

Engineers Comments Regarding Surface Water Drainage

Application Reference:	F/16/24/RES	Reviewer Reference:	ADC/SB
Planning Officer:	Jessica Riches	Date of Review:	06/01/2025
Site Name:	Land at Ford Airfield Ford		
Application Description:	Approval of reserved matters following outline permission F/4/20/OUT for phase reserved matters 4 (south), for the erection of 357 No. residential dwellings plus associated roads, infrastructure, parking, landscaping, open space & play areas and associated works. This application affects a Public Right of Way, may affect the setting of a Listed Building and falls within CIL Zone 1 (Ford strategic site - zero rated).		
Assessment Number:	1 of 1		

Policy and Guidance Information

Arun District Council Surface Water Drainage Guidance - <https://www.arun.gov.uk/surfacewater>

Land Drainage Consent – <https://www.westsussex.gov.uk/fire-emergencies-and-crime/dealing-with-extreme-weather/flooding/flood-risk-management/ordinary-watercourse-land-drainage-consent/> and

<https://www.arun.gov.uk/land-drainage-consent/>

Arun District Council surface water pre-commencement conditions -

<https://www.arun.gov.uk/planning-pre-commencement-conditions>

The SuDs Manual [C753] by CIRIA

Sustainable drainage systems: non-statutory technical standards'

<https://assets.publishing.service.gov.uk/media/5a815646ed915d74e6231b43/sustainable-drainage-technical-standards.pdf>

Response

Objection

Critical Items for Surface Water Drainage Design Conditions

The failure to adequately address the following items will result in an objection to a surface water drainage design.

If any of these items are inadequately addressed by the submission, then their correction may result in a redesign of the surface water drainage scheme. A redesign is likely to have site wide implications such as the potential for storage structures to increase in volume or plan area.

Items are further elaborated upon in the attached comment tracker where necessary.

Further comments which are unlikely to impact the design methodology will be provided in the comment tracker, these relate to the detailed design. Unless clearly stated, it is considered that these additional comments are unlikely to result in a redesign of the system. These can be addressed following a second consultation to prevent unnecessary refusals.

Critical Item

Reason

Status

Winter groundwater monitoring data.	<p>Adequate winter groundwater monitoring data must be supplied to evidence that infiltration designs have sufficient freeboard from the base of structures and the peak groundwater level.</p> <p>The same data is necessary to ensure that the potential for buoyancy has been adequately considered in attenuation designs.</p>	Compliant
Winter infiltration testing data.	<p>Adequate winter infiltration testing must be supplied to justify the proposed discharge method and design infiltration rates.</p> <p>Infiltration tests must be completed strictly in accordance with BRE DG 365, CIRIA R156 or a similar approved method. Testing depths must account for peak groundwater levels and correspond with the location and depth of proposed infiltration features.</p> <p>Designs must be based upon the <u>slowest</u> infiltration rate evidenced closest to a proposed infiltration feature. Average design rates will not be accepted.</p> <p>The results of incomplete tests should not be extrapolated to obtain design values for infiltration rates.</p>	Compliant
The hierarchy for sustainable drainage.	<p>The proposed discharge method must accord with the SuDS hierarchy as given below. Evidence must be supplied to justify the proposed discharge method.</p> <ol style="list-style-type: none"> 1. Rainwater reuse where possible. 2. Complete discharge into the ground (infiltration). 3. Hybrid infiltration and restricted discharge to an appropriate water body or surface water sewer. 4. Restricted discharge to an appropriate water body. 5. Restricted discharge to a surface water sewer. 6. Restricted discharge to a combined sewer. <p>A water body may be defined as a river, watercourse, ditch, culverted watercourse, reservoir, wetland or the sea.</p>	Compliant

	Engineers cannot support any proposed connection of surface water to the foul sewer.	
Calculations	<p>Calculations for pre-development run off rates must be based upon the positively drained area only.</p> <p>Proposed discharge rates must not increase flood risk on site or elsewhere. Discharge rates must be restricted to QBAR or 2 l/s/ha, depending on whichever is higher.</p>	Not supplied
	<p>Designs must be based on the most recently available rainfall data at the time of conditions being applied. <u>FSR rainfall data will not be accepted.</u> FEH rainfall data is based upon more recent records and continues to be updated.</p>	Compliant
	<p>Designs must use the correct climate change allowances at the time of determination of the outline or full planning application.</p> <p>CV values for all events must be set to 1. This includes summer, winter, design, and simulation events.</p> <p>The correct allowance for urban creep must be applied.</p> <p>Additional storage must be set to zero unless it can be evidenced where this is provided.</p> <p>Infiltration half-drain times must be less than 24 hours.</p> <p>Infiltration design rates must be applied to the sides of soakaways, or to the base of infiltration blankets. Design rates must not be applied to both the base and sides of infiltration structures.</p> <p>A surcharged outfall must be modelled.</p>	Insufficient
Natural catchments design.	<p>The submission must define the natural drainage characteristics within, and hydraulically linked to, the site and demonstrate that the drainage proposals will integrate with and not compromise the function of the natural and existing drainage systems.</p> <p>The condition, performance (including capacity where appropriate) and ownership of any</p>	Insufficient

	<p>existing site surface water drainage infrastructure must be accurately reported.</p> <p>Appropriate easements to watercourses and other services must be shown on all plans.</p> <p>Where there are areas of flood risk from any source on the site, it must be shown how a sustainable surface water drainage design can be accommodated on the site without conflicting with those areas of flood risk.</p> <p>Designs must replicate the natural drainage catchments of the site. All surface water drainage designs must therefore drain via gravity to corresponding points of discharge.</p> <p>The use of pumps for surface water drainage is not sustainable and will not be supported.</p>	
Plans	Plan areas, depths and levels of drainage infrastructure must accurately correspond with the supporting calculations.	Insufficient
Water quality benefits.	An assessment of water quality is necessary to evidence that the proposed design provides adequate treatment of surface water.	Not supplied
Biodiversity and amenity benefits.	The surface water drainage design must provide biodiversity and amenity benefits.	Insufficient - unassessed
Trees and planting	<p>There should be no conflict between surface water drainage infrastructure and existing or proposed trees or planting.</p> <p>The design must consider the potential growth of proposed trees and adequate mitigation must be provided to protect drainage infrastructure where conflict <u>cannot</u> be avoided.</p>	Insufficient

Additional comments to the planning officer

The NPPF states that when determining any planning application, local planning authorities should ensure that flood risk is not increased elsewhere (paragraph 173 and 180e). The PPG guides local planning authorities to refer to 'Sustainable drainage systems: non-statutory technical standards' and detailed industry guidance like The SuDS Manual [C753] by CIRIA to guide decisions about the design, maintenance, and operation of sustainable drainage systems for non-major development.

This consultation has been primarily informed by The SuDS Manual.

The following documents and plans have been assessed to inform this consultation:

- Drainage Technical Note RM4_05.A; Report Ref: 2205771-R18-B dated 22/08/2024 (split into five parts for this submission). Referred to as the **Technical Note**.
- 2205771-222 - RM4 – Impermeable Areas Plan (Sheet 1)
- 2205771-223 - RM4 – Impermeable Areas Plan (Sheet 2)
- 2205771-162 Rev A – RM4 – Levels Strategy (Sheet 1 of 2)
- 2205771-163 Rev A – RM4 – Levels Strategy (Sheet 2 of 2)
- 24053-11 Phase 4 – Tree Protection
- 2205771-D190 – RM4 – Site Sections (Sheet 1) Referred to as **Site Sections**.
- TOR-RM4-XX-DR-L-P-012 Rev A – Softworks 1 of 10
- TOR-RM4-XX-DR-L-P-013 Rev A – Softworks 2 of 10
- TOR-RM4-XX-DR-L-P-014 Rev A – Softworks 3 of 10
- TOR-RM4-XX-DR-L-P-015 Rev A – Softworks 4 of 10
- TOR-RM4-XX-DR-L-P-016 Rev A – Softworks 5 of 10
- TOR-RM4-XX-DR-L-P-017 Rev A – Softworks 6 of 10
- TOR-RM4-XX-DR-L-P-018 Rev A – Softworks 7 of 10
- TOR-RM4-XX-DR-L-P-019 Rev A – Softworks 8 of 10
- TOR-RM4-XX-DR-L-P-020 Rev A – Softworks 9 of 10
- TOR-RM4-XX-DR-L-P-021 Rev A – Softworks 10 of 10

Within the Drainage Technical Note, the following plans are contained and referred to as follows:

- 2205771-D020 Rev H - Sitewide Indicative Surface Water Drainage Strategy - Appendix D (part 4 on the portal). Referred to as **ISW Plan**.
- 2205771-142 Rev A – RM4 - Drainage Strategy (Sheet 1) – Appendix D (part 4 on the portal). Referred to as **Drainage Layout 1**.
- 2205771-143 Rev A – RM4 - Drainage Strategy (Sheet 2) – Appendix D (part 4 on the portal). Referred to as **Drainage Layout 2**.

Existing watercourses are referred to as follows:

- Watercourse 1: The watercourse opposite the site entrance on Yapton Road as shown on Inset 2 on the ISW Plan.
- Watercourse 2: The watercourse opposite Horsemere Green Lane as shown on Inset 3 on the ISW Plan.
- Watercourse 3: The watercourse on the opposite side of Ford Lane adjacent to Wicks Farm as shown on Inset 1 on the ISW Plan.
- ExAF Network – The existing Airfield Drainage Network. Not shown on plans.

Summary

Inadequate information has been submitted to assess whether the surface water drainage of this phase does not increase flood risk. The strategy is unclear, plans are contradictory, and they are supported by calculations that lack sufficient detail.

Disposal locations on third party land have not been confirmed and there is insufficient investigation into the existing drainage network on the site.

The landscaping, which is being decided by this application, conflicts with the proposed drainage strategy and may result in sustainable drainage objectives being compromised.

If there have been further documents provided as part of a pre-application advice process with the LPA or West Sussex County Council [WSCC], then these should have been submitted to support the application. This is to ensure that consultations and subsequent decision making is transparent.

Ground Investigations and Hierarchy

This parcel has sufficient groundwater monitoring observations to evidence that groundwater levels will be too high across the parcel to achieve 1m of unsaturated ground between the base of any infiltrating structure and groundwater. We therefore agree that infiltration will not be possible in this parcel. We support the proposed overarching strategy of water reuse with water butts, and then storing surface water before discharging at a restricted rate to an appropriate receiving waterbody.

However, further information is required about the strata evidenced in the boreholes. This is necessary to assess the QBAR calculations once submitted - see below. This information is noted to be included in Attachment III to the Omnia Letter (Appendix C of the technical note) but has not been included in this submission.

Disposal locations – Existing Network

Insufficient information has been submitted regarding the existing site, its current drainage arrangements and natural catchments to determine if the proposed discharge locations and rates will not increase flood risk.

The SuDS Manual states that an applicant is required to define the *“state, performance and ownership of any existing site surface water drainage infrastructure and [demonstrate] that the drainage proposals consider, use or protect these systems (where appropriate).”* Table B.2 p806. This is necessary in the information that is submitted to support outline and full planning applications.

In addition, our Local Plan Policy W DM3 states that SuDS must: *“e. Retain the existing drainage network of the site and the wider area”*.

There is existing drainage infrastructure on the site installed to serve Ford Airfield. This is shown on the attached mapping. The mapping may not be accurate and needs verification, however, there is no doubt that the network exists.

The drainage system is not mentioned in the technical note. The existing drainage network for this part of the site discharges to the River Arun. At the point where the network outfalls, the river is a tidal waterbody and therefore less sensitive to the effects of surface water discharge.

Further investigation is required into the existing network. It is unclear where the collection points for these pipes are. If all these pipes can, or were once able to, collect surface water then most of the area north of the public footpath would discharge to the River Arun. By discharging all this area to the proposed discharge point for network 2, to Watercourse 2, opposite Horsemere Green Lane, flood risk may be increased.

Irrespective of whether the airfield drainage can and should be used, it is not acknowledged or protected. The ExAF Network is not shown on any of the site plans and nor has it been considered a constraint to the development of the layout of the site. The status and condition of the network is unknown, and it is unclear whether the network has a legal right to protection via our Land Drainage Byelaws. An easement of 3m either side of the edge of the culverts may be necessary.

It is also unclear who owns the ExAF Network. It was likely to have been installed by The Ministry of Defence with ownership passed on to the landowner, however, this must be confirmed. If it has a right to protection or maintenance in any deeds or other legal agreements, then these must be honoured.

Disposal Locations – Achievability of Connection on Third Party Land

The surface water drainage for this parcel relies on connection to basins outside of this Reserved Matters application. These basins connect to watercourses 1 and 2, they are both located on third party land. The achievability of the proposed surface water drainage scheme is reliant upon installation of drainage infrastructure on this land. The only mention of this is within Appendix B of the technical note (part 3 on the portal).

WSCC (acting as the Lead Local Flood Authority) stated that evidence of third-party agreement would need to be evidenced. It was indicated that this need not be submitted with the application, the designer stated that third party agreement plans would be provided.

It is unclear if these agreements have been provided to WSCC, but they have not been submitted to the LPA, who must ultimately decide the application.

It is unclear how the applicant will drain parts of the site if third-party agreement is not obtained. There are no other watercourses, surface water or combined sewers in the vicinity of the site. The planning officer is invited to consider the appeal decision on application reference APP/K0425/W/23/3332129 which was dismissed on similar grounds.

Disposal Locations – Natural Catchments

The disposal locations must replicate the natural drainage catchments of the site to ensure that flood risk is not increased. The ISW Plan does not reflect the Drainage Layouts and neither of them fully reflect the natural topography of the site. It is also unclear if any of the parcels north of RM4 and Phase 5 will discharge into the same networks.

On Drainage Layout 1 a northern part of this parcel is shown as flowing to the road on the layout – this is illustrated and bordered with green on figure 1 below. The road ultimately discharges to basin 3, which outfalls to Watercourse 1. This area does not appear to naturally drain in this direction, the topography of the site indicates that surface water is likely to flow south and southwest. By diverting surface water to a different outfall, volumes and rates may be artificially increased which may increase flood risk downstream.

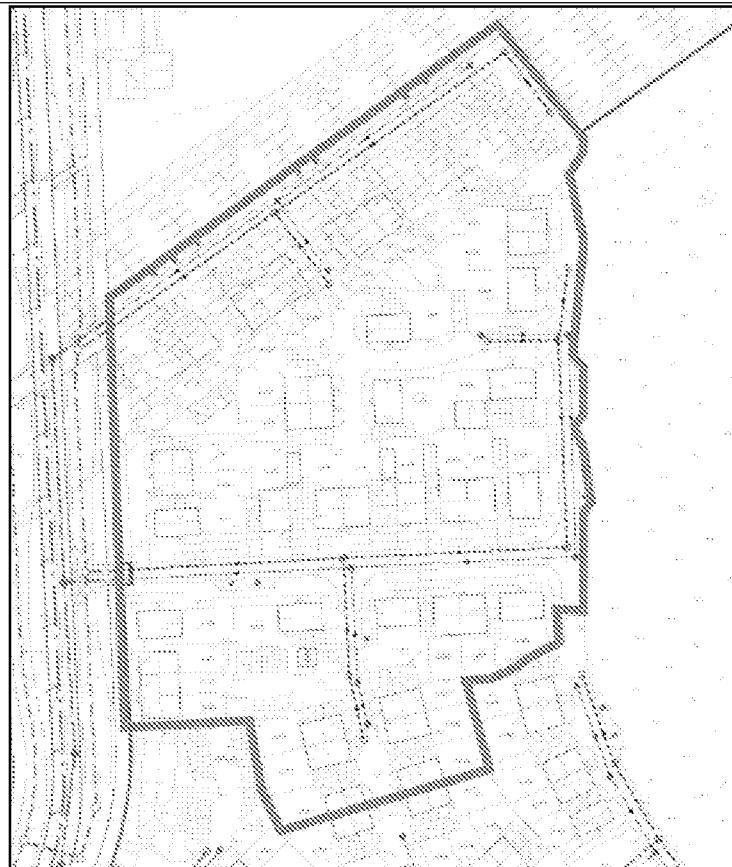


Figure 1: Northern section of the parcel shown as draining to the road on Drainage Layout 1.

On the ISW plan this area discharges to the southern basins with the remainder of the parcel which directly contradicts the drainage layouts.

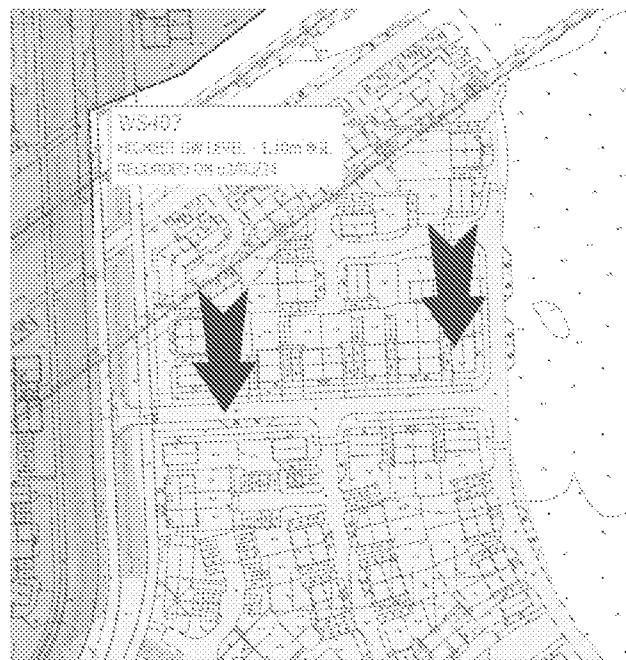


Figure 2: Northern section of the parcel shown as draining to Drainage Area 5 on ISW Plan.

Drainage Area 5 appears to have two different outfalls: Watercourse 1 and Watercourse 2 (via Drainage Area 6). By including basin 3 and the outfall Watercourse 1 within Drainage Area 5, it is difficult to assess the different drainage catchments accurately.

The area shown in figure 1 is used as example as follows:

- The impermeable area plan does not differentiate this area. The whole of this RM4 phase is shown with areas differentiated by surface type rather than catchment.
- Drainage Layout 1 shows the area connected to the road, which discharges to Basin 3 and Watercourse 1.
- ISW Plan shows the area within Drainage Area 5, with flow arrows pointing in a different direction to the connection location shown on Drainage Layout 1.
- ISW Plan includes two (one direct, one indirect) discharge locations for Drainage Area 5. The contributing areas for each are not shown on any plan.
- The supporting calculations show the full Drainage Area 5 from the ISW Plan discharging to Watercourse 2.
- The contributing areas in the supporting calculations do not match the impermeable area plan.

The topography of the site also indicates that part of the proposed Phase 5 housing should contribute to the same catchment as the northern half of this parcel. This area is south of the runway, and north of the public footpath as shown bordered in black in Figure 3. This is not shown on Indicative SW Strategy, which indicates that the full phase will discharge to network 1 (Drainage Area 3) and ultimately Watercourse 1. By discharging this area to that location, when it would naturally drain elsewhere, flood risk may be increased downstream.

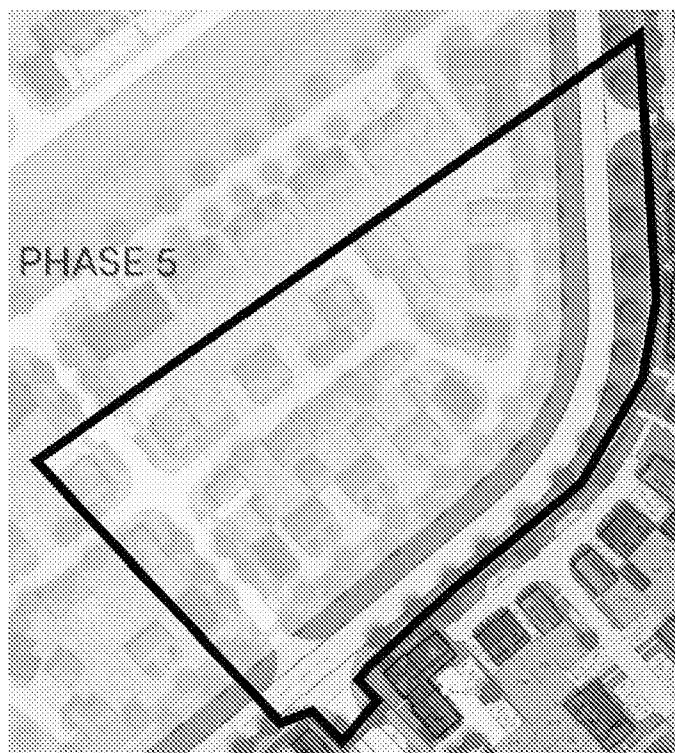


Figure 3: Phase 5 section which is likely to naturally drain to Drainage Area 5.

Our assessment of the natural catchments is based upon the LIDAR for the site overlaid with the site plan and watercourse mapping – see attached. The planning officer should be aware that this is not information submitted by the applicant but serves as an evidence base to support our rationale. The catchments defined by the designer do not have a supporting justification based on the natural pre-development topography of the site.

Disposal locations – Impermeable area plans

Without an accurate understanding of the contributing areas to the drainage system it is not possible to determine if flood risk will be increased because of the development, or whether the scale and layout of the development may later be affected by changes to the SuDS system for the site.

The impermeable areas in the calculations do not reflect those shown on the impermeable area plan. This is further complicated by the catchment areas differing between them; on the impermeable area plan there is no catchment differentiation for the whole phase, on ISW Plan there are two Drainage Areas for the phase (5 and 6) as discussed above.

The impermeable area plan differentiates contributing areas by type; driveways or roofs for example. It is understood why residential roofs may be distinguished - as these have an allowance for urban creep applied to them – however, the other types need not be categorised. The contributing area plan should support the calculations; therefore, it would make more sense for the areas within different catchments and sub-catchments to be delineated.

As stated above, the impermeable area plans do not correspond with the calculations or the ISW Plan. There is insufficient information given on the drainage layouts to determine if there is any correspondence with them.

Modelled Contributing Areas

The high-level modelling for the whole strategic site has been submitted, this is not specific to the Reserved Matters being decided here but is a useful start point nonetheless. To clarify, only the modelling for Network 2, from page 25 to 29 of part 5 of the technical note on the public portal are relevant to this parcel (as submitted – please see comments above regarding catchments). The impermeable areas contributing to the network are listed as:

- 5.391ha entering at node H
- 5.076ha entering at node H4.

Both nodes are not labelled anywhere on the indicative sitewide strategy or the drainage layouts.

The total contributing area corresponds with the ‘impermeable area (ha) including urban creep’ column on the ISW Plan. These impermeable areas are based on an arbitrary percentage impermeable area (60% + 10% urban creep).

It is not clear if the contributing areas for the basins have been allowed for. They are not shown on the impermeable area plans.

The use of estimated impermeable areas introduces an unnecessary element of risk to the decision-making process. For these Reserved Matters, on the basis of the impermeable area plan, it would

appear that the initial estimated contributing area may be overestimated. However, as discussed above, the impermeable/contributing area plans need revision.

If the contributing areas have been overestimated, then it may be argued that the volume of storage needed in the basins will be less than proposed. However, if the same (higher) contributing areas are used in the calculations for the runoff rate, this will artificially increase the approved rate of runoff from the site. This could increase flood risk downstream as surface water will enter the watercourse network faster than it would naturally.

It is imperative that the contributing areas are accurately modelled for each phase to ensure that both the discharge rates and the volume of storage is adequate. Where the scale and layout of an unsubmitted phase is unknown, it is expected that a cautious estimate is used. This would involve overestimating the contributing areas for volume of surface water, and underestimating them for the discharge rates. Ultimately each phase of the development should accurately evidence its contributing areas. If there is insufficient spare capacity in the wider system, this may need to be provided upstream within the phase.

Proposed Discharge Rates

QBAR is quoted as being 2.42 l/s/ha in section 2.9 of the drainage technical note, this is apparently based on the FEH method. The calculations do not appear to have been submitted, therefore it is not possible to assess the method. If the calculations cannot be assessed, then the discharge rates, and by extension, the size of the storage required, cannot be approved.

It is unlikely that the methodology will be acceptable as the same paragraph of the drainage technical note indicates that the maximum allowable discharge rate includes an allowance for urban creep. The SuDS Manual is clear that; *“To ensure that flood risk in the catchment does not increase with time, uplift factors on greenfield runoff rates should not be applied.”* (Section 24.7 p526). Therefore, if it is found on submission that greenfield runoff rates include an uplift for urban creep (as indicated) then the objection will be sustained. This will impact the volume of storage required and therefore potentially the layout of the site.

Surcharged Outfalls

The drainage technical note acknowledges the need for surcharged outfall modelling. This is to ensure that downstream constraints are adequately considered and that the components will drain down within a suitable timescale. Paragraph 2.12, 2.14 and 4.6 all state that all outfalls have been modelled up to the flood levels in a 1 in 100 years +40% CC event. However, there does not appear to be any evidence of this modelling in the calculations that have been submitted.

The SuDS Manual indicates; *“Where discharge from the site could be constrained because of high water levels at the outfall from the site, the likelihood of such water levels coinciding with design events for the drainage system should be evaluated and accounted for as part of the design process.”* Section 3.2.5 p43.

It is expected that the surcharge levels and duration will be assessed to ensure that this constraint has been adequately considered. Without being able to assess this constraint we are unable to determine if flood risk may be increased on site or if additional storage may be required to accommodate surface water from subsequent storms.

Levels Information

Insufficient levels information (cover levels and invert levels) has been given on the drainage layouts to check if a gravity solution with self-cleansing velocities is achieved. These cannot be compared with the calculations. The nodes in the calculations are not all shown on the drainage layout or the ISW Plan.

If a gravity solution is not possible then ground levels may be artificially raised, or pumps may be proposed. Pumping surface water is not sustainable and should be considered as a last resort. Therefore, it is important to ensure that a gravity solution can be achieved prior to the determination of the scale or layout of the development.

Water Treatment

No assessment of water treatment is provided. If the design requires modification to ensure water treatment at source, then this may affect the layout or landscaping. Water quality is one of the four pillars of sustainable drainage design. The design must support the management of water quality in receiving surface waters. This involves:

- Preventing runoff from the site to receiving surface waters for the majority of small rainfall events.
- Treating runoff to prevent negative impacts on the receiving water quality.

The SuDS Manual, Section 4.3.

Ground Raising

The Site Sections shows that roads 15, 16, and 17 have significant land raising (around 1m). These roads are labelled on the Levels Strategies. It is unclear why only one sheet of site sections have been submitted. The Levels Strategies indicate that there will be land raising elsewhere on the site which is not illustrated by the submitted sections. For example, on road 76 on sheet 2, the proposed levels are 1.495m higher than the existing level of 4.93mAOD. It is unclear how this land raising will affect the drainage strategy or the natural drainage catchments. There is no mention of land raising in the drainage technical note.

The planning officer should note the proposed levels and any impact these may have on other considerations prior to determination.

Landscaping conflicts

Numerous proposed trees are shown within lined swales. The roots will damage the liners and may allow groundwater ingress. This is not allowed for in the design. If groundwater can enter the system, its volume is unquantifiable and will consume capacity that is reserved for surface water storage. By extension this is likely to increase flood risk. Landscaping is being agreed at this stage and the inclusion of these trees may mean that the swales cannot be agreed or approved later via condition. The swales provide important shallow conveyance, biodiversity and amenity benefits.

Biodiversity, Amenity and Interception Drainage

It is acknowledged that this phase incorporates swales as open conveyance features. These are likely to contribute to interception drainage and the biodiversity and amenity value of the surface water drainage scheme. However, these benefits are not discussed or assessed within the

technical note. The supporting documentation must evidence how all sustainable drainage design objectives are being met.

Flood Risk

The Flood Risk Assessment [FRA] for the site has not been submitted. It is acknowledged that the FRA is unlikely to affect the surface water drainage design. However, there may be details in the document that answer some of the points raised above. It is also important to consider all sources of flood risk and how these may influence the development of the layout and drainage strategy.

Overcoming our objection

If the planning officer is minded to allow the applicant additional time to submit further documents to support this application, then further evidence may overcome our objection. Please do not submit further documents without prior discussion with the planning officer as to whether it will be possible for these to be assessed or influence their determination.

A reduced site-specific version of our full surface water drainage design checklist is provided below. This has been edited to remove elements that are not applicable to this site, either due to the scale of the proposal or the method of disposal. The checklist is provided to assist the applicant and designer in preparing a revised design to meet our requirements. It is applicable to Ford Airfield RM4 only.

Items highlighted should be submitted prior to determination of this application to overcome our objection.

The full unedited surface water design checklist is available on our website at <https://www.arun.gov.uk/surfacewater/>. **If the design is amended following receipt of our consultation the designer may need to refer to the full checklist to ensure that the revised design meets our requirements.**

Ford Airfield RM4 Designer Checklist

Ground Investigation Results

Comment: Items highlighted should be submitted prior to determination of this application to overcome our objection.

Groundwater monitoring

- Plan showing location of monitoring points provided.
- Depths of holes detailed.
- Dates of observations and depth to groundwater recorded.
- Evidence of the strata within borehole or monitoring pits provided.

Requested to aid speed of assessment

- Plan showing the peak groundwater levels at each monitoring point in mAOD.
- Peak groundwater levels recorded in metres below ground level and mAOD.

Infiltration testing

Not required due to high groundwater.

Surface Water Drainage Statement

Comment: Items highlighted should be submitted prior to determination of this application to overcome our objection.

Where information has been partially submitted, the missing information has been highlighted in **bold**.

Disposal method (Select as appropriate)

- Rainwater reuse is proposed where possible.
- ~~Infiltration is proposed and maximised wherever possible.~~
- Restricted discharge to a water body is proposed where a full infiltration design is not possible.
- Restricted discharge to a public or private highway drainage network is proposed where a full infiltration design is not possible and there are no nearby water bodies or surface water sewers.

Disposal method justification

- Infiltration has been adequately investigated, in winter, at appropriate and varying depths where appropriate, above peak recorded winter groundwater levels at the given location.
- Onsite and boundary, open and culverted water bodies are investigated (**location, mapping, network, flow direction, ownership/responsibility, depth, and condition**).
- Offsite nearby downstream water bodies are investigated (location, mapping, network, flow direction, **ownership/responsibility, depth, and condition**).
- Any relevant permissions or legal agreements from asset or landowners that are needed are identified and evidence of consents provided.

Requested to aid speed of assessment

- Any previous relevant correspondence or pre-application advice from the **Local Planning Authority [LPA]** or the Lead Local Flood Authority [LLFA] regarding the surface water drainage design is included with the statement.

Existing Site

Essential

- It is clear what the **natural** drainage characteristics of the site and hydraulically linked areas are.
- Natural flow paths are identified on a plan (where applicable).
- Existing site drainage features are investigated – condition, performance, and ownership.
- Any appropriate easements to watercourses or other infrastructure are investigated.
- Existing and future flood risk from any source is detailed.

It is suggested that the above is achieved with the following, which may be combined where appropriate:

- An existing topographical plan. **On ISW Plan**
- An existing drainage catchment plan.
- An existing site surface water drainage plan (where applicable).
- Flood maps (fluvial, tidal, pluvial, groundwater, sewer, and reservoir) are supplied (or Flood Risk Assessment referred to).
- Confirmation and surveys of any existing drainage infrastructure on the site.
- Full details of any known flooding on the site.

Proposed Design

Essential

- Statement confirming the proposed design criteria including fixed design calculation inputs for the SuDS system. Examples include:
 - Climate change allowances,
 - Urban creep allowance,
 - CV values,
 - Rainfall data,
 - MADD factor or additional storage.
- Natural catchments are followed.
- Where phased construction is proposed, the phases correspond to natural catchments and can function independently from each other.
- The design is gravity based with no use of pumps.
- Natural systems that deliver specific hydrological function, such as watercourses or wetlands, are preserved.
- Where there is existing drainage infrastructure on the site it is clearly explained or illustrated what is being retained, upgraded, or removed.
- Details of necessary off-site works and consents are provided. **Consents only for RES.**
- ~~If the surface water drainage is designed to flood in the 1% Annual Exceedance Probability [AEP]~~
~~+ Climate Change Allowance [CCA] event, then the flood volume is contained safely on site without flooding any part of a building or utility plant susceptible to water or affecting safe access or egress.~~
- The design provides and evidences interception drainage and is able to capture and retain on site the first 5mm of the majority of all rainfall events.
- Water quality and treatment is adequately assessed – with an assessment appropriate for the scale and proposed use of the site.
- Adequate freeboard is provided between the top water level of any open storage features and the top of the bank.
- There are no clashes with other infrastructure.
- Self-cleansing velocities are achieved where pipes are proposed.
- The proposed discharge rate is explained and justified (for attenuation designs).

- Where there is a risk that the base of an attenuation feature may penetrate peak groundwater levels, additional mitigation measures to prevent groundwater ingress are incorporated into the design and construction method statement.
- Where there is a risk that the base of an attenuation feature may penetrate peak groundwater levels the effects of buoyancy have been considered in the design.
- Amenity benefits are provided by the drainage system (assessed by others).
- Biodiversity benefits are provided by the drainage system (assessed by others).
- Landscaping has been designed to ensure ease of maintenance of drainage assets.
- The justification and criteria for tree root avoidance and mitigation measures is clear, referencing adopting body standards where applicable.
- Biodiversity and ecological enhancements do not impede the functionality, maintenance or capacity of the drainage system.
- It is confirmed what elements of the SuDS will be private.
- It is confirmed what the adoption arrangements for SuDS components will be.
- A construction method statement for the SuDS system, appropriate to the scale of the development, is submitted.
- A maintenance plan for the SuDS system, appropriate to the scale of the development, is submitted. [Please refer to our SuDS Maintenance Checklist where this is stipulated by condition.]
- Any potential health and safety issues relating to SuDS implementation and management have been considered and managed.

Preferred

- Ground raising is avoided where possible.
- The drainage system is considered by and contributes to the biodiversity net gain statement (assessed by others).

Impermeable Area/Catchment Plan

Comment: Items highlighted should be submitted prior to determination of this application to overcome our objection.

Catchments and sub-catchments need to be demarcated. If the wider phase (RM4) is likely to be constructed in sub-phases, these should be shown on a plan and tie in with the sub-catchments.

Essential

- Different drainage catchments are demarcated.
- Where phased construction is proposed, each phase is shown on a plan.
- An impermeable area plan is provided showing all positively drained areas including open surface water storage plan areas.

Preferred

- Impermeable areas are shown in m^2 on the impermeable areas plan(s).
- Demarcated impermeable areas correspond with the distribution of those areas in the supporting calculations.

Surface Water Drainage Calculations

Comment: Items highlighted should be submitted prior to determination of this application to overcome our objection.

General

- The most recently applicable, or previously agreed FEH rainfall data is used.
- CV values for all events are set to 1. This includes summer, winter, design, and simulation events.
- The correct climate change allowances, appropriate for the full lifetime of the development, have been applied to all calculations.
- A 10% allowance for urban creep is applied to all residential roof areas.
- 100% Annual Exceedance Probability [AEP] + Climate Change Allowance [CCA] (1 in 1 year) event calculations provided.
- 3.33% AEP + CCA (1 in 30 year) event calculations provided showing that the full surface water volume is contained within the designed system without flooding.
- 1% AEP + CCA (1 in 100 year) event calculations provided showing that the full surface water volume is contained safely on site, without flooding any part of a building or utility plant susceptible to water or affecting safe access or egress.

Attenuation and Restricted Discharge

- Greenfield run off rates are based upon the positively drained area of the site only.
- Discharge rates are restricted to QBAR or 2 l/s/ha, depending on whichever is higher, for all storms up to the 1% AEP + CCA event.
- Half drain times and available capacity in the drainage system for subsequent storms are considered.
- A surcharged outfall to a watercourse or sewer has been modelled. The surcharge level is the 1% AEP + CCA flood event for the receiving watercourse, or to the top of the bank if appropriate hydraulic modelling is not available.

Requested to aid assessment

- FEH22 point descriptors for the site are provided.

Drainage Plans and Specifications

Comment: Items highlighted should be submitted prior to determination of this application to overcome our objection.

Where only part of an item is required for the RES or we have specific comment, then this is highlighted in **bold**.

Essential

Plans are provided showing:

- The proposed design within the proposed site layout. **Further detail required.**
- Existing site sections and levels.
- Proposed site sections and levels.
- Long and cross sections for the proposed drainage system including final finished floor levels.
- Exceedance flow management routes.
- Details of connections to watercourses and sewers. **Levels only for RES.**
- Maintenance access and any arisings storage and disposal arrangements.

These plans must be of sufficient detail that a reviewer can be confident that the design can be constructed without flood risk being increased on site or elsewhere.

Specifications are required for all materials used in the design. We suggest that this is best achieved and illustrated with site specific construction detail drawings. The combination of construction details, with plans and sections, ensure that the proposed standard of construction will facilitate adoption and maintenance by an appropriate body and have structural integrity.

The following checklist is designed to demonstrate the level of detail required:

Easements

- 3m easements are shown from the top of the bank of all ordinary watercourses, and from the edge of all culverted watercourses on all plans.
- Any appropriate easements as stipulated by any public or private utility provider shown on all plans.
- Maintenance easements are shown from the top of the bank from all open SuDS features on all plans.
- Existing trees and their root protection zones are shown on any drainage layout.
- Proposed trees and appropriate easements are shown on any drainage layout.

Detail

- It can be clearly determined what a pipe's **diameter**, pipe materials, **gradients**, flow directions and invert levels are from the plans.
- It can be clearly determined what an inspection chamber or manhole's **cover level**, **invert level**, cover loading grade and sump depth (where applicable) are from the plans.
- All attenuation features (including permeable paving) are clearly labelled with their **dimensions**, **invert/base levels** and **cover levels**.
- Control structures are labelled with **discharge rates**, **hydraulic head**, **invert** and **cover levels** and ideally model number.
- Measures to protect drainage from tree root damage are clearly shown on any drainage layout.
- Any areas of necessary ground raising are clearly justified and demarcated on a plan, with depths and levels.
- Potential flow routes off site are shown. The plan also includes proposed external ground levels, finished floor levels of buildings and designed slopes on all impermeable surfaces such as highways or car parks.
- Cross sections and long sections of all open features are provided.
- Construction detail drawings are site specific.
- Construction detail drawings are provided for all components including but not limited to:
 - Attenuation structures
 - Manholes/inspection chambers
 - Catchpits/silt traps
 - Flow control devices
 - Permeable paving
 - Headwalls
 - Channel drains
 - Gullies
 - Pipe bed and surround
 - Pipe to pipe connections
 - Filter strips or drains
 - Swales
 - Bio-retention systems
 - Ponds
 - Tree pits and measures to protect drainage from root incursion

- Water treatment features
- Water butts or alternative methods of water reuse – also to be shown on plans.

The following items are requested to aid assessment or confidence in construction:

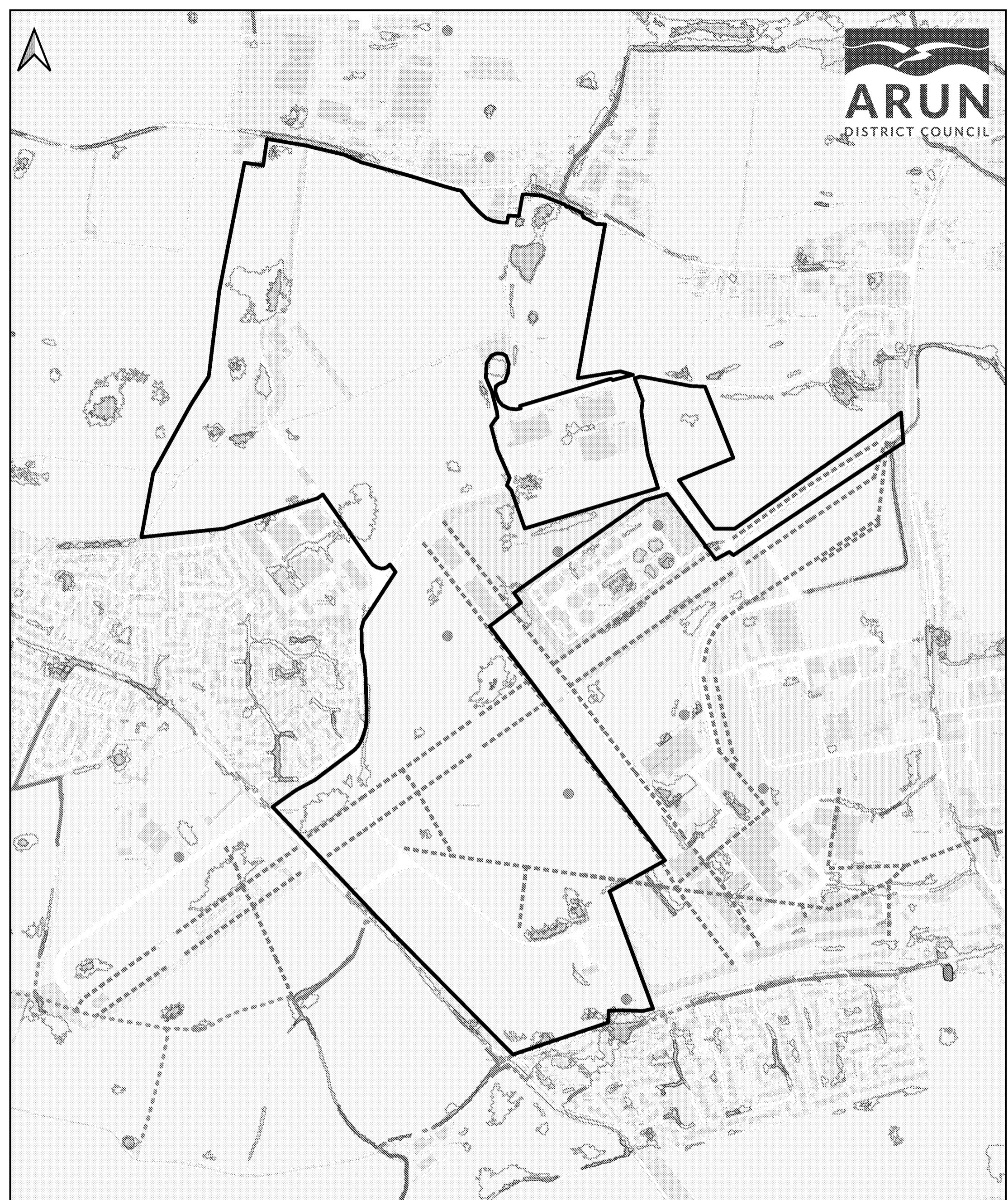
- Where features have a non-uniform plan area, a plan showing the coordinates of the perimeter is provided.
- All drainage infrastructure is labelled to correspond with the supporting calculations.

Other

- Open feature planting specification is provided (to be assessed by others).

This checklist is designed to aid an applicant with their submission. The list is not exhaustive, and our engineers may request additional information to enable them to review a proposal to their satisfaction.

The checklist may also request information that an applicant does not feel is relevant to their submission. In this case the applicant can provide an explanation as to why they have omitted certain information in their drainage statement. However, the appraising engineer reserves the right to request this information if they believe it is necessary for their review.



Ford Airfield Watercourse Mapping and SW Flood Risk

Scale: 1:6500 @ A3

0 0.05 0.1 km

Legend

— Ford Airfield Red Line Boundary

ADC DRAINAGE

Statutory main rivers

— Main_River_Arun

Ordinary Watercourse Culverted Line (Editable)

— Ordinary Watercourse Line (Editable)

■ Ordinary WaterCourse Poly (Editable)

— Surface Water Drain Line (Editable)

— IDD Area Watercourses Line (Editable)

● Boreholes Point 2005

● Waterwells Point 2005

Surface Water Flood Risk

■ Surface Water Flood Map EXTENT 1 in 100

■ Surface Water Flood Map EXTENT 1 in 1000

Basemap

Outdoor_27700

PHASE 5
INDICATIVE LAYOUT

 Insert Title Here
Insert Subtitle Here

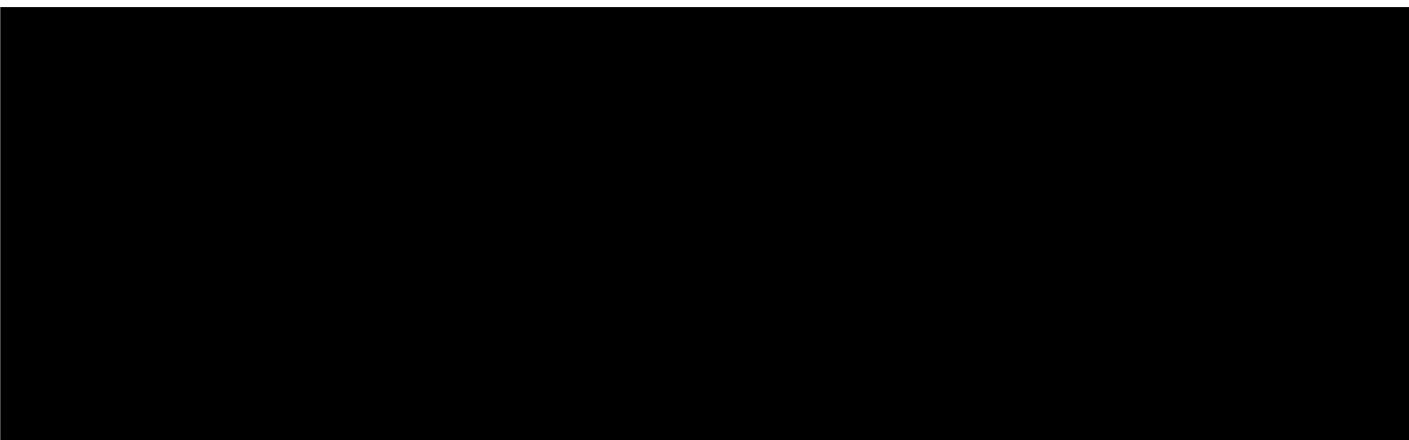
 0 0.05 0.1 km
Scale: 1:1000 @ A0

Legend

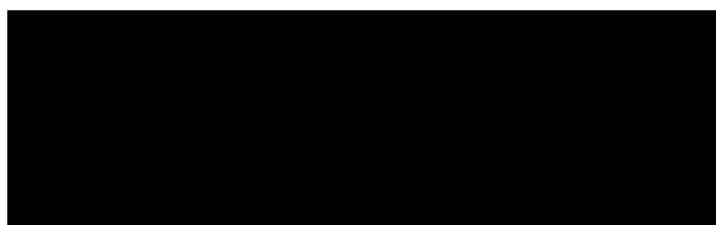
ADC Engineers Mapping	Ordinary Watercourse	Surface Water Drain	IDD Area Watercourses	WSCC Highways and PROW	Surface Water Flood Risk
Ordinary Watercourse Nodes (8781)	Highway Drain Nodes	Surface Water Drain Nodes	Arun IDB Ditches	Arun IDB Public Rights of Way	Historical Flooding Area
Headwall (6463)	Gully	Headwall	Manhole	Historical Flooding	
Manhole (1809)	Headwall	Manhole			

Notes:

- WSCC Public Rights of Way
- Surface Water Flood Map EXTENT 1 in 1000



Drainage Engineers response



Arun District Council, Civic Centre, Maltravers Rd
Littlehampton, West Sussex, BN17 5LF
www.arun.gov.uk

To register to receive notifications of planning applications in your area please go to
<https://www1.arun.gov.uk/planning-application-finder>



From: Sarah Burrow <Sarah.Burrow@arun.gov.uk>
Sent: 06 January 2025 14:59
To: Planning.Responses <Planning.Responses@arun.gov.uk>
Cc: Jessica Riches <Jessica.Riches@arun.gov.uk>; David Easton <David.Easton@arun.gov.uk>; Karl McLaughlin <Karl.McLaughlin@arun.gov.uk>; Paul Cann <Paul.Cann@arun.gov.uk>
Subject: F/16/24/RES - Land at Ford Airfield - Engineers Comments Regarding Surface Water Drainage
Importance: High

Hi Jessica,

Find our consultation – an objection – attached. Apologies for the delay in response.

Kind regards

Sarah Burrow

Flood Risk and Drainage Engineer, Coastal Engineers and Flood Prevention

T: 01903 737815

E: sarah.burrow@arun.gov.uk

Usual working pattern:

Monday – Flexible between 8am and 6pm

Tuesday and Wednesday – 9:15am to 2:45pm

Thursday – 9am to 6pm

Friday – Flexible between 8am and 6pm

Arun District Council, Civic Centre, Maltravers Rd

Littlehampton, West Sussex, BN17 5LF

www.arun.gov.uk

