



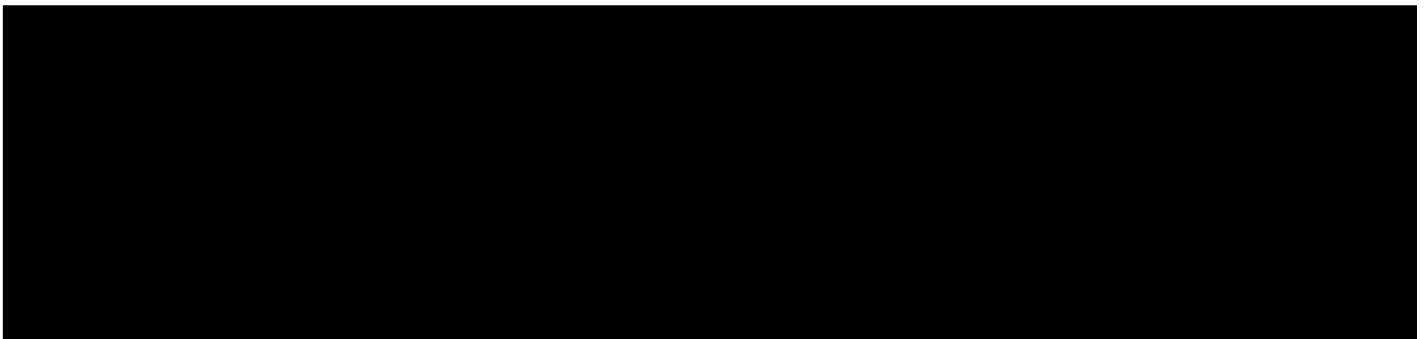
Hi Nigel

Comments in green below. I can confirm that based upon what you have provided to date, I am happy to remove our objection and request conditions to control the detailed design and maintenance.

David/Juan – I will be requesting conditions; PCENG D2 (standard condition will need some slight modification to suit), PCENG D3, PCENG D4, ENG D1 and informative's INFORM D (will need slight modification), INFORM D2 and INFORM D3.

Regards

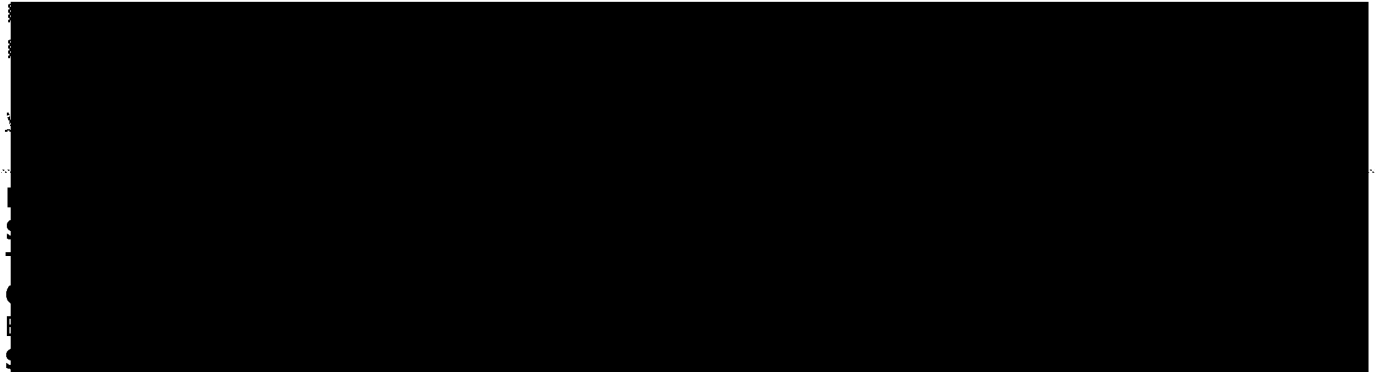
Paul Cann
Principal Engineer (Drainage)



Hi Paul,
Further to your email below, I have reviewed your comments and have provided responses to each point in red. Should you have any queries please give me a call.

Regards

Nigel Grayer
SDP Consulting Engineers
Address: Suite 3, Salar House, Campfield Road, St Albans, Herts AL1 5HT
Office Switchboard: 01727 844606



Nigel

Comments below;

1. System no.1 (adjacent Ford Road) arrangements are now much improved.
2. Two RWP's are connecting into the permeable pavement from the refuse store – can these be connected into the hydrobrake chamber associated with outfall no.1. We looked at connecting the rainwater pipes noted to outfall 1 but the levels don't allow it. The ground is at 2.8m AOD, but the water level in the attenuation connected to outfall 1 is at 3.5m AOD. Detail design may allow a deep flow gutter to be used and allow these rainwater pipes to be moved to a more suitable location or omitted. Predicted water level and proposed ground levels noted. It may be possible to connect these RWP's into outfall no.1 via a sealed system arrangement/non return valve, and potentially increasing the storage in outfall no.1 system to allow for the additional flows. Of course, this is not ideal. Whilst the potential flows are not huge, every effort should be made to remove them from the permeable pavement system (which as we know will be inundated in certain fluvial flood conditions). On this occasion, I would be happy for you to investigate other solutions as part of the detailed design.
3. Tank beneath building;
 - a) It is noted that the tank has had the orifice removed and now relies on a 150mm outlet, low level hydrobrake and sealed system to operate. The sealed part of the system will need to be very robust. Agreed. Ok
 - b) Bolted steel tank sections noted but unclear how it will be possible to unbolt them, particularly any bolts on the upper rim of the tank ie. below floor/void. Yes this needs more detailed consideration with a tank supplier/fabricator. We have also looked at designing a system where the tanks can be lowered to allow access. Access into the voids is very good as the base level is down at 2.8m AOD. The primary members could be designed with a splice in them which would allow a hydraulic winch stacker (similar to that used to install steel beams in buildings), to lower the platform and tank down allowing much better access. This needs some detailed design which would be best conditioned to allow a detailed solution to be sorted. Agreed
 - c) Tanks would need to be protected against corrosion both inside and out. Agreed. The tanks will need to be galvanised inside and out along with any steel support structure. Ok
 - d) The upstream rodding point is shown on the section but not on the plan. Specify as 300mm diameter pipe. We have amended the plan to show the pipe as 300mm in diameter. Ok

e) Show tank gradient on section. The tank gradients have been shown on the plan. I can't identify the actual gradient, however, I am happy to leave this to the detailed design. Just be aware that a reasonable fall will be expected.

e) Access is still considered an issue and needs to be addressed further. My suggestion; In addition to the rodding points, can man entry access be made into each tank? I.e. side entry via hatch with appropriate water tight pressure seals/wheel handle/etc i.e. similar to what you can get on marine vessels. We can look at providing access panels to the sides of all the tanks in conjunction with the notes for item (b) above. Again this needs some detailed design input from a manufacturer/fabricator and as with (b) above could perhaps, be conditioned. Noted, and agree it can be conditioned. The essential thing here is that you are now fully aware that the access needs to be greatly improved and some reasonable ideas have been batted about. It will now come down to the detailed design.

4. Calculations do not appear to consider surcharged outfalls. Please simulate networks 1 and 2 with two scenarios i.e. discharging against the ditch being full (to top of bank) and also assuming fluvial flood conditions i.e. 4.12m AOD. We have re-run the calculations for networks 1 and 2 for both cases and the attenuation is still acceptable as drawn. We will not need the checkmate valves and these have been removed from the drawing. Noted but I think it would be a good idea to include non-return valves/flap valves for good measure. This can be part of the detailed design.
5. Please simulate network 3 to discharge against the ditch being full (to top of bank), based upon the crated storage only. The calculations seem to be missing the page referencing the storage tank details i.e. 95% voids, etc. We have re-run the calculation for the surcharged ditch and the crated attenuation as drawn is sufficient. An additional page has been added to the calculation referencing the 95%voids etc. ok
6. The culvert to be diverted is an ordinary watercourse (landowner responsibility) but located within the Internal Drainage District which is managed by the EA. Therefore, the EA will need to agree the design (Activity Permit probably required), however, since the Internal Drainage Board is likely to be dissolved in the near future, we may also be involved in the design checking. Please note that ninety degree bends need to be avoided and therefore some slight reconfiguration is required. We note your comments regarding statutory body approvals and have made some adjustments to the route of the diverted culvert to avoid 90 degree bends. ok
7. West Sussex County Council (LLFA) have been copied in (drawings already provided to them) and will obviously need to make comments too. Noted. I am sure Kevin will provide comments upon receipt of this email.
8. If the proposals are eventually deemed acceptable, then planning conditions will be requested in order to address the fully detailed design and future maintenance arrangements. Items 2, 3, 4 and 5 need to be resolved before getting to this stage.

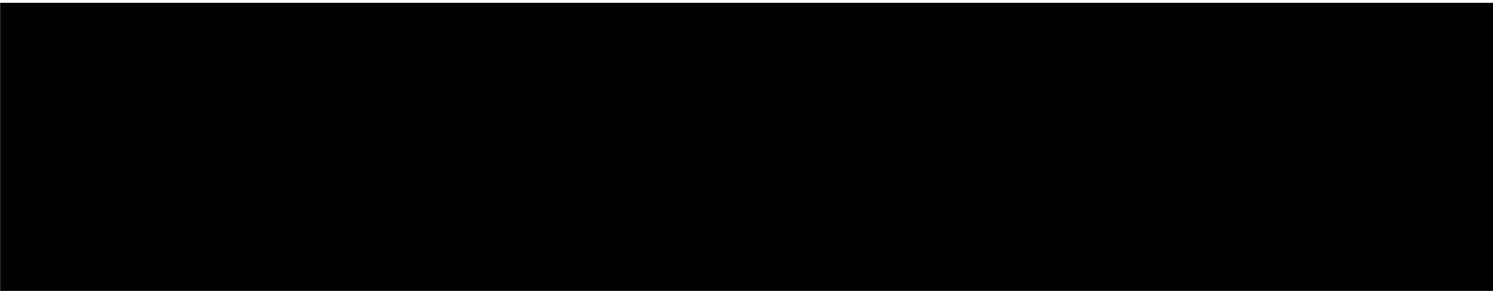
I await your reply, so the proposals can be considered further.

Regards

Paul Cann
Principal Engineer (Drainage)



Save the environment - think before you print.



Afternoon Paul,

Further to your email dated the 2nd April 2020 to Juan Baeza and David Spring, I would comment as follows.

Please find attached our revised drainage drawing E19-003-1000A and micro drainage calculations along with structural sketch E19-003-SK2000 showing the support to the raised tanks.

I have also shown below my proposed responses to the queries raised on the drainage submission. If you can review and let me have any comments and confirm who you would like me to send the response to.

1. Fluvial flood water (designing against the 1 in 100 yr +105% modelled event) will still overwhelm the car park drainage and parts of the roof drainage system (The roof water currently discharges into the system serving the permeable surfaced car park). Consider separating the roof water from the system serving the permeable pavement. I.e. provide at least two separate outfalls (possibly three bearing in mind item 2 below) to the watercourse/s with independent hydrobrakes and flap valves. Sealing all components of the roof water system below 4.12m AOD to prevent fluvial flood water inundation i.e. sealed manhole covers, etc. Accept that the permeable pavement system will be inundated with fluvial flood water, since there is little that can be done to prevent flood water entry. Compensate for this by overdesigning the permeable pavement storage (factor to be agreed).

Please find attached a copy of drawing E19-003-1000 A which has been revised as follows.

The roof drainage from each building has been separated out from the car park drainage. Each system has its own outfall into the adjacent watercourse. All manholes which have cover levels below 4.12m AOD, will have sealed bolt down covers. The storage tank for the roof water runoff by Ford Road has been set as high as possible to keep the majority above the top of ditch level (2.0m AOD). Therefore should the ditch become surcharged the storage for the roof water runoff will not become inundated. The attenuation below the car park has been sized to suit the car park runoff ignoring the voided stone below the permeable paving. The crates below the car park provide 73 Cu.M of attenuation. The 30% voided stone below the car park will provide approximately an extra 150 Cu.M of attenuation.

2. Tank access for maintenance is still an issue. Whilst an attempt has been made to address this, the western tanks having slightly better access than the eastern tanks, however, this still falls short of what is required. Perhaps consider moving the western storage from beneath the building to the area between Ford Rd and the building, ensuring cover levels are set above 4.12m AOD and sealed for good measure? Can this option be achieved? Connect this system independently to the northern watercourse.
Drawing E19-003-SK1000 A indicates a scheme which locates the attenuation outside the building towards Ford Road. The drainage from the roof also has its own outfall to the watercourse. All rainwater pipes have sumps to remove silt and allow easy maintenance.
3. Suitable access to the eastern tanks –including the orifice control is a challenge. Full safe access is required to all tank sections/link pipes, etc for inspection/cleaning. The fact that access points will be at a height of around 1.5m above ground level is also a key point here and a safe form of access will need to be provided. Whilst a low flow channel and rodding points will provide some help, it is not considered a total solution and

needs further investigation to see what is possible. This is where the building would benefit from a blue roof arrangement as an alternative arrangement.....

Drawing E19-003-1000 A and SK2000 show additional details on access and maintenance of the high level suspended tanks. The tank supports are shown in more detail on SK2000. As the majority of the supports are below the tank in the form of a steel plate and secondary beams. The primary beams span to supporting walls. All the steel structure will be galvanised. This layout will allow plenty of safe access to maintain the tanks. The tanks themselves will be sectional steel tanks which will be bolted together insitu. They can be jettied out and cleaned. If required they can also be unbolted cleaned and put back together. Each of the tanks will have plates welded inside to create 'V' shape in the base to form a low flow channel. All the rainwater pipes will have external high level gully set above the flood level. This will take the form of a brick column with a cover which can then be removed to allow access to the gulley. A detail has been shown on drawing SK1000 A. The roof of the block is designed to emulate a traditional sloping tiled roof. Whilst there is a small flat roof area, taking account of the necessary roof penetrations, including an automatic opening smoke vent (AOV) renders a "blue roof" impractical.

4. Orifices to be protected by perforated filters to reduce risk of blockage.

As each system now has its own outfall, we will be using hydrobrakes in manholes which are much simpler to keep clean and free from blockages.

5. All RWP's to connect to tanks at soffit to soffit level and somehow incorporate silt traps (roofs still produce siltation due to leaf fall collected in gutters/moss growing on the roof, etc). Provide a safe means of access to rodding eyes/silt traps.

All the RWP's are now shown connection to the soffit of the tanks. Silt traps are shown as noted above. The silt traps and rodding eyes are set 1.5m above ground level, (about shoulder height). This means they are accessible from ground level. If higher access is required a small scaffold tower can be used.

6. Both systems to store 1 in 100 year event + 40% (without flooding) and designed against a surcharged outfall ie. assume ditch is full to top of bank. Also simulate discharge (roof water systems) against predicted flood level of 4.12m AOD.

The watercourse has been taken as surcharged and a proprietary Checkmate valve shown. Details are attached with the micro drainage calculations for the surface water drainage.

7. Details of low flow channel for tanks/gradient/tank material/link pipes to be min 300mm diameter.

Details have been added to drawing E19-003-1000 A in terms of the tank type, gradients and low flow channels.

8. Additional Items.

Southern water had requested detailed location of the existing mains and drains. These have been located by SDP and the locations have been added to the attached drawing E19-003-1000A.

All new structures are well in access of 6.0m from any Southern Water mains or drains

The surface water drain crossing the site, does not appear on any Southern Water asset plans. This is proposed to be diverted through the development to maintain whatever limited flow this may have. It will have its own outfall into the watercourse.

I trust the above is sufficient for your use but should you have any queries please give me a ring.

Regards

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<http://www.arun.gov.uk>

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