
**BCL Consultant Hydrogeologists Limited**

HR Wallingford
Working with water

# Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

| | |
|---|---|
| Calculated by: | Henry Lister |
| Site name: | North Quay, Newhaven |
| Site location: | Newhaven, BN9 0AB |

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates

| | |
|---|---|
| Latitude: | 50.79712° N |
| Longitude: | 0.05231° E |

| | |
|---|---|
| Reference: | 6071642 |
| Date: | 2017-09-29T15:00:46 |

| Methodology | IH124 |
|---|---|

## Site characteristics

| | |
|---|---|
| Total site area (ha) | 2.64 |
| Significant public open space (ha) | 0 |
| Area positively drained (ha) | 2.64 |
| Pervious area contribution (%) | 30 |
| Impermeable area (ha) | 2.508 |
| Percentage of drained area that is impermeable (%) | 95 |
| Impervious area drained via infiltration (ha) | 0 |
| Return period for infiltration system design (year) | 10 |
| Impervious area drained to rainwater harvesting systems (ha) | 0 |
| Return period for rainwater harvesting system design (year) | 10 |
| Compliance factor for rainwater harvesting system design (%) | 66 |
| Net site area for storage volume design (ha) | 2.64 |
| Net impermeable area for storage volume design (ha) | 2.52 |

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

## Design criteria

| | |
|---|---|
| Volume control approach | Flow control to max of 2 l/s/ha or |

| | Default | Edited |
|---|---|---|
| Climate change allowance factor | 1.4 | 1.4 |
| Urban creep allowance factor | 1.1 | 1.1 |
| Interception rainfall depth (mm) | 5 | 5 |
| Minimum flow rate (l/s) | 5 | 5 |

| | |
|---|---|
| Qbar estimation method | Specify Qbar manually |
| SPR estimation method | Calculate from SOIL type |

| | Default | Edited |
|---|---|---|
| Qbar total site area (l/s) | 8.08 | 80 |
| SOIL type | 3 | 3 |
| HOST class | N/A | N/A |
| SPR | 0.37 | 0.37 |

## Hydrology

| | Default | Edited |
|---|---|---|
| SAAR (mm) | 739 | 739 |
| M5-60 Rainfall Depth (mm) | 20 | 20 |
| 'r' Ratio M5-60/M5-2 day | 0.3 | 0.3 |
| Rainfall 100 yrs 6 hrs | 70 | |
| Rainfall 100 yrs 12 hrs | 99.12 | |
| FEH/FSR conversion factor | 1.18 | 1.18 |
| Hydrological region | 7 | |
| Growth curve factor: 1 year | 0.85 | 0.85 |
| Growth curve factor: 10 year | 1.62 | 1.62 |
| Growth curve factor: 30 year | 2.3 | 2.3 |
| Growth curve factor: 100 year | 3.19 | 3.19 |

## Site discharge rates

| | Default | Edited |
|---|---|---|
| Qbar total site area (l/s) | 8.08 | 80 |
| Qbar net site area (l/s) | 8.08 | 80 |
| 1 in 1 year (l/s) | 6.9 | 68 |
| 1 in 30 years (l/s) | 8.1 | 80 |
| 1 in 100 years (l/s) | 8.1 | 80 |

## Estimated storage volumes

| | Default | Edited |
|---|---|---|
| Interception storage ($m^3$) | 100 | 100 |
| Attenuation storage ($m^3$) | 3808 | 1157 |
| Long term storage ($m^3$) | 0 | 0 |
| Treatment storage ($m^3$) | 301 | 301 |
| Total storage *(excluding treatment)* ($m^3$) | 3908 | 1257 |

# Runoff Assessment for the 100-Year Storm Event

**RUNOFF ASSESSMENT FOR THE 100-YEAR STORM EVENT**

**i) RETURN PERIOD (Design Storm)**

**T (Rounded; yr) = 100** (as per National Planning Policy Framework & supporting technical guidance)

**iia) PEAK FLOW RATE**

Q = 2.78 AKI Modified Rational Method

Catchment Area (A; ha) = 2.64 (surface area of site)

Runoff coefficient (K) = 0.95 (nomogram)

I (mm/hr) = 118.60 (15 minutes duration)

**Q (l/s) = 827**

**iib) AVAILABLE SOAKAWAY AREA**

**Area (m2) = 0** (no soakaway potential)

**iii) ATTENUATION STORAGE VOLUME FOR GIVEN DISCHARGE RATE**

**Qp(l/s) = 80.00** (set at 80 l/s after 6 hrs of tide locking)

| Storm Duration | Storm Duration | Rainfall Intensity | Volume of Incident Rainfall since commencement of storm | Volume of Discharge since commencement of storm | Storage Required |
|---|---|---|---|---|---|
| (mins) | (hrs) | (mm/hr) | (m3) | (m3) | (m3) |
| 15 | 0.25 | 118.6 | 744 | 0 | 744 |
| 30 | 0.50 | 72.98 | 916 | 0 | 916 |
| 45 | 0.75 | 54.73333333 | 1030 | 0 | 1030 |
| 60 | 1.00 | 44.55 | 1118 | 0 | 1118 |
| 75 | 1.25 | 37.96 | 1191 | 0 | 1191 |
| 90 | 1.50 | 33.28666667 | 1253 | 0 | 1253 |
| 105 | 1.75 | 29.78285714 | 1308 | 0 | 1308 |
| 120 | 2.00 | 27.04 | 1357 | 0 | 1357 |
| 135 | 2.25 | 24.82666667 | 1402 | 0 | 1402 |
| 150 | 2.50 | 23 | 1443 | 0 | 1443 |
| 165 | 2.75 | 21.46181818 | 1481 | 0 | 1481 |
| 180 | 3.00 | 20.14666667 | 1517 | 0 | 1517 |
| 195 | 3.25 | 19.00615385 | 1550 | 0 | 1550 |
| 210 | 3.50 | 18.00857143 | 1582 | 0 | 1582 |
| 225 | 3.75 | 17.12533333 | 1612 | 0 | 1612 |
| 240 | 4.00 | 16.3375 | 1640 | 0 | 1640 |
| 255 | 4.25 | 15.63058824 | 1667 | 0 | 1667 |
| 270 | 4.50 | 14.99111111 | 1693 | 0 | 1693 |
| 285 | 4.75 | 14.41263158 | 1718 | 0 | 1718 |
| 300 | 5.00 | 13.882 | 1742 | 0 | 1742 |
| 315 | 5.25 | 13.39428571 | 1765 | 0 | 1765 |
| 330 | 5.50 | 12.94727273 | 1787 | 0 | 1787 |
| 345 | 5.75 | 12.53217391 | 1809 | 0 | 1809 |
| 360 | 6.00 | 12.14833333 | 1830 | 0 | 1830 |
| 375 | 6.25 | 11.7904 | 1850 | 72 | 1778 |
| 390 | 6.50 | 11.45692308 | 1869 | 144 | 1725 |
| 405 | 6.75 | 11.14518519 | 1888 | 216 | 1672 |
| 420 | 7.00 | 10.85142857 | 1907 | 288 | 1619 |
| 435 | 7.25 | 10.57655172 | 1925 | 360 | 1565 |
| 450 | 7.50 | 10.316 | 1942 | 432 | 1510 |
| 465 | 7.75 | 10.07096774 | 1959 | 504 | 1455 |
| 480 | 8.00 | 9.84 | 1976 | 576 | 1400 |
| 495 | 8.25 | 9.620606061 | 1992 | 648 | 1344 |
| 510 | 8.50 | 9.411764706 | 2008 | 720 | 1288 |
| 525 | 8.75 | 9.213714286 | 2024 | 792 | 1232 |
| 540 | 9.00 | 9.025555556 | 2039 | 864 | 1175 |
| 555 | 9.25 | 8.845405405 | 2054 | 936 | 1118 |
| 570 | 9.50 | 8.673684211 | 2068 | 1008 | 1060 |
| 585 | 9.75 | 8.50974359 | 2083 | 1080 | 1003 |
| 600 | 10.00 | 8.353 | 2097 | 1152 | 945 |
| 615 | 10.25 | 8.202926829 | 2110 | 1224 | 886 |
| 630 | 10.50 | 8.059047619 | 2124 | 1296 | 828 |
| 645 | 10.75 | 7.920930233 | 2137 | 1368 | 769 |
| 660 | 11.00 | 7.788181818 | 2150 | 1440 | 710 |
| 675 | 11.25 | 7.660444444 | 2163 | 1512 | 651 |
| 690 | 11.50 | 7.537391304 | 2176 | 1584 | 592 |
| 705 | 11.75 | 7.419574468 | 2188 | 1656 | 532 |

| | | | | | |
|---|---|---|---|---|---|
| 720 | 12.00 | 7.305833333 | 2201 | 1728 | 473 |
| 735 | 12.25 | 7.179591837 | 2208 | 1728 | 480 |
| 750 | 12.50 | 7.0584 | 2215 | 1728 | 487 |
| 765 | 12.75 | 6.941960784 | 2222 | 1728 | 494 |
| 780 | 13.00 | 6.829230769 | 2228 | 1728 | 500 |
| 795 | 13.25 | 6.720754717 | 2235 | 1728 | 507 |
| 810 | 13.50 | 6.615555556 | 2242 | 1728 | 514 |
| 825 | 13.75 | 6.514181818 | 2248 | 1728 | 520 |
| 840 | 14.00 | 6.415714286 | 2254 | 1728 | 526 |
| 855 | 14.25 | 6.320701754 | 2261 | 1728 | 533 |
| 870 | 14.50 | 6.228965517 | 2267 | 1728 | 539 |
| 885 | 14.75 | 6.139661017 | 2273 | 1728 | 545 |
| 900 | 15.00 | 6.053333333 | 2279 | 1728 | 551 |
| 915 | 15.25 | 5.969836066 | 2285 | 1728 | 557 |
| 930 | 15.50 | 5.888387097 | 2291 | 1728 | 563 |
| 945 | 15.75 | 5.80952381 | 2297 | 1728 | 569 |
| 960 | 16.00 | 5.733125 | 2302 | 1728 | 574 |
| 975 | 16.25 | 5.658461538 | 2308 | 1728 | 580 |
| 990 | 16.50 | 5.586060606 | 2313 | 1728 | 585 |
| 1005 | 16.75 | 5.515820896 | 2319 | 1728 | 591 |
| 1020 | 17.00 | 5.447058824 | 2324 | 1728 | 596 |
| 1035 | 17.25 | 5.380869565 | 2330 | 1728 | 602 |
| 1050 | 17.50 | 5.316 | 2335 | 1728 | 607 |
| 1065 | 17.75 | 5.252394366 | 2340 | 1728 | 612 |
| 1080 | 18.00 | 5.191111111 | 2345 | 1728 | 617 |
| 1095 | 18.25 | 5.130958904 | 2350 | 1800 | 550 |
| 1110 | 18.50 | 5.072432432 | 2355 | 1872 | 483 |
| 1125 | 18.75 | 5.015466667 | 2360 | 1944 | 416 |
| 1140 | 19.00 | 4.959473684 | 2365 | 2016 | 349 |
| 1155 | 19.25 | 4.904935065 | 2370 | 2088 | 282 |
| 1170 | 19.50 | 4.851794872 | 2375 | 2160 | 215 |
| 1185 | 19.75 | 4.8 | 2379 | 2232 | 147 |
| 1200 | 20.00 | 4.7495 | 2384 | 2304 | 80 |
| 1215 | 20.25 | 4.699753086 | 2389 | 2376 | 13 |
| 1230 | 20.50 | 4.651219512 | 2393 | 2448 | -55 |