

Proposed Manufacturing Facility
Bluemay Phase 3,
Bidmead Park, Sells Green, Melksham, SN12 6RS



FRA and Drainage Strategy Report

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At a Glance – Summary

- The development comprises new manufacturing facility with a small link corridor to the existing warehouse.
- An FRA is provided, as requested by the LLFA.
- The existing site drains to an attenuation pond with a restricted discharge. The existing pond is enlarged to accommodate the additional flow.
- Stormwater strategy has been determined following site investigations.
- A site drainage layout is included and will utilise a geocellular storage tank and a new detention basin discharging into the existing pond, which will be enlarged.
- The result of the proposals is no increase in off-site flow, thus resulting in no increase in flood risk for on or off-site stakeholders.
- The pre-development off-site flow rate has been matched, providing betterment over greenfield rates.
- The foul water will be connected by gravity into the existing private system.
- LLFA pre-application comments addressed.
- A maintenance schedule is provided to ensure the ongoing function of the drainage system.

1 Introduction

1.1 This assessment has been prepared in support of a planning application to provide a new manufacturing facility at the current Bluemay site at Bidmead Park, Sells Green, Melksham, SN12 6RS The site location is as Figure 1. With the existing site layout as Figure 2 and the proposed development as Figure 3.

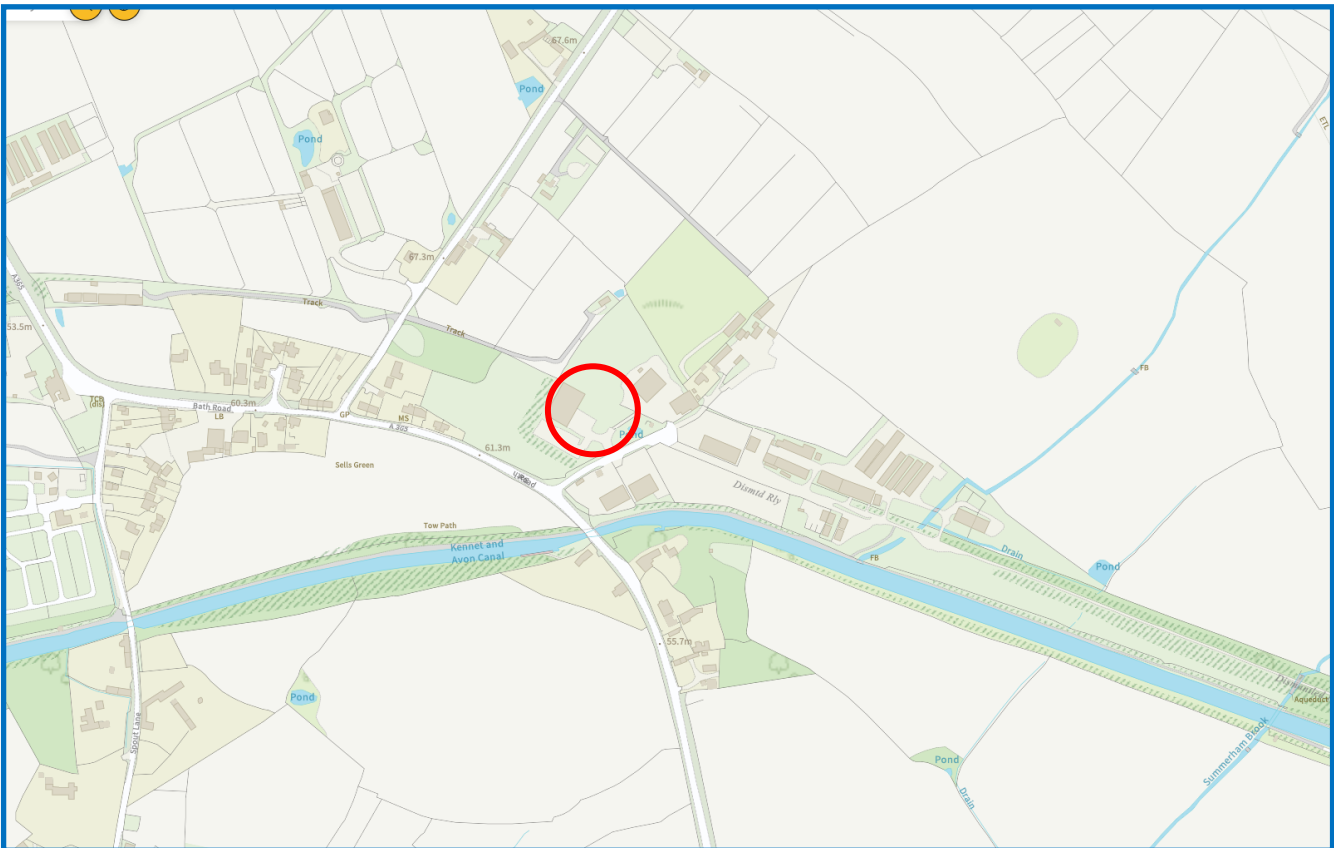


Figure 1 Site Location

- 1.2 The existing site is located on a small industrial estate off the A365 road. The industrial estate comprises several large warehouses. The Kennet and Avon Canal is approximately 60m south of the site. The site comprises a warehouse circa 800m² constructed around 25 years ago. There are a further 2No warehouses & workshops to the east of the site approximately 520m² and 300m². It is not exactly clear how old these are, however, are expected to have been constructed around 50 years ago.
- 1.3 The site is accessed by a private road and includes an existing car park with warehouse access apron, beyond which there is extensive green space. The site is bordered by the A365 to the west, the private access road to the south. To the north and east there are boundary hedges with fields beyond.
- 1.4 The site is higher to the north and the east, with some spoil from the previous warehouse construction being used to form banks and areas of flat open space. The lowest part of the site is to the south where it is accessed from the private road. The existing site layout is shown in figure 2
- 1.5 During original warehouse construction around 25 years ago significant cut was undertaken to form the slab levels. To minimise future earthworks the reduced level for the new facility was also cut at that time, with the location of the new proposal in a slightly depressed area, cut up to 400mm lower than the existing slab level.
- 1.6 The proposals in this planning application are to construct a new warehouse manufacturing facility with a footprint of 1000m² and associated access and amenities. The new warehouse will have a small link corridor connection to the existing warehouse, as shown in figure 3.

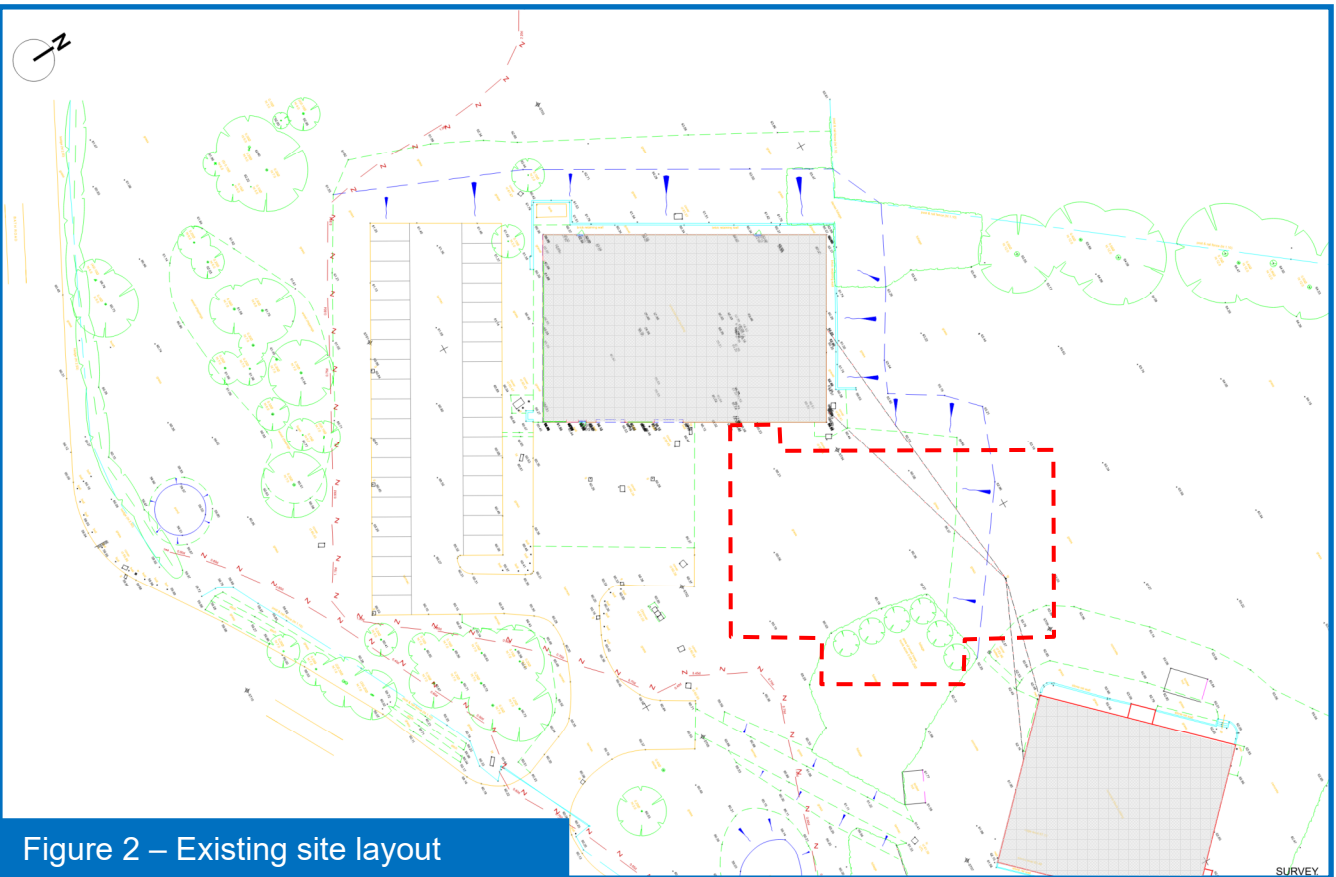


Figure 2 – Existing site layout

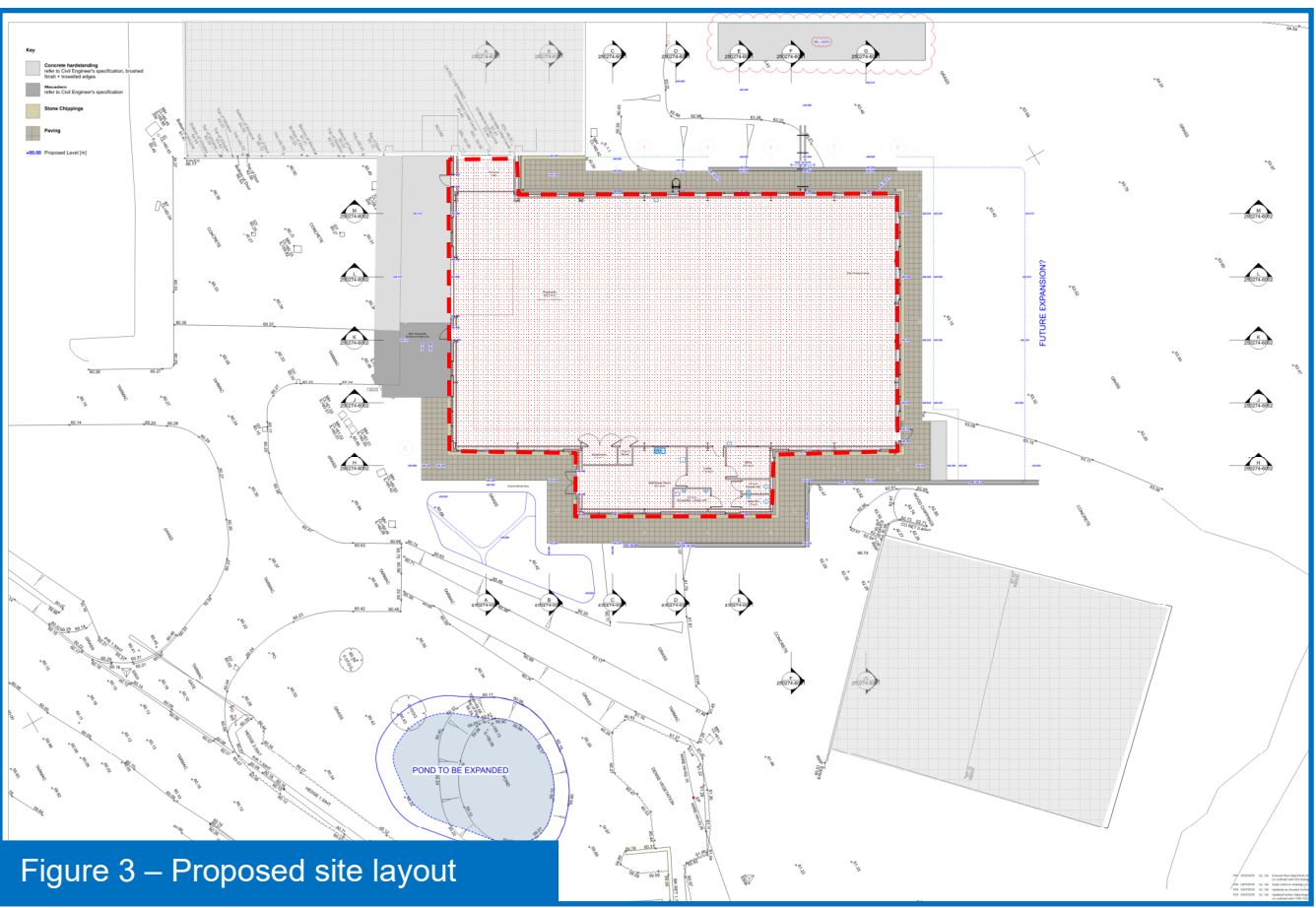


Figure 3 – Proposed site layout

- 1.7 A pre-planning application was submitted to Wiltshire County Council for their initial comments on the scheme. In response, the LLFA for Wiltshire County Council (WCC) have advised that a site-specific FRA will be required for this application. The pre planning application reference is ENQ/2025/00810 and has been included as Appendix A.
- 1.8 As the site is under 1Ha and in FZ1, the main FRA concern as referenced by the LLFA is surface water flooding. The main thrust of this report will therefore be the robust design of site drainage to avoid uncontrolled site flooding, the mitigation of flood impact on downstream catchment. This is covered in the sections below.

2 Flood Hazard – Possible sources and probabilities of flooding

- 2.1 **Fluvial Flooding** – The EA online ‘Flood Map for Planning’ (shown in Figure 4) confirms the site is in Zone 1 with an annual probability of fluvial flooding of less than 0.1%. The map evidence and the relative levels of the site compared to any adjacent watercourses confirm that fluvial flood risk is **very low**.

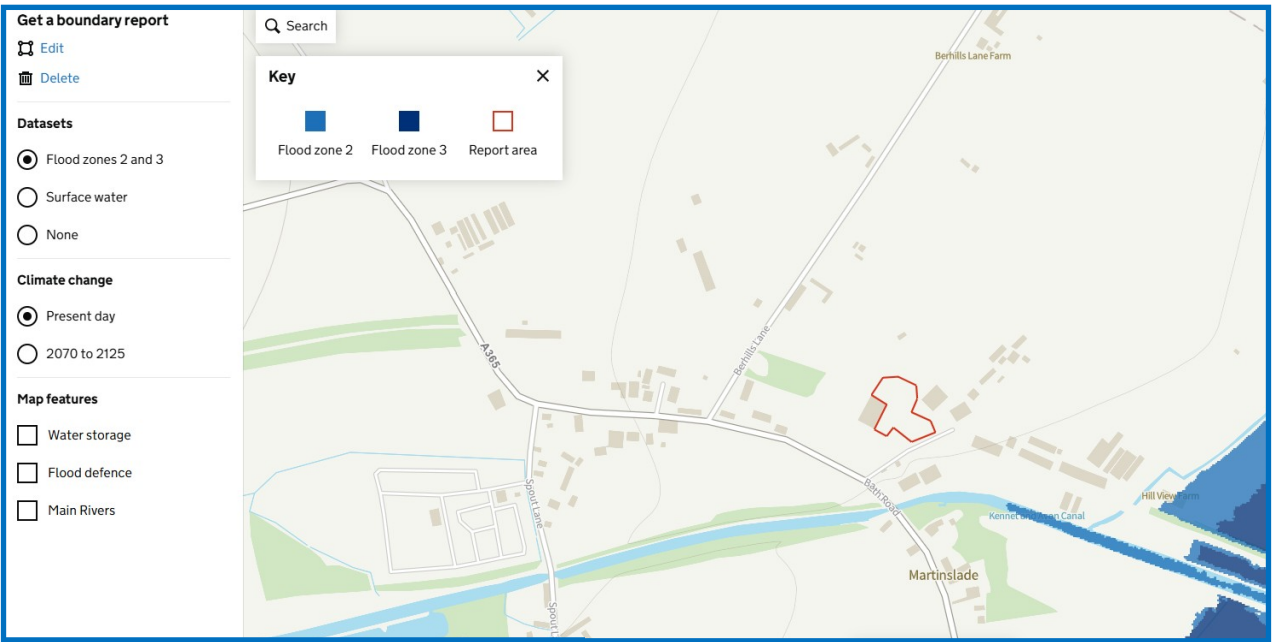


Figure 4 – Fluvial Flood Map

- 2.2 **Flooding from Drains, Sewers and Burst Water Mains** – The site generally falls in a SE direction, with a plateau formed for the existing and proposed building facility surrounded by green space. Service records have identified no significant services (mains or sewers), there are some small diameter local private existing drainage and water supply pipes, for which any failure would be easily be accommodated in the overland flow regime. There are public sewers and water supply assets in the main road adjacent to the site (A365). The road falls away to the south, so for any failure of public systems the site is protected as the warehouse FFL is around 500mm higher than the road.

Taking all of the above factors into account; flood risk from drains, sewers and burst water mains is considered to be **low**.

- 2.3 **Groundwater Flooding** – The site is underlain by mudstone of the Kimmeridge clay formation. Infiltration testing carried out on the site found the site to be impermeable. Testing identified a historic former railway at a level of around 59.00m AOD. Groundwater was encountered around 1.0m – 1.5m below the railway level. The site is located around 60m to the north of the Kennet and Avon Canal and is approximately 3.00m higher in elevation. There are no basements that might be vulnerable to external groundwater pressures and the

contours of the site would direct any groundwater seepages away from the buildings. Given the impermeable nature of the subsoil, any groundwater issues would be at worst negligible.

Taking all these factors into account, groundwater flood risk is considered to be **low**.

- 2.4 **Pluvial Flooding & Flooding from Land** – Figure 3 is an extract from the EA surface water flood map, which shows there is an area of the site at the proposed facility that may be susceptible to surface water flooding. This is due to the land in this area being pre excavated some 25 years ago to provide a formation for the new facility. The ground has been a little zealously over dug which has formed a depression up to 400mm deep in relatively impermeable sub soil, hence the surface ponding shown.
- 2.5 Under the pre app the LLFA have requested ‘the applicant must *‘demonstrate that overland flow routes safely manage flood risk, preventing flood risk to people and property from increasing’*. Therefore Flood Risk Analysis is to be undertaken to consider how the coarse flood EA mapping relates to the detailed site Topo and proposals to demonstrate flood risk to people & property is mitigated

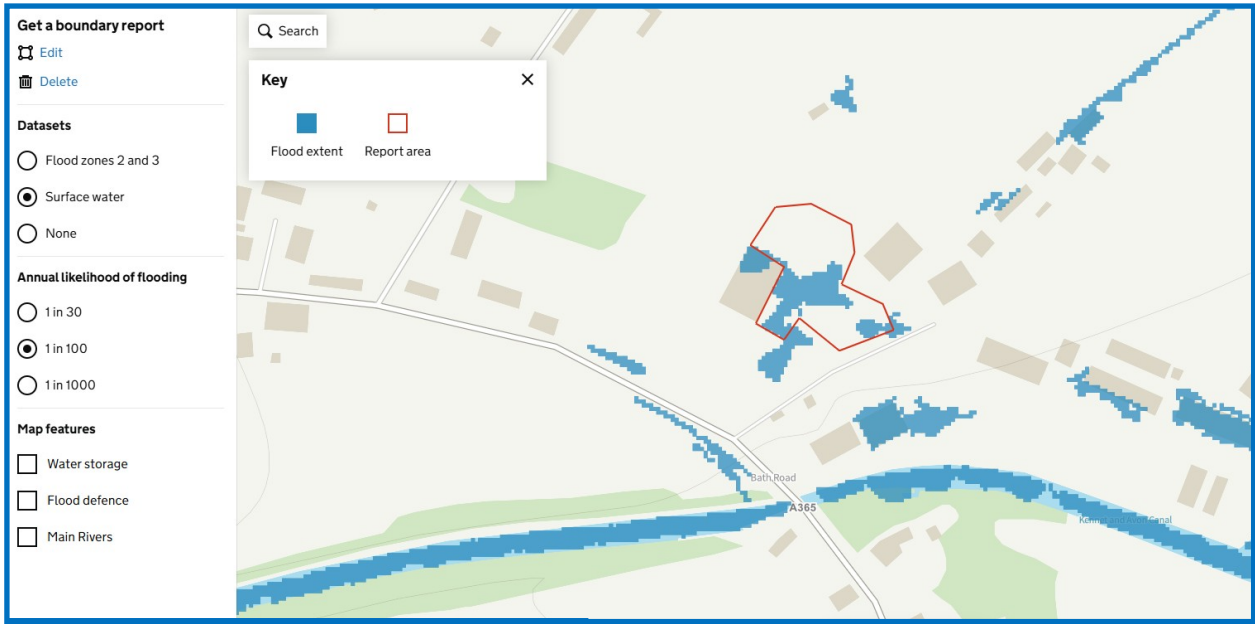


Figure 5 – Pluvial Flood Map

- 2.6 The existing prepared site formation at up to 400mm below FFL is identified from topo survey analysis to be the source of the EA surface water ponding. With analysis of the existing paving's, it is confirmed that the extent of existing perceived flooding is not correct and an over exaggeration based on the coarse lidar data. The surface flooding will be smaller with more isolated pockets of local depression.
- 2.7 By simply installing the new slab and surrounds the small surface water flooding is entirely resolved. The new FFL is set at 60.50 to match the existing FFL (and allow internal fork lift access between buildings). The level of proposed building at 60.50 and the external path set lower enables an overland flow route around the perimeter of the proposed and existing buildings. This surface flow runs off site over land around 250mm below the FFL and then passes off site to lower land at the South East, this final overland flow route is as per the current regime, so there is no change to offsite owners.
- 2.8 The overland flow routes are included on the site plan, included as Appendix G, so with the suitable overland flow routes and with the measures described, the risk of surface water flooding can be considered to be **low**.
- 2.9 As clarified in section 4 of this report, Surface water drainage from the proposed development will be discharged to a watercourse via the existing attenuation pond and control structure. Design parameters for the new attenuation storage will ensure there is no surface flooding resulting from peak flows from all storms up to a 100yr return period (1% annual probability) event including climate change allowances.

2.10 **Flooding from Other Artificial Sources** – As previously noted, the Kennett and Avon Canal runs approximately 60m to the south of the development site. At this location, the canal water level is around 57m AOD, approximately 3m below the elevation of the development site. There is a marina serving the Kennett and Avon Canal located approximately 800m to the south and east of the site (Caen Hill Marina). The approximate water level of the marina is 54m AOD, some 6m below the lowest point of the development site. Any failure of the marina, the subsequent flood route for would be South towards the Summerham Brook, away from the development site. Therefore, the risk of flooding from artificial sources is considered to be **very low**.



Figure 6 – Reservoir Flood Map

3 Existing Stormwater Run-off

- 3.1 The existing site (as identified on Figure 2) is currently a manufacturing facility with warehouse, associated car park and hardstanding. The development area is currently a flat area of green land. The existing drainage regime has been very well established by, topo survey, CCTV drainage survey, and the historic drainage drawings provide by the client. The existing drainage is shown on drawing 1708-C01 and has been included as Appendix C.
- 3.2 A greenfield calculation has been undertaken for the area of catchment effected by the development, this is presented with a green boundary line on the proposed drawing C02 provided in Appendix G. The below greenfield run-off rates have been calculated using industry standard software, Microdrainage using their Source Control design module. The rates are included in the table below and included as Appendix B

Return Period (year)	Greenfield Discharge Rate (l/s)
1	1.2
QBar	1.6
30	3.0
100	3.8

- 3.3 The existing hardstanding areas are positively drained, there are 2 separate drainage systems discharging in different directions. Drawing 1708-C01 shows the existing drainage network and existing drainage catchments complete with contributing areas.
- a) Existing Catchment A. The western most area is drained to an existing pond and has a catchment of the car park and a small amount of the road. This is a completely separate drainage system and is not impacted by the development, nor is it intended to be modified in any way. It is therefore not discussed any further in this report.
- b) Existing Catchment B. The rest of the site includes the warehouse, the access apron and the remaining part of the road. This all drains to the “duck pond” attenuation, and discharges via a 100mm dia pipe to a manhole outside the site boundary. The off site flow then discharges into an unnamed drainage ditch approximately 600m to the east of the site. This drainage system will be affected by the development proposals. The total contributing area of catchment B is 1655m²
- 3.4 The duck pond has a 100mm outlet pipe at a level of 59.23m AOD. This has been confirmed by topographical survey. The incoming pipes are larger at 225mm and 150mm, therefore suggesting the pond will provided attenuation with the smaller 100mm outlet pipe acting as the flow controller. Given the report writers experience of designing attenuation around this time, that would seem like an obvious design approach for the period.
- 3.5 The crest level of the duck pond is 59.72m AOD, providing 490mm deep of storage. This is the lowest crest level, any exceedance events would weir over in this location should it become overwhelmed by a large storm event. The current duck pond attenuation is shown in Figure 7.



Figure 7 – Existing Duck Pond Attenuation

- 3.6 Modelling has been carried with an aim of understanding how the existing system operates. Based on the impermeable contributing area and the storage volume within the pond, the modelling confirms that the pond was designed to accommodate a 1 in 30 year storm event with a freeboard of around 120mm and no allowance for climate change. This is considered broadly in line with the design guidance in place at the time the pond was designed and constructed (mid 1990's). So the existing model created is considered representative.
- 3.7 A 100 year event can also just about be accommodated within the pond, with only 22mm freeboard.
- 3.8 The existing flow rates and top water levels for some selected storm events are provided below. Existing pond modelling is included as Appendix D.

Return Period	TWL (m AOD)	Off-site Flow Rate (l/s)	Comments
1 year	59.415	5.9	
30 year	59.603	7.4	117mm of freeboard. Design standard at the time of construction.
100 year	59.698	8.0	Only 22mm freeboard
100 year +45%	FLOOD	N/A	Modern design standards

- 3.9 The level within the pond influences the discharge rate based on the hydraulic head over the 100mm outlet control.

4 Proposed Stormwater Drainage

- 4.1 This section of the report addresses the impact of flooding in the downstream catchment due to the potential increase in run-off generated by the introduction of new impermeable areas on the site. Obligations on developers to provide sustainable drainage systems are cited in NPPF.
- 4.2 In line with current best practice in the design of sustainable drainage (SuDS) together with EA and LLFA advice, a hierarchical approach should be taken for the disposal of surface water from the site, this approach is also cited within the National Standard for Sustainable Drainage Systems (SuDS) with Preferred option being harvesting, and referencing in order of priority:
- 1) Collected for non-potable use.
 - 2) Infiltrated to ground.
 - 3) Discharged to an above ground surface water body.
 - 4) Discharged to a surface water sewer, or another piped surface water system.
 - 5) Discharged to combined sewer.
- 4.3 With reference to the hierarchy, the proposed production. warehouse facility will have negligible use for recycled water as the existing toilets in the original building are retained, there is no expected increase in staffing (and staffing levels generally are very low). Therefore the environmental impact of the embedded carbon emissions generated by excavating, installing, and operating a recycling system is considered to be far greater than the negligible benefit a rainwater harvesting system will provide. Therefore, rainwater harvesting has been discounted on sustainability measures.
- 4.4 Infiltration tests have been undertaken by Structural Soils Ltd in July 2025 to establish if infiltration is a viable solution, key extracts of the investigation are provided in Appendix E.
- 4.5 Infiltration tests were carried out at the locations shown on drawing 1708-C02, included as Appendix G. The infiltration test carried out (ref: TP02) did not yield a rate. This is in line with other intrusive GI test carried out on the site, identifying that the site is underlain by clay. Therefore, infiltration is not a viable means of discharge and is discounted.
- 4.6 As clarified in the existing drainage regime, the existing site currently discharges via an attenuation (duck) pond to an off site watercourse. This extant watercourse is therefore the preferred discharge route.
- 4.7 To discharge via a new watercourse connection downstream of the existing pond would by cumulative sums of the existing plus proposed flow rates increase the overall off site flow rates. Providing the new site discharges at no greater than greenfield rate, is generally permitted, but fundamentally increasing the flow and having two or three separate off site controllers is not preferred. Often on new sites a single controller is requested where possible, for simplicity of final discharge control.
- 4.8 A significant problem identified at scheme design is the final discharge levels. The roof is resolved by

innovative high level pipes as discussed below. However it is difficult to attenuate the new low level paving areas. So it seems obvious to combine these with the existing duck pond.

- 4.9 The existing duck pond presents an opportunity to be included in the proposed surface water drainage design to provide a single discharge from the site. As discussed in Section 3, the off-site flow currently discharges to a watercourse around 600m to the east of the site via a piped network. The existing off site discharge shall be re-used for the proposed drainage network.
- 4.10 The proposed drainage network can be broken down into 2 separate parts. The roof and subsequent Rainwater Pipes serving it, and the surrounding access paths and warehouse access apron.
- 4.11 The ground levels are critical on this site. The proposed warehouse FFL shall be 60.50m AOD to match the existing warehouse. In order to achieve this FFL the existing ground level will be profiled with retaining walls and batters required to interface with the existing ground levels.
- 4.12 If the RWP's were allowed to drop to ground level of 60.50, then given the discharge levels, there would be no choice other than providing a attenuation tank and a pumped discharge. The design team from the outset of scheme design have considered methods of gravity control from the roof to avoid the ongoing costs and sustainability issues of pumping.
- 4.13 To allow the RWP's to achieve a gravity discharge, they must enter the ground at high level (above retaining wall and batters). This will be achieved by service crossings above the perimeter access path for the warehouse, and gutters have been designed and located accordingly to minimise crossings. Discharging at this high level allows sufficient falls to incorporate a geocellular storage tank high in the bank, before a controlled discharge. The roof area (including the small link corridor roof) is 1000m² so a large part of the development area to be drained. In providing a high level storage tank and flow control device, we manage to avoid pumping on what on what is a very challenging site in terms of levels.
- 4.14 The discharge rate from the geocellular storage tank shall be controlled by a Hydrobrake with a 50mm opening (to protect against blockages). The flow rate from the geocellular tank shall be 1.6 l/s and will pass on to the duck pond.
- 4.15 The external access paths and warehouse access apron have a contributing area of 364m² and are also very sensitive to levels as they need to be lower than the FFL of the warehouse to provide overland flow routing.
- 4.16 The perimeter paths are sandwiched between retaining structure and the warehouse and providing conventional drainage is not possible as it would become too deep to attenuate without pumping. To avoid pumping a shallow drainage channel is provided around the path perimeter to route the flow to attenuation at the building frontage. The channel has a high point in the northern corner of the path, so that flows are split. The west side of the warehouse will drain to a pipe under the building. The remaining area of the path will drain in a clockwise direction to the south-east corner of the warehouse where a shallow detention basin is provided. Directly adjacent to the basin, the paths will have flush edgings so that run-off will tip directly into the basin.
- 4.17 The concrete access apron to the warehouse frontage will have a shallow channel drain that discharges directly into the basin.
- 4.18 The new basin must be very shallow to prevent surcharging from the duck pond. It is therefore 400mm deep with 1 in 4 side slopes to facilitate easy maintenance. The outlet of the basin will be controlled by an orifice of 30mm diameter, limiting the flow from the basin to a maximum of 1.1 l/s. The outlet from the new shallow basin will be via a perforated collection pipe in gravel media, thereby providing excellent fine filtering to the 30mm control.
- 4.19 As shown on drawing 1708-C02, the development will add 2No additional pipes discharging into the existing duck pond. The total increase in peak flows reaching the existing duck pond will be 1.6l/s from the geocellular tank and 1.1l/s from the detention basin. The total increase is therefore 2.7 l/s.
- 4.20 As discussed in section 3 of this report, the existing duck pond has a simple 100mm dia control pipe outlet which restricts the discharge rate from the pond, based on the water level within it. Adding an additional flow of peak 2.7 l/s would increase the pond level and hence discharge rate.

- 4.21 The existing duck pond therefore needs to increase in size so that the additional 2.7 l/s can be accommodated, without increasing the water level of the pond and thus not increasing the off-site flow. If the pond can be increased sufficiently this will result in no increase to off-site flow under any storm conditions.
- 4.22 There are complexities in modelling the new warehouse drainage and combining the flows with the existing duck pond. The duck pond was designed at a time when different standards were in place, so modelling the existing pond with new design standards including climate change would confirm the pond is undersized by today's standards and fail for the extreme storm events. We therefore need to take a rationalised, logical approach to the existing pond and size increase. The fundamental principle used is thus:
- The new basin and cellular attenuation must be designed for the 100 year plus climate change event. Therefore the new build elements will generate no uncontrolled discharge from site.
 - The existing duck pond regime has already been analysed. This model needs to be re-run, for the same events allowing for the additional inflow. The duck pond needs to be increased in size such the larger size accommodates the additional flow, and the discharge rate and levels from the existing system modelled in Section 3 are not compromised.
- 4.23 As an initial calculation, the existing duck pond reaches its highest storage level during the 60min winter storm, so we will analyse this critical storm for duck pond storage. During the 60min storm, the original duck pond has a storage volume of 29.1m³. The proposed drainage networks are discharging into the existing pond at 2.7 l/s, so when taken over an hour this generates 9.72m³ in additional volume. This equates to around a third additional storage is required to accommodate the 60min storm. This is an overestimation, as the inflow is a peak of 2.7 l/s and will be less than this for a period.
- 4.24 With the space available, we elected to increase the pond by an extra 50% (15m³) to 44.4m³ at the 30 year level (59.415).
- 4.25 A further check was carried out by using the "cascading ponds" section within the source control module of Microdrainage as per the Figure 8 schematic to give reassurance that the pond is suitably sized across the full range of storm profiles. The table below shows the output of the cascading pond modelling which is included as Appendix F. The goal of the modelling is to prove the enlarged pond would take the proposed additional drainage systems without increasing the offsite flow.

Return Period (Years)	Existing Duck Pond		Proposed Duck Pond		Comments
	TWL (m AOD)	Discharge Rate (l/s)	TWL (m AOD)	Discharge Rate (l/s)	
1	59.415	5.9	59.425	6.0	Marginal increase in off site flow rate
30	59.603	7.4	59.594	7.3	Decrease in off site flow rate
100	59.698	8.0	59.686	7.9	Decrease in off site flow rate

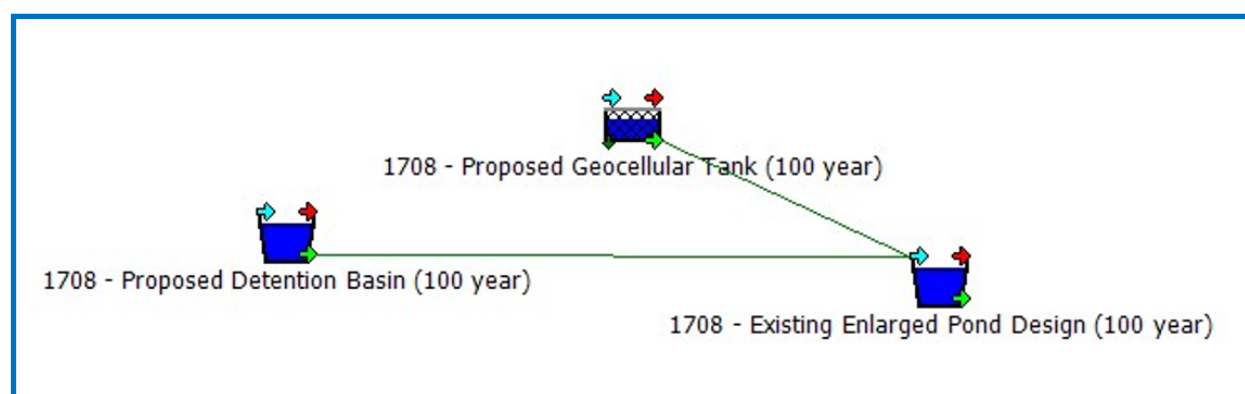


Figure 8 – Cascading Pond Schematic

- 4.26 The result of the modelling confirms a reduction in the off-site flow rate from the proposed drainage network when compared to the existing scenario for all but the 1 year storm (which is not a major event that will lead to flooding). This goes further than the legislation of restricting to greenfield rates, and reduces the existing discharge, such that by providing the development the offsite storm discharge is reduced. And the 100 year level in the duck pond is also reduced by 12mm. The results confirm the design will not increase the risk of flooding downstream for the 30 year and 100 year storms.
- 4.27 Ground levels adjacent to the building shall fall away, protecting the building from overland flow and surface ponding, should the drainage network become blocked.
- 4.28 Based on the existing pond modelling calculations provided, the design provides betterment as the entire proposed area is to be controlled within the enlarged existing pond and the flow rate off site shall not increase for the critical storms.
- 4.29 The proposed drainage layout is shown in Appendix G.
- 4.30 Land drainage consent to be considered at detailed design stage should planning be approved. There are no works to existing watercourses and no increase in off-site flow rate.

5 Management of Everyday rainfall (Interception)

- 5.1 The National Standard for Sustainable Drainage Systems (SuDS) Standard 2 states that new developments should:
- Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems.
 - Evidence shall be provided that the approach to managing runoff from 'everyday' rainfall has been developed alongside and in support of the management of runoff quality (standard 4) and the delivery of amenity and biodiversity benefits (standards 5 and 6).
- 5.2 To satisfy the above, interception is to be used to prevent the first 5mm of run-off from leaving the site. Guidance sets out typical ratios for each SuDS element that is being implemented.
- 5.3 The geocellular storage tank (which is essential to avoid pumping) discharges into the duck pond which has been enlarged to accommodate the additional flows, so some interception will occur within the enlarged pond.
- 5.4 For the detention basin, the base area must be a minimum 20% of the impermeable catchment, and this has been achieved. The external paving is an area of 364m². the base of the detention basin is 75m², so satisfies the above guidance.

6 Water Quality – Storm.

- 6.1 The roof area is relatively clean and the proposed drainage layout provides a silt trap upstream of the geocellular storage tank for sediment control. This discharges to the duck pond providing further water quality treatment.
- 6.2 The detention basin will provide water quality improvements.
- 6.3 The existing enlarged duck pond will provide further water quality improvements
- 6.4 With the above measures in place, there will be excellent water quality improvement to discharges from the site.

7 Climate change

- 7.1
- The design life of the project is in excess of 60 years. An allowance for 45% climate change induced rainfall has been included in the 100 year calculations. This will ensure that the effect of potential higher rainfall rate are mitigated to below pre-development conditions well into the 2080's.
- 7.2
- Figure 9 has been taken from DEFRA website on climate change allowances.
- 7.3
- Final design will be approved by building control.

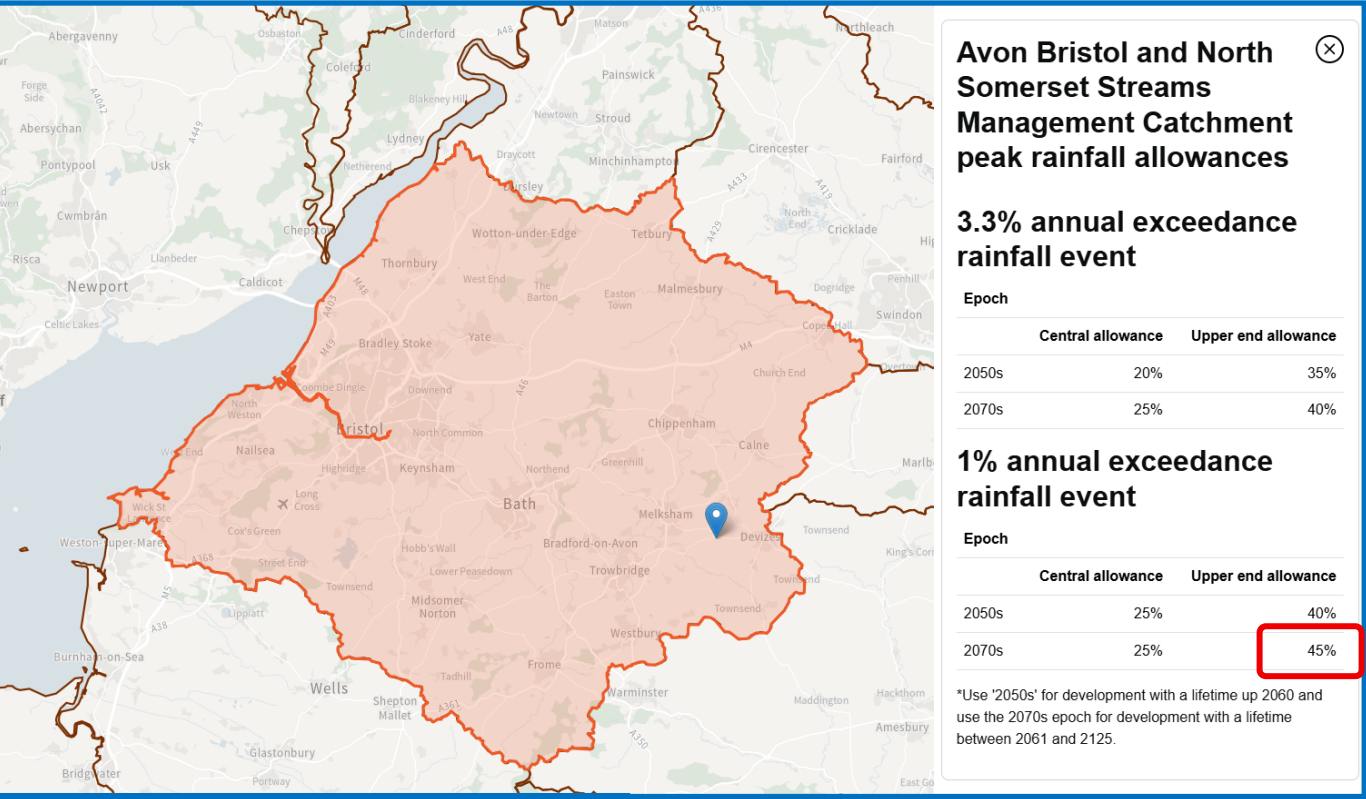


Figure 9 – Climate Change Allowance

8 Flood Risk Management Measures

- 8.1
- The proposed site drainage systems will be designed so that they are easy to inspect and simple to maintain, with plenty of access points for future maintenance.
- 8.2
- Potential issues that will need to be addressed in order to sustain the low level of flood risk on the site will be:
 - Checking of the channel drain it is functioning as intended and is not compromised by silt accumulation.
 - Periodical inspection and jetting of drain runs.
 - Clearing of gutters and rainwater gullies to prevent any carry-over of debris into the drainage system. Where necessary, leaf guards should be fitted to gutters and downpipe outlets to prevent the ingress of leaves and moss etc.

Where regular checks are required a maintenance schedule has been included as Appendix K. It is advised that initially inspections are carried out at short intervals for the drainage, and the need for checking would be reviewed on an ongoing basis depending on how the various elements are performing.

9 Off Site Impacts

- 9.1
- Potential off-site impacts are addressed by the design proposal provided. With the proposed sustainable drainage measures in place together with the drainage management procedures described, it is considered that there will be no increase in flood risk to off-site receptors, including for the effects of climate change.

10 Residual Flood Risks

- 10.1
- The residual flood risks following development taking account of climate change effects are considered to be as follows:
 - 10.1.1 Less than 0.1% annual probability of fluvial flooding to the development site.
 - 10.1.2 1% annual risk of exceedance flows due to surcharged drain systems within the site but negligible risk of flood damage from this source bearing in mind the relationship of proposed floor levels to site levels.
 - 10.1.3 Risk of downstream flooding due to run-off from the development maintained at pre-development levels for all storm events up to the worst case 100yr event through sustainable drainage measures, with 40% capacity allowance for climate change.
- 10.2
- For exceedance events and in line with WCC requirements overland flow must be considered. This is for events such as system blockage/failure. As per the layout in Appendix D all paving falls away from doors, with external paving laid to falls to the SE. Therefore, any overland flow would pass through the site and not impact the buildings.
- 10.3
- Overall residual flood risk post development is therefore considered to be **low**.

11 Foul Drainage

- 11.1
- There is an existing private foul water pumping station serving the site which discharges to the public foul network. There will be negligible increase in foul loaded as there will be no increase in staff numbers post development. The client has been made aware that the existing foul water pumping station will remain as per current operation.
- 11.2
- The pumping station is regularly serviced by the provider.

12 LLFA Pre-Application response

- 12.1 The LLFA have kindly provided pre-application comments so it is useful to respond to those concerns directly. These are addressed in the table below and refer to the site specific items raised within the LLFA response, which is included as Appendix A.

LLFA comments	Comment response	Refer to section with report
It is noted that the existing site drains via a collection network, with surface water attenuated in a pond, before discharging into a ditch to the east of the site, across third-party land.	Existing drainage utilises an attenuation pond and discharges to a ditch to the east of the site.	Section 3
We note the applicant proposes to either extend the existing attenuation pond or provide a secondary controlled attenuation system.	Existing pond to be enlarged and combined with supplementary storage.	Section 4
The applicant must ensure there is sufficient volume in the drainage system to manage increased flows.	Existing pond modelled and enlarged suitably to manage increase in flows.	Section 4
The applicant must demonstrate that the development will not increase flood risk to existing people & property, or third-party land	Design generates no increase to off-site flow and prevention of flooding on site.	Section 4 Section 9
The applicant must ensure there is no increase in the runoff rate post-development on the greenfield runoff rates for the increased impermeable land.	There is no increase in off-site flow. Additional greenfield rates are not used as we have matched and bettered pre-development rates.	Section 4 Section 9
The applicant must gain land drainage consent if there will be an increased rate or volume of discharge into the watercourse post-development	Land drainage consent to be applied for due to increase in volume to existing watercourse. This is considered a procedural matter. This will be applied for at a later design stage.	Section 4

APPENDIX A – Wiltshire County Council FRA & Drainage Strategy Pre-Planning advice


 Wiltshire Council

Wiltshire Council Planning Consultation Response

4th August 2025

Wiltshire Council Drainage Engineer
Technical Services Drainage Engineer
Wiltshire Council

Application No: ENQ/2025/00810 - Bluemay Ltd. Warehouse, Melksham, SN12 6RS
New warehouse building for manufacturing, with associated external works.

Pre-Application Advice: Flood Risk

The Wiltshire Council Strategic Flood Risk Assessment, [SFRA Data Explorer](#), has indicated that the site is located within Flood Zone 1. It is noted the applicant has stated that there is mapped surface water flooding at the site. Although, the site has already been excavated, lowering the existing ground level by 400mm below surrounding land. At detailed design, the applicant must demonstrate that overland flow routes safely manage flood risk, preventing flood risk to people and property from increasing. We note the completion of construction may impact mapped flooding, despite this the applicant will have to demonstrate flood risk to people & property is mitigated.

Overall, the site is shown to be at moderate cumulative risk of flooding in the future from all sources.

A site-specific Flood Risk Assessment (FRA) is required for this application. The site-specific FRA should demonstrate that the site is not adversely affected by flood risk from different sources, and how the flood risk from **all sources** will be managed without increasing flood risk to the development itself or elsewhere. It should also outline the proposed drainage strategy for the site. The applicant is referred to the Environment Agency's [advice](#) on how to prepare an FRA, as well as their standing [advice](#) for vulnerable developments.

Pre-Application Advice: Drainage Strategy / Drainage Design

Based on BGS Mapping / Cranfield University Soils mapping, the site is indicated to be underlain by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils; this indicates that drainage could be impeded, but soakaway testing in accordance with BRE 365 would confirm whether the site is suitable to discharge surface water by infiltration. The suitability of infiltration to dispose of surface water will need to be assessed by the applicant.

Based on DEFRA Magic Maps the site has been shown to not be in a Source Protection Zone.

The applicant should note that in all instances the preference should be to utilise blue-green SuDS which provide multi-faceted benefits to the site (in terms of water quantity, quality, amenity and biodiversity); for example, for attenuation features preference should be given to use of swales / ponds / detention basins (if technically feasible) instead of attenuation tanks. The applicant should adopt a holistic approach to planning the site, and sufficient space for SuDS features should be provided at an early stage in order to fulfil the requirements of NPPF Paragraph 169; the LLFA will not accept statements that there is insufficient space for SuDS or that SuDS have not been utilised due to cost.

Any proposals should be designed in accordance with the Non-statutory Technical Standards for Sustainable Drainage Systems and the latest SuDS Manual (C753).

The applicant should note the EA's updated climate change guidance (dated [27 May 2022](#)) when preparing the Flood Risk Assessment / Drainage Strategy.


 Wiltshire Council

The developer should provide the following information as part of future planning applications:

Drainage Strategy

- Evidence that SuDS have been selected, wherever possible, to provide a wide range of benefits including amenity, biodiversity and maintaining water quality.
- Evidence that SuDS source control measures to manage water quantity and maintain water quality have been implemented wherever possible and throughout the management train so the development is not reliant upon large attenuation features close to the points of discharge.
- Existing greenfield runoff rates for the site.
- Post development runoff rates in accordance with Wiltshire Council's betterment policy:
 - *With regards the control of surface water discharges from new development, Wiltshire Council requires post development discharges from greenfield sites to provide 20% betterment over pre-development discharges for all storm events between the 1 in 1year and 1 in 100year return period events.*
 - *For greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.*
- Evidence demonstrating how the surface water disposal hierarchy has been applied and how all other options have been exhausted. The hierarchy is set out below (as per the Sewerage Sector Guidance, paragraph C.3.12):
 - Surface water runoff is collected for use.
 - Discharge into the ground via infiltration.
 - Discharge to a watercourse or other surface water body.
 - Discharge to surface water sewer or other drainage system, discharging to a watercourse or other surface water body.
 - Discharge to a combined sewer.
- The drainage strategy does not increase flood risk, as a result of catchment transfer.
- A detailed plan showing the existing drainage features on the site and how the proposed drainage strategy will be implemented.
- If infiltration is proposed, it is implemented in manner that does not create an offsite impact, particularly if there are reports of groundwater flooding in the area.
- Surface water can be safely managed within the proposed development, up to and including a 1 in 100 year plus climate change event.
- Existing flood flow routes through the site have been maintained or where they will be affected, adequate measures to intercept and safely control flows through the site have been provided to ensure flood risk is not increased elsewhere.
- All proposed drainage features are outside flood zones 2 and 3 and where they are adjacent to an ordinary watercourse, they are not located within the EA surface water flood maps. Where drainage features are located adjacent to flood zones 2 and 3, they must be above the 1 in 100 year plus climate change flood level. This information can be provided by the EA.
- The strategy mimics the existing drainage characteristics of the site by retaining and utilising any existing drainage features.
- Measures to prevent pollution of the receiving groundwater and/or surface waters.
- A clearly labelled drainage layout plan showing the pipe networks and any attenuation ponds. The plan should show any pipe node numbers referred to within the drainage calculations.

Ground Investigations

- Geotechnical factual and interpretive reports, including infiltration tests in accordance with British Research Establishment (BRE) Digest 365 – Soakaway Design.
- Groundwater level monitoring (taking into account seasonal variations).
- The applicant is referred to Wiltshire Council's [Surface Water Soakaway Guidance](#) for the standards that must be met for planning approval and adoption of infiltration drainage features.

Detailed Drainage calculations

- Calculations and drawings for the drainage system design showing designated holding areas and conveyance routes based on no flooding on site for a 1 in 30 year plus climate change rainfall event.
- Calculations and drawings for the drainage system design showing designated holding areas and conveyance routes based on no flooding on site for a 1 in 100 year plus climate change rainfall event in respect to a building (including basement) or utility plant susceptible to water within the development.
- Calculations should include an allowance for increased surface water runoff, as a result of urban creep, in accordance with LASOO guidance.
- Hydraulic Models should set the MADD factor / additional storage volume factor to 0m³ / ha in order to prevent an overestimation of storage capacity in the proposed drainage network.

Design Drawings

- A plan showing the cross sections and design of any attenuation pond and its components.
- Drawings showing conveyance routes for flows exceeding the 1 in 100 year plus climate change rainfall event that minimise the risk to people and property.

Third party consent

- Consent for any outfalls from the proposed drainage systems into a public sewer or other drainage system not owned by the applicant.

Ownership and Management

- Details of how the proposed and existing drainage features on the site will be maintained and managed after completion with confirmation from the relevant authority that they will adopt any systems that are being offered for adoption.

Construction

- Adequate measures during construction to control pollution to existing watercourses and groundwater.
- A construction management plan.

Site-specific comments regarding drainage & flood risk:

- It is noted the existing site drains via a collection network, with surface water attenuated in a pond, before discharging into a ditch to the east of the site, across third-party land.
- We note the applicant proposes to either extend the existing attenuation pond or provide a secondary controlled attenuation system.
- The applicant must ensure there is sufficient volume in the drainage system to manage increased flows.
- The applicant must demonstrate the development will not increase flood risk to existing people & property, or third-party land.
- The applicant must ensure there is no increase in the runoff rate post-development on the greenfield runoff rates for the increased impermeable land.
- The applicant must gain land drainage consent if there will be an increased rate or volume of discharge into the watercourse post-development.

Informatives:

The table below stipulates the information typically required at each application stage. Provision of the correct information will expedite the processing of applications by the drainage team.

Pre-app	Outline	Full	Reserved matters	Discharge of conditions	Document to be submitted
✓	✓	✓			Flood Risk Assessment / Statement
✓	✓	✓			Drainage Strategy / Statement & sketch layout plan
	✓				Preliminary layout drawings
	✓				Preliminary "Outline" hydraulic calculations
	✓				Preliminary landscape proposals
	✓				Ground investigation report (for infiltration)
	✓	✓			Evidence of third party agreement for discharge to their system (in principle/ consent to discharge)
		✓		✓	Maintenance program and on-going maintenance responsibilities
		✓	✓		Detailed development layout
		✓	✓	✓	Detailed flood & drainage design drawings
		✓	✓	✓	Full Structural, hydraulic & ground investigations
		✓	✓	✓	Geotechnical factual and interpretive reports, including infiltration results
		✓	✓	✓	Evidence of measures to prevent pollution of the receiving groundwater and/or surface waters
		✓	✓	✓	Drawings showing conveyance routes for flows exceeding the 1 in 100 year plus climate change
		✓	✓	✓	Detailed landscaping details
		✓	✓	✓	Discharge agreements (temporary and permanent)
		✓	✓	✓	Development Management & Construction Phasing Plan

Barney Taylor (AtkinsRéalis working on behalf of Wiltshire Council Drainage).

APPENDIX B – Greenfield Runoff Rates

Infrastructure Design Studio		Page 1																								
31 Dyer Street	1708 - BLUEMAY																									
Cirencester	GREENFIELD																									
Glos GL7 2PP	RUN-OFF RATES																									
Date 25/11/2025	Designed by LTB																									
File	Checked by MS																									
Causeway	Source Control 2020.1																									
<u>ICP SUDS Mean Annual Flood</u> Input <table><tr><td>Return Period (years)</td><td>100</td><td>Soil</td><td>0.450</td></tr><tr><td>Area (ha)</td><td>0.328</td><td>Urban</td><td>0.000</td></tr><tr><td>SAAR (mm)</td><td>750</td><td>Region Number</td><td>Region 8</td></tr></table> Results 1/s <table><tr><td>QBAR Rural</td><td>1.6</td></tr><tr><td>QBAR Urban</td><td>1.6</td></tr><tr><td>Q100 years</td><td>3.8</td></tr><tr><td>Q1 year</td><td>1.2</td></tr><tr><td>Q30 years</td><td>3.0</td></tr><tr><td>Q100 years</td><td>3.8</td></tr></table>			Return Period (years)	100	Soil	0.450	Area (ha)	0.328	Urban	0.000	SAAR (mm)	750	Region Number	Region 8	QBAR Rural	1.6	QBAR Urban	1.6	Q100 years	3.8	Q1 year	1.2	Q30 years	3.0	Q100 years	3.8
Return Period (years)	100	Soil	0.450																							
Area (ha)	0.328	Urban	0.000																							
SAAR (mm)	750	Region Number	Region 8																							
QBAR Rural	1.6																									
QBAR Urban	1.6																									
Q100 years	3.8																									
Q1 year	1.2																									
Q30 years	3.0																									
Q100 years	3.8																									
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APPENDIX C – Drawing 1708-C01 Existing Drainage General Arrangement



D:\projects\1708_C01.dwg 26/11/2025 16:13:54

APPENDIX D – Existing Pond Microdrainage Modelling

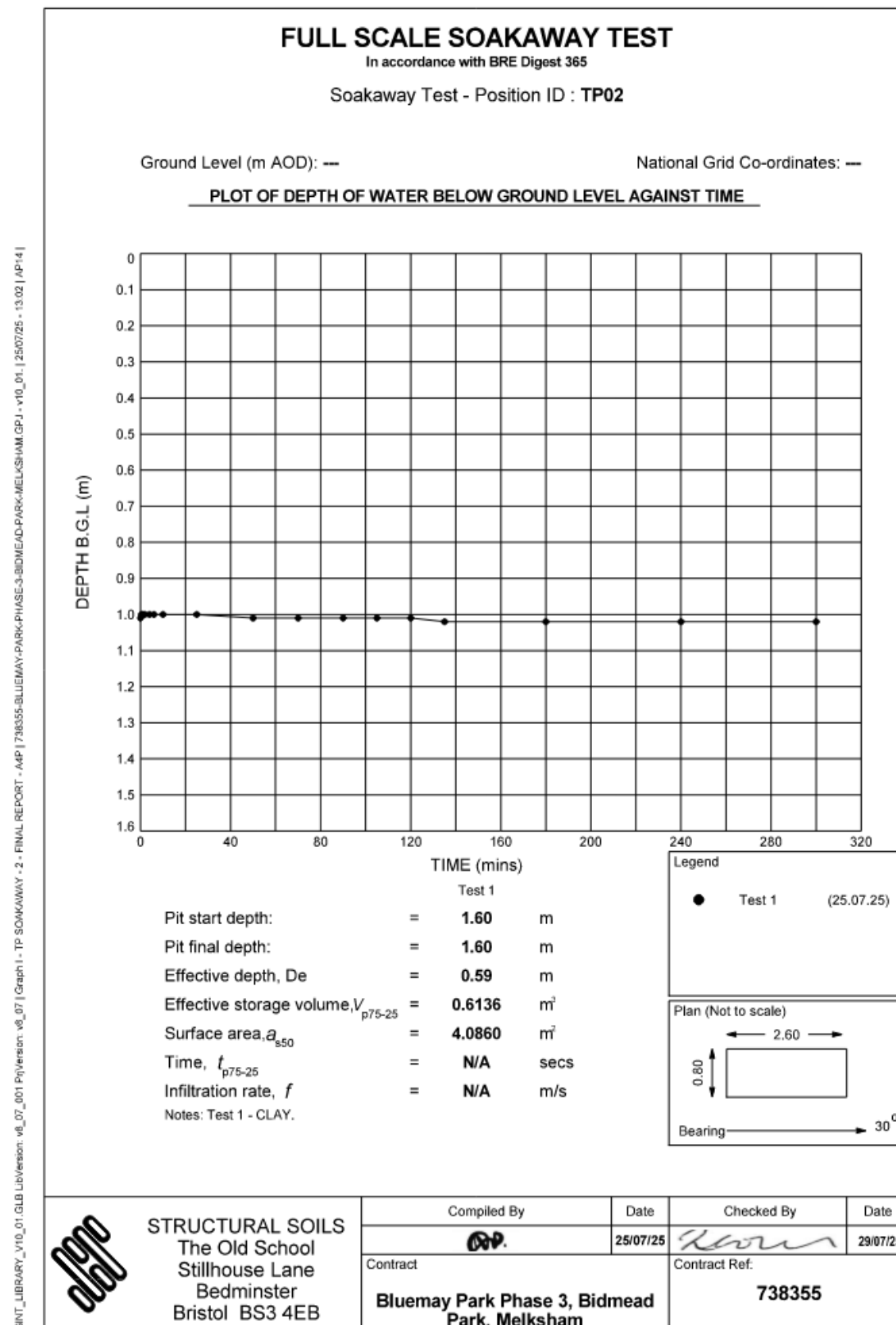
Infrastructure Design Studio				Page 1	
31 Dyer Street Cirencester Glos GL7 2PP		1708 - BLUEMAY PH3 EXISTING POND 30 YEAR			
Date 29/07/2025 File 1708 - Existing Pond De...		Designed by LTB Checked by MS			
Causeway		Source Control 2020.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	59.522	0.242	6.8	20.6	Flood Risk
30 min Summer	59.558	0.278	7.1	24.3	Flood Risk
60 min Summer	59.574	0.294	7.2	26.0	Flood Risk
120 min Summer	59.565	0.285	7.1	25.0	Flood Risk
180 min Summer	59.543	0.263	7.0	22.8	Flood Risk
240 min Summer	59.520	0.240	6.8	20.4	Flood Risk
360 min Summer	59.479	0.199	6.5	16.5	Flood Risk
480 min Summer	59.448	0.168	6.2	13.6	Flood Risk
600 min Summer	59.425	0.145	6.0	11.5	Flood Risk
720 min Summer	59.412	0.132	5.7	10.4	O K
960 min Summer	59.396	0.116	4.7	9.0	O K
1440 min Summer	59.378	0.098	3.6	7.5	O K
2160 min Summer	59.362	0.082	2.7	6.2	O K
2880 min Summer	59.350	0.070	2.1	5.3	O K
4320 min Summer	59.338	0.058	1.6	4.3	O K
5760 min Summer	59.332	0.052	1.3	3.8	O K
7200 min Summer	59.328	0.048	1.1	3.5	O K
8640 min Summer	59.325	0.045	0.9	3.3	O K
10080 min Summer	59.322	0.042	0.8	3.1	O K
15 min Winter	59.549	0.269	7.0	23.3	Flood Risk
30 min Winter	59.589	0.309	7.3	27.7	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	78.854	0.0	24.4	16	
30 min Summer	51.309	0.0	31.8	28	
60 min Summer	31.905	0.0	39.7	44	
120 min Summer	19.242	0.0	47.9	78	
180 min Summer	14.157	0.0	52.8	112	
240 min Summer	11.334	0.0	56.4	144	
360 min Summer	8.291	0.0	61.9	206	
480 min Summer	6.632	0.0	66.0	264	
600 min Summer	5.574	0.0	69.3	320	
720 min Summer	4.835	0.0	72.2	376	
960 min Summer	3.860	0.0	76.8	500	
1440 min Summer	2.807	0.0	83.8	736	
2160 min Summer	2.039	0.0	91.4	1104	
2880 min Summer	1.624	0.0	97.0	1468	
4320 min Summer	1.178	0.0	105.5	2192	
5760 min Summer	0.937	0.0	112.0	2936	
7200 min Summer	0.784	0.0	117.2	3632	
8640 min Summer	0.678	0.0	121.5	4400	
10080 min Summer	0.600	0.0	125.3	5072	
15 min Winter	78.854	0.0	27.4	16	
30 min Winter	51.309	0.0	35.7	30	
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Infrastructure Design Studio					Page 2
31 Dyer Street		1708 - BLUEMAY PH3			
Cirencester		EXISTING POND			
Glos GL7 2PP		30 YEAR			
Date 29/07/2025		Designed by LTB			
File 1708 - Existing Pond De...		Checked by MS			
Causeway		Source Control 2020.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	59.603	0.323	7.4	29.1	Flood Risk
120 min Winter	59.583	0.303	7.2	27.0	Flood Risk
180 min Winter	59.549	0.269	7.0	23.4	Flood Risk
240 min Winter	59.514	0.234	6.7	19.9	Flood Risk
360 min Winter	59.456	0.176	6.3	14.3	Flood Risk
480 min Winter	59.418	0.138	6.0	10.9	O K
600 min Winter	59.404	0.124	5.2	9.7	O K
720 min Winter	59.393	0.113	4.5	8.8	O K
960 min Winter	59.379	0.099	3.7	7.6	O K
1440 min Winter	59.362	0.082	2.7	6.2	O K
2160 min Winter	59.346	0.066	2.0	4.9	O K
2880 min Winter	59.338	0.058	1.6	4.3	O K
4320 min Winter	59.330	0.050	1.2	3.7	O K
5760 min Winter	59.325	0.045	0.9	3.3	O K
7200 min Winter	59.321	0.041	0.8	3.0	O K
8640 min Winter	59.318	0.038	0.7	2.7	O K
10080 min Winter	59.315	0.035	0.6	2.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	31.905	0.0	44.4	48	
120 min Winter	19.242	0.0	53.6	86	
180 min Winter	14.157	0.0	59.2	120	
240 min Winter	11.334	0.0	63.2	154	
360 min Winter	8.291	0.0	69.3	214	
480 min Winter	6.632	0.0	73.9	264	
600 min Winter	5.574	0.0	77.7	320	
720 min Winter	4.835	0.0	80.8	382	
960 min Winter	3.860	0.0	86.0	500	
1440 min Winter	2.807	0.0	93.9	750	
2160 min Winter	2.039	0.0	102.3	1104	
2880 min Winter	1.624	0.0	108.7	1468	
4320 min Winter	1.178	0.0	118.2	2204	
5760 min Winter	0.937	0.0	125.4	2872	
7200 min Winter	0.784	0.0	131.2	3576	
8640 min Winter	0.678	0.0	136.1	4344	
10080 min Winter	0.600	0.0	140.4	5080	
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Infrastructure Design Studio		Page 3									
31 Dyer Street	1708 - BLUEMAY PH3										
Cirencester	EXISTING POND										
Glos GL7 2PP	30 YEAR										
Date 29/07/2025	Designed by LTB										
File 1708 - Existing Pond De...	Checked by MS										
Causeway	Source Control 2020.1										
<u>Rainfall Details</u>											
Rainfall Model	FSR	Winter Storms Yes									
Return Period (years)	30	Cv (Summer) 0.750									
Region	England and Wales	Cv (Winter) 0.840									
M5-60 (mm)	20.700	Shortest Storm (mins) 15									
Ratio R	0.400	Longest Storm (mins) 10080									
Summer Storms	Yes	Climate Change % +0									
<u>Time Area Diagram</u>											
Total Area (ha) 0.166											
<table><tr><th colspan="2">Time (mins)</th><th>Area</th></tr><tr><th>From:</th><th>To:</th><th>(ha)</th></tr><tr><td>0</td><td>4</td><td>0.166</td></tr></table>			Time (mins)		Area	From:	To:	(ha)	0	4	0.166
Time (mins)		Area									
From:	To:	(ha)									
0	4	0.166									
©1982-2020 Innovyze											

Infrastructure Design Studio		Page 4																
31 Dyer Street	1708 - BLUEMAY PH3																	
Cirencester	EXISTING POND																	
Glos GL7 2PP	30 YEAR																	
Date 29/07/2025	Designed by LTB																	
File 1708 - Existing Pond De...	Checked by MS																	
Causeway	Source Control 2020.1																	
<u>Model Details</u>																		
Storage is Online Cover Level (m) 59.720																		
<u>Tank or Pond Structure</u>																		
Invert Level (m) 59.280																		
<table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>71.0</td><td>0.440</td><td>128.0</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	71.0	0.440	128.0								
Depth (m)	Area (m²)	Depth (m)	Area (m²)															
0.000	71.0	0.440	128.0															
<u>Pipe Outflow Control</u>																		
<table><tr><td>Diameter (m)</td><td>0.100</td><td>Entry Loss Coefficient</td><td>0.500</td></tr><tr><td>Slope (1:X)</td><td>100.0</td><td>Coefficient of Contraction</td><td>0.600</td></tr><tr><td>Length (m)</td><td>32.000</td><td>Upstream Invert Level (m)</td><td>59.280</td></tr><tr><td>Roughness k (mm)</td><td>0.600</td><td></td><td></td></tr></table>			Diameter (m)	0.100	Entry Loss Coefficient	0.500	Slope (1:X)	100.0	Coefficient of Contraction	0.600	Length (m)	32.000	Upstream Invert Level (m)	59.280	Roughness k (mm)	0.600		
Diameter (m)	0.100	Entry Loss Coefficient	0.500															
Slope (1:X)	100.0	Coefficient of Contraction	0.600															
Length (m)	32.000	Upstream Invert Level (m)	59.280															
Roughness k (mm)	0.600																	
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APPENDIX E – Ground Investigation Report – Infiltration Testing and key extracts



Transport, *Design Manual for Roads and Bridges Interim Advice Note (IAN) 73/06 (Draft HD25)*.

The plate load and TRL DCP test results are included in Appendix C. TRL DCP tests 02 and 07 show that a modulus of subgrade reaction value of at 60,000 kN/m²/m could be assumed for floor slab design north of the footprint of the former railway, where the floor would be underlain by stiff clay soils (both natural soils and Made Ground). Test DCP06, located near the southern edge of the former railway showed similar results below 0.90 m depth where it passed into clay soils (as seen in WS06 alongside).

Plate load test PLT03 showed a lower value of about 35,000 kN/m²/m but due to the very shallow test depth this is unlikely to be representative.

7.6 Soakaways

The suitability of a site for soakaways depends on the characteristics of the soil (or rock) and the groundwater level beneath the site. For design purposes the soil infiltration rate should be measured by completing soakage tests in pits following the methodology described in Building Research Establishment Digest 365 Soakaway design, 2016 (BRE-365).

BRE-365 states that a soakaway should discharge from full to half volume within 24 hours in readiness for subsequent storm inflow. Groundwater should not rise above the base of the soakaway.

A soakaway test was completed at 1.60 m depth in trial pit TP02 which was located outside of and >5 m from the proposed building footprint. Here very stiff natural Kimmeridge Clay soils were found below 0.60 m depth and negligible drainage occurred over the 5 hour duration of the test. The clay soils are unsuitable for soakaway type drainage.

SSL later learned that it is planned to construct a second flood attenuation pond south of the existing pond. This pond would fall outside of the mapped footprint of the former railway and the location is also expected to be underlain by stiff natural clays.

Within the footprint of the former railway groundwater was encountered at several locations at depths of between around 1.00 m and 1.50 m, with standing water levels of around 1 m below the main site level (~ 59 mAOD) subsequently being measured in monitoring wells.

The site is unsuitable for conventional soakaway type drainage due to shallow groundwater in the Made Ground within the footprint of the former railway, and low permeability clay soils outside of it.

It is understood, anecdotally, that rainwater ponds on the main flat grassed area of the site at times during wetter parts of the year.

7.7 Protection of Buried Concrete

This assessment of the potential for chemical attack on buried concrete is based on current guidance contained in BRE Special Digest 1 ('SD1', 2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment*. Third Edition.

APPENDIX F – Cascading Pond Modelling

Infrastructure Design Studio					Page 1
31 Dyer Street Cirencester Glos GL7 2PP		1708 - BLUEMAY PH3 EXISTING POND 30 YEAR			
Date 29/07/2025 File 30 year Cascade.CASX		Designed by LTB Checked by MS			
Causeway		Source Control 2020.1			
Cascade Summary of Results for 1708 - Existing Pond Enlarged (30 year).SRCX					
Upstream Structures			Outflow To Overflow To		
1708 - Proposed Detention Basin (30 year).SRCX			(None)	(None)	
1708 - Proposed Geocellular Tank (30 year).SRCX					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	59.504	0.224	6.7	30.3	Flood Risk
30 min Summer	59.552	0.272	7.0	37.6	Flood Risk
60 min Summer	59.582	0.302	7.2	42.4	Flood Risk
120 min Summer	59.594	0.314	7.3	44.4	Flood Risk
180 min Summer	59.590	0.310	7.3	43.8	Flood Risk
240 min Summer	59.581	0.301	7.2	42.2	Flood Risk
360 min Summer	59.557	0.277	7.1	38.3	Flood Risk
480 min Summer	59.532	0.252	6.9	34.5	Flood Risk
600 min Summer	59.510	0.230	6.7	31.1	Flood Risk
720 min Summer	59.490	0.210	6.6	28.1	Flood Risk
960 min Summer	59.457	0.177	6.3	23.3	Flood Risk
1440 min Summer	59.418	0.138	6.0	17.8	O K
2160 min Summer	59.400	0.120	4.9	15.3	O K
2880 min Summer	59.389	0.109	4.3	13.9	O K
4320 min Summer	59.376	0.096	3.5	12.1	O K
5760 min Summer	59.367	0.087	3.0	10.9	O K
7200 min Summer	59.360	0.080	2.6	10.1	O K
8640 min Summer	59.353	0.073	2.3	9.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	78.854	0.0	60.7	17	
30 min Summer	51.309	0.0	79.0	31	
60 min Summer	31.905	0.0	98.7	56	
120 min Summer	19.242	0.0	119.1	88	
180 min Summer	14.157	0.0	131.4	122	
240 min Summer	11.334	0.0	140.3	156	
360 min Summer	8.291	0.0	153.9	224	
480 min Summer	6.632	0.0	164.2	290	
600 min Summer	5.574	0.0	172.5	352	
720 min Summer	4.835	0.0	179.5	412	
960 min Summer	3.860	0.0	191.1	530	
1440 min Summer	2.807	0.0	208.5	750	
2160 min Summer	2.039	0.0	227.4	1104	
2880 min Summer	1.624	0.0	241.5	1472	
4320 min Summer	1.178	0.0	262.6	2204	
5760 min Summer	0.937	0.0	278.7	2936	
7200 min Summer	0.784	0.0	291.7	3672	
8640 min Summer	0.678	0.0	302.6	4400	
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Infrastructure Design Studio					Page 2
31 Dyer Street Cirencester Glos GL7 2PP		1708 - BLUEMAY PH3 EXISTING POND 30 YEAR			
Date 29/07/2025 File 30 year Cascade.CASX		Designed by LTB Checked by MS			
Causeway		Source Control 2020.1			
Cascade Summary of Results for 1708 - Existing Pond Enlarged (30 year).SRCX					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	59.347	0.067	2.0	8.3	O K
15 min Winter	59.504	0.224	6.7	30.3	Flood Risk
30 min Winter	59.552	0.272	7.0	37.6	Flood Risk
60 min Winter	59.582	0.302	7.2	42.4	Flood Risk
120 min Winter	59.589	0.309	7.3	43.5	Flood Risk
180 min Winter	59.580	0.300	7.2	42.0	Flood Risk
240 min Winter	59.564	0.284	7.1	39.4	Flood Risk
360 min Winter	59.528	0.248	6.8	33.9	Flood Risk
480 min Winter	59.494	0.214	6.6	28.8	Flood Risk
600 min Winter	59.465	0.185	6.4	24.4	Flood Risk
720 min Winter	59.440	0.160	6.2	20.9	Flood Risk
960 min Winter	59.413	0.133	5.7	17.1	O K
1440 min Winter	59.395	0.115	4.7	14.7	O K
2160 min Winter	59.381	0.101	3.8	12.8	O K
2880 min Winter	59.372	0.092	3.3	11.5	O K
4320 min Winter	59.359	0.079	2.5	9.9	O K
5760 min Winter	59.347	0.067	2.0	8.4	O K
7200 min Winter	59.340	0.060	1.7	7.4	O K
8640 min Winter	59.336	0.056	1.5	6.9	O K
10080 min Winter	59.333	0.053	1.3	6.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
10080 min Summer	0.600	0.0	312.0	5136	
15 min Winter	78.854	0.0	60.7	17	
30 min Winter	51.309	0.0	79.0	31	
60 min Winter	31.905	0.0	98.6	58	
120 min Winter	19.242	0.0	119.1	92	
180 min Winter	14.157	0.0	131.4	130	
240 min Winter	11.334	0.0	140.3	168	
360 min Winter	8.291	0.0	154.0	238	
480 min Winter	6.632	0.0	164.2	302	
600 min Winter	5.574	0.0	172.6	364	
720 min Winter	4.835	0.0	179.6	420	
960 min Winter	3.860	0.0	191.2	512	
1440 min Winter	2.807	0.0	208.5	752	
2160 min Winter	2.039	0.0	227.4	1124	
2880 min Winter	1.624	0.0	241.5	1496	
4320 min Winter	1.178	0.0	262.6	2208	
5760 min Winter	0.937	0.0	278.8	2952	
7200 min Winter	0.784	0.0	291.7	3672	
8640 min Winter	0.678	0.0	302.6	4320	
10080 min Winter	0.600	0.0	312.0	5016	
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Infrastructure Design Studio		Page 3									
31 Dyer Street	1708 - BLUEMAY PH3										
Cirencester	EXISTING POND										
Glos GL7 2PP	30 YEAR										
Date 29/07/2025	Designed by LTB										
File 30 year Cascade.CASX	Checked by MS										
Causeway	Source Control 2020.1										
<u>Cascade Rainfall Details for 1708 - Existing Pond Enlarged (30 year).SRCX</u>											
Rainfall Model	FSR	Winter Storms Yes									
Return Period (years)	30	Cv (Summer) 1.000									
Region	England and Wales	Cv (Winter) 1.000									
M5-60 (mm)	20.700	Shortest Storm (mins) 15									
Ratio R	0.400	Longest Storm (mins) 10080									
Summer Storms	Yes	Climate Change % +0									
<u>Time Area Diagram</u>											
Total Area (ha) 0.166											
<table><thead><tr><th colspan="2">Time (mins)</th><th>Area</th></tr><tr><th>From:</th><th>To:</th><th>(ha)</th></tr></thead><tbody><tr><td>0</td><td>4</td><td>0.166</td></tr></tbody></table>			Time (mins)		Area	From:	To:	(ha)	0	4	0.166
Time (mins)		Area									
From:	To:	(ha)									
0	4	0.166									
©1982-2020 Innovyze											

Infrastructure Design Studio		Page 4								
31 Dyer Street	1708 - BLUEMAY PH3									
Cirencester	EXISTING POND									
Glos GL7 2PP	30 YEAR									
Date 29/07/2025	Designed by LTB									
File 30 year Cascade.CASX	Checked by MS									
Causeway	Source Control 2020.1									
<u>Cascade Model Details for 1708 - Existing Pond Enlarged (30 year).SRCX</u>										
Storage is Online Cover Level (m) 59.720										
<u>Tank or Pond Structure</u>										
Invert Level (m) 59.280										
<table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>120.0</td><td>0.440</td><td>183.0</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	120.0	0.440	183.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)							
0.000	120.0	0.440	183.0							
<u>Pipe Outflow Control</u>										
Diameter (m)	0.100	Entry Loss Coefficient	0.500							
Slope (1:X)	100.0	Coefficient of Contraction	0.600							
Length (m)	32.000	Upstream Invert Level (m)	59.280							
Roughness k (mm)	0.600									
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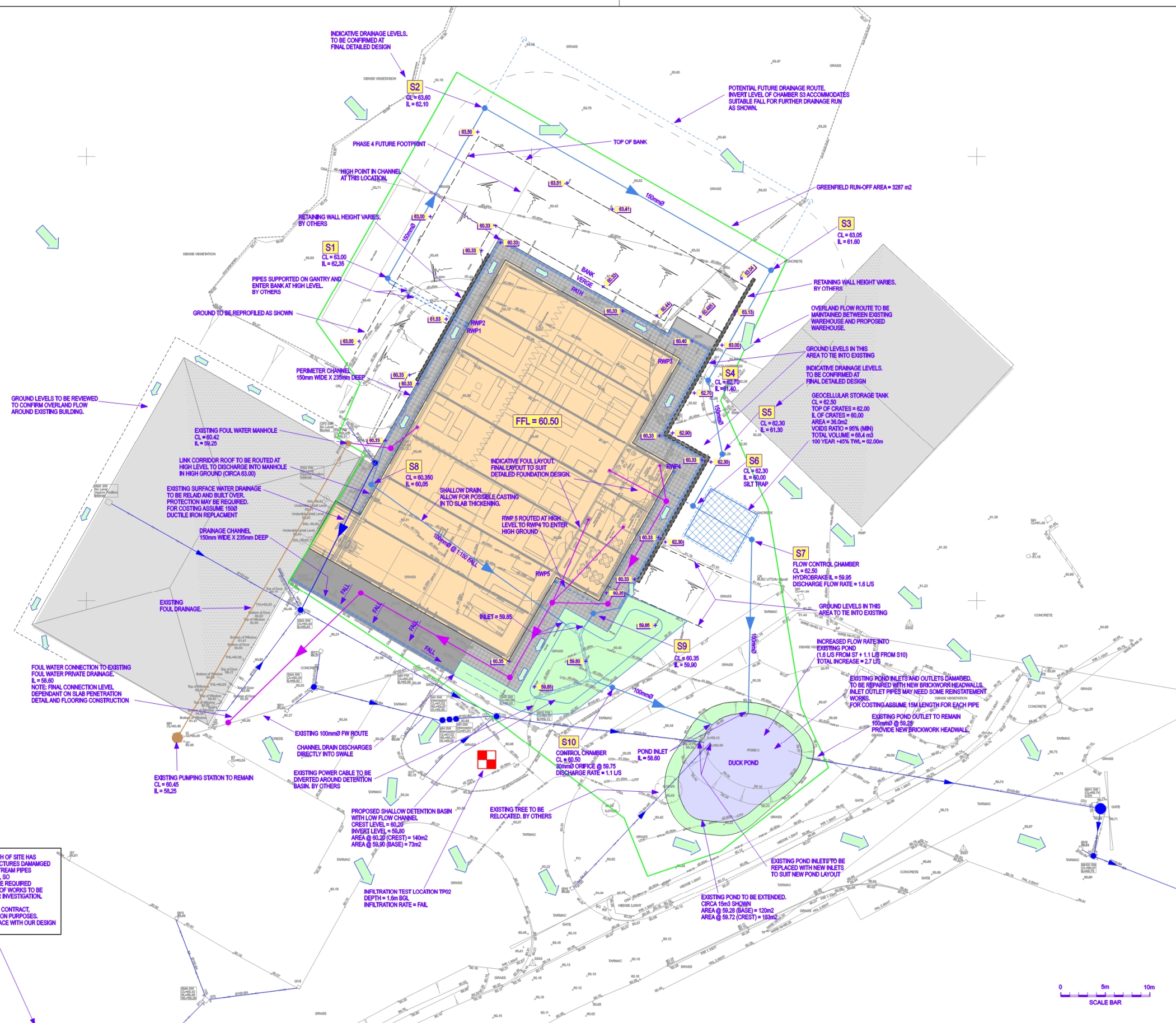
Infrastructure Design Studio					Page 1
31 Dyer Street Cirencester Glos GL7 2PP		1708 - BLUEMAY PH3 EXISTING ENLARGED POND 100 YEAR			
Date 29/07/2025 File 100 year Cascade.CASX		Designed by LTB Checked by MS			
Causeway		Source Control 2020.1			
Cascade Summary of Results for 1708 - Existing Enlarged Pond Design (100 year).SRCX					
Upstream Structures		Outflow To Overflow To			
1708 - Proposed Detention Basin (100 year).SRCX		(None)		(None)	
1708 - Proposed Geocellular Tank (100 year).SRCX					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	59.565	0.285	7.1	39.7	Flood Risk
30 min Summer	59.628	0.348	7.6	50.0	Flood Risk
60 min Summer	59.671	0.391	7.8	57.5	Flood Risk
120 min Summer	59.686	0.406	7.9	60.1	Flood Risk
180 min Summer	59.682	0.402	7.9	59.4	Flood Risk
240 min Summer	59.671	0.391	7.8	57.4	Flood Risk
360 min Summer	59.645	0.365	7.7	52.9	Flood Risk
480 min Summer	59.618	0.338	7.5	48.3	Flood Risk
600 min Summer	59.592	0.312	7.3	44.0	Flood Risk
720 min Summer	59.568	0.288	7.1	40.1	Flood Risk
960 min Summer	59.525	0.245	6.8	33.4	Flood Risk
1440 min Summer	59.462	0.182	6.3	24.0	Flood Risk
2160 min Summer	59.414	0.134	5.8	17.3	O K
2880 min Summer	59.401	0.121	5.0	15.5	O K
4320 min Summer	59.385	0.105	4.1	13.4	O K
5760 min Summer	59.376	0.096	3.5	12.1	O K
7200 min Summer	59.368	0.088	3.1	11.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	102.469	0.0	78.9	18	
30 min Summer	67.223	0.0	103.7	32	
60 min Summer	41.961	0.0	129.9	60	
120 min Summer	25.266	0.0	156.4	94	
180 min Summer	18.510	0.0	171.9	128	
240 min Summer	14.747	0.0	182.6	162	
360 min Summer	10.729	0.0	199.3	230	
480 min Summer	8.548	0.0	211.7	298	
600 min Summer	7.160	0.0	221.7	362	
720 min Summer	6.193	0.0	230.0	426	
960 min Summer	4.921	0.0	243.8	550	
1440 min Summer	3.554	0.0	264.0	782	
2160 min Summer	2.562	0.0	285.8	1104	
2880 min Summer	2.030	0.0	301.8	1468	
4320 min Summer	1.459	0.0	325.4	2204	
5760 min Summer	1.153	0.0	343.1	2936	
7200 min Summer	0.961	0.0	357.2	3672	
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Infrastructure Design Studio					Page 2
31 Dyer Street Cirencester Glos GL7 2PP		1708 - BLUEMAY PH3 EXISTING ENLARGED POND 100 YEAR			
Date 29/07/2025 File 100 year Cascade.CASX		Designed by LTB Checked by MS			
Causeway		Source Control 2020.1			
<u>Cascade Summary of Results for 1708 - Existing Enlarged Pond Design (100 year).SRCX</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Summer	59.363	0.083	2.7	10.3	O K
10080 min Summer	59.357	0.077	2.4	9.6	O K
15 min Winter	59.565	0.285	7.1	39.6	Flood Risk
30 min Winter	59.628	0.348	7.6	50.0	Flood Risk
60 min Winter	59.672	0.392	7.8	57.5	Flood Risk
120 min Winter	59.683	0.403	7.9	59.5	Flood Risk
180 min Winter	59.675	0.395	7.9	58.1	Flood Risk
240 min Winter	59.658	0.378	7.7	55.1	Flood Risk
360 min Winter	59.620	0.340	7.5	48.7	Flood Risk
480 min Winter	59.582	0.302	7.2	42.4	Flood Risk
600 min Winter	59.546	0.266	7.0	36.6	Flood Risk
720 min Winter	59.514	0.234	6.7	31.7	Flood Risk
960 min Winter	59.460	0.180	6.3	23.8	Flood Risk
1440 min Winter	59.409	0.129	5.5	16.6	O K
2160 min Winter	59.391	0.111	4.4	14.2	O K
2880 min Winter	59.381	0.101	3.8	12.8	O K
4320 min Winter	59.368	0.088	3.0	11.0	O K
5760 min Winter	59.358	0.078	2.5	9.8	O K
7200 min Winter	59.349	0.069	2.1	8.5	O K
8640 min Winter	59.342	0.062	1.8	7.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
8640 min Summer	0.827	0.0	369.0	4408	
10080 min Summer	0.728	0.0	379.1	5136	
15 min Winter	102.469	0.0	78.9	18	
30 min Winter	67.223	0.0	103.6	31	
60 min Winter	41.961	0.0	129.8	60	
120 min Winter	25.266	0.0	156.4	98	
180 min Winter	18.510	0.0	171.9	136	
240 min Winter	14.747	0.0	182.6	174	
360 min Winter	10.729	0.0	199.3	246	
480 min Winter	8.548	0.0	211.7	316	
600 min Winter	7.160	0.0	221.7	382	
720 min Winter	6.193	0.0	230.0	446	
960 min Winter	4.921	0.0	243.7	566	
1440 min Winter	3.554	0.0	264.0	766	
2160 min Winter	2.562	0.0	285.8	1104	
2880 min Winter	2.030	0.0	301.8	1472	
4320 min Winter	1.459	0.0	325.4	2248	
5760 min Winter	1.153	0.0	343.2	2944	
7200 min Winter	0.961	0.0	357.2	3672	
8640 min Winter	0.827	0.0	369.0	4384	
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Infrastructure Design Studio		Page 3
31 Dyer Street	1708 - BLUEMAY PH3	
Cirencester	EXISTING ENLARGED POND	
Glos GL7 2PP	100 YEAR	
Date 29/07/2025	Designed by LTB	
File 100 year Cascade.CASX	Checked by MS	
Causeway	Source Control 2020.1	
<u>Cascade Summary of Results for 1708 - Existing Enlarged Pond Design (100 year).SRCX</u>		
Storm Event	Max Level (m)	Max Depth (m)
		Max Control (l/s)
		Max Volume (m³)
		Status
10080 min Winter	59.338	0.058
		1.6
		7.1
		O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)
		Discharge Volume (m³)
		Time-Peak (mins)
10080 min Winter	0.728	0.0
		379.1
		5072
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Infrastructure Design Studio		Page 4
31 Dyer Street	1708 - BLUEMAY PH3	
Cirencester	EXISTING ENLARGED POND	
Glos GL7 2PP	100 YEAR	
Date 29/07/2025	Designed by LTB	
File 100 year Cascade.CASX	Checked by MS	
Causeway	Source Control 2020.1	
<u>Cascade Rainfall Details for 1708 - Existing Enlarged Pond Design (100 year).SRCX</u>		
Rainfall Model	FSR	Winter Storms Yes
Return Period (years)	100	Cv (Summer) 1.000
Region	England and Wales	Cv (Winter) 1.000
M5-60 (mm)	20.700	Shortest Storm (mins) 15
Ratio R	0.400	Longest Storm (mins) 10080
Summer Storms	Yes	Climate Change % +0
<u>Time Area Diagram</u>		
Total Area (ha) 0.166		
Time (mins)	Area (ha)	
From:	To:	
0	4	0.166
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Infrastructure Design Studio		Page 5																								
31 Dyer Street	1708 - BLUEMAY PH3																									
Cirencester	EXISTING ENLARGED POND																									
Glos GL7 2PP	100 YEAR																									
Date 29/07/2025	Designed by LTB																									
File 100 year Cascade.CASX	Checked by MS																									
Causeway	Source Control 2020.1																									
<u>Cascade Model Details for 1708 - Existing Enlarged Pond Design (100 year).SRCX</u> Storage is Online Cover Level (m) 59.720 <u>Tank or Pond Structure</u> Invert Level (m) 59.280 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>120.0</td><td>0.440</td><td>183.0</td></tr></table> <u>Pipe Outflow Control</u> <table><tr><td>Diameter (m)</td><td>0.100</td><td>Entry Loss Coefficient</td><td>0.500</td></tr><tr><td>Slope (1:X)</td><td>100.0</td><td>Coefficient of Contraction</td><td>0.600</td></tr><tr><td>Length (m)</td><td>32.000</td><td>Upstream Invert Level (m)</td><td>59.280</td></tr><tr><td>Roughness k (mm)</td><td>0.600</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	120.0	0.440	183.0	Diameter (m)	0.100	Entry Loss Coefficient	0.500	Slope (1:X)	100.0	Coefficient of Contraction	0.600	Length (m)	32.000	Upstream Invert Level (m)	59.280	Roughness k (mm)	0.600		
Depth (m)	Area (m²)	Depth (m)	Area (m²)																							
0.000	120.0	0.440	183.0																							
Diameter (m)	0.100	Entry Loss Coefficient	0.500																							
Slope (1:X)	100.0	Coefficient of Contraction	0.600																							
Length (m)	32.000	Upstream Invert Level (m)	59.280																							
Roughness k (mm)	0.600																									
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NOTES			

Rev	DATE	BY	AMENDMENT
C	27/11/25	LTB	UPDATED FOR PLANNING SUBMISSION
B	25/09/25	LTB	STRATEGY UPDATE TO SUIT UPDATED ARCHITECTS LAYOUT
A	07/08/25	LTB	FIRST ISSUE

DRAWING STATUS

FOR COMMENT



Infrastructure
Design Studio
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CLIENT

BEARD

PROJECT

BLUEMAY PHASE 3
WAREHOUSE EXTENSION

DRAWN BY	LTB	CHECKED	MS
DATE	JULY 2025	DATE	JULY 2025

TITLE

BELOW GROUND
DRAINAGE
GENERAL ARRANGEMENT

SCALE	PROJECT No.	DRAWING No.	REV.
1:200	1708	C02	C

APPENDIX H – Geocellular Storage Microdrainage Calculations

Infrastructure Design Studio							Page 1
31 Dyer Street Cirencester Glos GL7 2PP			1708 - BLUEMAY PH3 PROPOSED TANK 100 YEAR +45%				
Date 24/09/2025 File 1708 - Proposed tank 10...			Designed by LTB Checked by MS				
Causeway			Source Control 2020.1				
<u>Summary of Results for 100 year Return Period (+45%)</u>							
Half Drain Time : 429 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	61.053	1.053	0.0	1.2	1.2	36.0	O K
30 min Summer	61.362	1.362	0.0	1.4	1.4	46.6	O K
60 min Summer	61.652	1.652	0.0	1.5	1.5	56.5	O K
120 min Summer	61.886	1.886	0.0	1.6	1.6	64.5	O K
180 min Summer	61.966	1.966	0.0	1.6	1.6	67.2	O K
240 min Summer	61.982	1.982	0.0	1.6	1.6	67.8	O K
360 min Summer	61.958	1.958	0.0	1.6	1.6	67.0	O K
480 min Summer	61.917	1.917	0.0	1.6	1.6	65.6	O K
600 min Summer	61.870	1.870	0.0	1.6	1.6	64.0	O K
720 min Summer	61.823	1.823	0.0	1.5	1.5	62.3	O K
960 min Summer	61.734	1.734	0.0	1.5	1.5	59.3	O K
1440 min Summer	61.578	1.578	0.0	1.4	1.4	54.0	O K
2160 min Summer	61.378	1.378	0.0	1.4	1.4	47.1	O K
2880 min Summer	61.204	1.204	0.0	1.3	1.3	41.2	O K
4320 min Summer	60.918	0.918	0.0	1.1	1.1	31.4	O K
5760 min Summer	60.694	0.694	0.0	1.0	1.0	23.7	O K
7200 min Summer	60.506	0.506	0.0	1.0	1.0	17.3	O K
8640 min Summer	60.268	0.268	0.0	1.0	1.0	9.2	O K
10080 min Summer	60.150	0.150	0.0	1.0	1.0	5.1	O K
15 min Winter	61.054	1.054	0.0	1.2	1.2	36.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	148.580	0.0	37.1	19			
30 min Summer	97.474	0.0	48.7	33			
60 min Summer	60.843	0.0	60.9	62			
120 min Summer	36.635	0.0	73.3	122			
180 min Summer	26.840	0.0	80.5	182			
240 min Summer	21.384	0.0	85.5	240			
360 min Summer	15.558	0.0	93.4	328			
480 min Summer	12.394	0.0	99.2	386			
600 min Summer	10.382	0.0	103.8	450			
720 min Summer	8.980	0.0	107.7	514			
960 min Summer	7.136	0.0	114.2	654			
1440 min Summer	5.154	0.0	123.7	926			
2160 min Summer	3.716	0.0	133.7	1340			
2880 min Summer	2.943	0.0	141.3	1732			
4320 min Summer	2.116	0.0	152.3	2508			
5760 min Summer	1.672	0.0	160.5	3288			
7200 min Summer	1.393	0.0	167.1	4040			
8640 min Summer	1.199	0.0	172.7	4672			
10080 min Summer	1.056	0.0	177.4	5248			
15 min Winter	148.580	0.0	37.1	19			
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Infrastructure Design Studio							Page 2
31 Dyer Street Cirencester Glos GL7 2PP			1708 - BLUEMAY PH3 PROPOSED TANK 100 YEAR +45%				
Date 24/09/2025 File 1708 - Proposed tank 10...			Designed by LTB Checked by MS				
Causeway			Source Control 2020.1				
Summary of Results for 100 year Return Period (+45%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	61.363	1.363	0.0	1.4	1.4	46.6	O K
60 min Winter	61.656	1.656	0.0	1.5	1.5	56.6	O K
120 min Winter	61.893	1.893	0.0	1.6	1.6	64.7	O K
180 min Winter	61.978	1.978	0.0	1.6	1.6	67.6	O K
240 min Winter	62.000	2.000	0.0	1.6	1.6	68.4	O K
360 min Winter	61.986	1.986	0.0	1.6	1.6	67.9	O K
480 min Winter	61.931	1.931	0.0	1.6	1.6	66.0	O K
600 min Winter	61.882	1.882	0.0	1.6	1.6	64.4	O K
720 min Winter	61.827	1.827	0.0	1.5	1.5	62.5	O K
960 min Winter	61.712	1.712	0.0	1.5	1.5	58.6	O K
1440 min Winter	61.503	1.503	0.0	1.4	1.4	51.4	O K
2160 min Winter	61.232	1.232	0.0	1.3	1.3	42.1	O K
2880 min Winter	61.004	1.004	0.0	1.2	1.2	34.3	O K
4320 min Winter	60.642	0.642	0.0	1.0	1.0	22.0	O K
5760 min Winter	60.238	0.238	0.0	1.0	1.0	8.1	O K
7200 min Winter	60.078	0.078	0.0	0.9	0.9	2.7	O K
8640 min Winter	60.028	0.028	0.0	0.8	0.8	1.0	O K
10080 min Winter	60.015	0.015	0.0	0.7	0.7	0.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	97.474	0.0	48.7	33			
60 min Winter	60.843	0.0	60.9	62			
120 min Winter	36.635	0.0	73.3	120			
180 min Winter	26.840	0.0	80.5	178			
240 min Winter	21.384	0.0	85.5	234			
360 min Winter	15.558	0.0	93.3	342			
480 min Winter	12.394	0.0	99.1	394			
600 min Winter	10.382	0.0	103.8	466			
720 min Winter	8.980	0.0	107.7	542			
960 min Winter	7.136	0.0	114.2	696			
1440 min Winter	5.154	0.0	123.7	996			
2160 min Winter	3.716	0.0	133.8	1428			
2880 min Winter	2.943	0.0	141.2	1844			
4320 min Winter	2.116	0.0	152.3	2676			
5760 min Winter	1.672	0.0	160.6	3288			
7200 min Winter	1.393	0.0	167.1	3816			
8640 min Winter	1.199	0.0	172.6	4416			
10080 min Winter	1.056	0.0	177.4	5136			
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Infrastructure Design Studio		Page 3
31 Dyer Street	1708 - BLUEMAY PH3	
Cirencester	PROPOSED TANK	
Glos GL7 2PP	100 YEAR +45%	
Date 24/09/2025	Designed by LTB	
File 1708 - Proposed tank 10...	Checked by MS	
Causeway	Source Control 2020.1	

Infrastructure Design Studio		Page 4																																																																																																																																											
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APPENDIX J – Detention Basin Microdrainage Calculations

Infrastructure Design Studio					Page 1
31 Dyer Street		1708 - BLUEMAY PH3			
Cirencester		PROPOSED BASIN			
Glos GL7 2PP		100 YEAR +45%			
Date 16/10/2025		Designed by LTB			
File 1708 - PROPOSED SWALE 1...		Checked by MS			
Causeway		Source Control 2020.1			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	59.984	0.184	0.9	15.6	Flood Risk
30 min Summer	60.029	0.229	1.0	20.1	Flood Risk
60 min Summer	60.068	0.268	1.0	24.0	Flood Risk
120 min Summer	60.092	0.292	1.1	26.6	Flood Risk
180 min Summer	60.095	0.295	1.1	27.0	Flood Risk
240 min Summer	60.093	0.293	1.1	26.7	Flood Risk
360 min Summer	60.087	0.287	1.1	26.0	Flood Risk
480 min Summer	60.079	0.279	1.1	25.2	Flood Risk
600 min Summer	60.070	0.270	1.0	24.2	Flood Risk
720 min Summer	60.061	0.261	1.0	23.3	Flood Risk
960 min Summer	60.043	0.243	1.0	21.5	Flood Risk
1440 min Summer	60.014	0.214	0.9	18.5	Flood Risk
2160 min Summer	59.977	0.177	0.9	14.9	Flood Risk
2880 min Summer	59.947	0.147	0.8	12.2	Flood Risk
4320 min Summer	59.903	0.103	0.7	8.3	Flood Risk
5760 min Summer	59.873	0.073	0.6	5.7	O K
7200 min Summer	59.851	0.051	0.6	4.0	O K
8640 min Summer	59.836	0.036	0.5	2.7	O K
10080 min Summer	59.824	0.024	0.5	1.8	O K
15 min Winter	59.984	0.184	0.9	15.6	Flood Risk
30 min Winter	60.030	0.230	1.0	20.1	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	148.580	0.0	16.3	18	
30 min Summer	97.474	0.0	21.4	33	
60 min Summer	60.843	0.0	26.7	62	
120 min Summer	36.635	0.0	32.2	122	
180 min Summer	26.840	0.0	35.4	178	
240 min Summer	21.384	0.0	37.6	204	
360 min Summer	15.558	0.0	41.0	266	
480 min Summer	12.394	0.0	43.6	334	
600 min Summer	10.382	0.0	45.6	404	
720 min Summer	8.980	0.0	47.4	470	
960 min Summer	7.136	0.0	50.2	608	
1440 min Summer	5.154	0.0	54.4	880	
2160 min Summer	3.716	0.0	58.8	1256	
2880 min Summer	2.943	0.0	62.1	1640	
4320 min Summer	2.116	0.0	67.0	2376	
5760 min Summer	1.672	0.0	70.6	3064	
7200 min Summer	1.393	0.0	73.5	3816	
8640 min Summer	1.199	0.0	75.9	4496	
10080 min Summer	1.056	0.0	78.0	5240	
15 min Winter	148.580	0.0	16.3	18	
30 min Winter	97.474	0.0	21.4	32	
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Infrastructure Design Studio				Page 2	
31 Dyer Street		1708 - BLUEMAY PH3			
Cirencester		PROPOSED BASIN			
Glos GL7 2PP		100 YEAR +45%			
Date 16/10/2025		Designed by LTB			
File 1708 - PROPOSED SWALE 1...		Checked by MS			
Causeway		Source Control 2020.1			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	60.068	0.268	1.0	24.0	Flood Risk
120 min Winter	60.093	0.293	1.1	26.7	Flood Risk
180 min Winter	60.098	0.298	1.1	27.2	Flood Risk
240 min Winter	60.094	0.294	1.1	26.8	Flood Risk
360 min Winter	60.086	0.286	1.1	25.9	Flood Risk
480 min Winter	60.076	0.276	1.0	24.8	Flood Risk
600 min Winter	60.064	0.264	1.0	23.6	Flood Risk
720 min Winter	60.052	0.252	1.0	22.4	Flood Risk
960 min Winter	60.029	0.229	1.0	20.0	Flood Risk
1440 min Winter	59.988	0.188	0.9	16.1	Flood Risk
2160 min Winter	59.941	0.141	0.8	11.6	Flood Risk
2880 min Winter	59.906	0.106	0.7	8.5	Flood Risk
4320 min Winter	59.858	0.058	0.6	4.6	O K
5760 min Winter	59.831	0.031	0.5	2.3	O K
7200 min Winter	59.813	0.013	0.4	1.0	O K
8640 min Winter	59.803	0.003	0.4	0.2	O K
10080 min Winter	59.800	0.000	0.3	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	60.843	0.0	26.7	62	
120 min Winter	36.635	0.0	32.2	118	
180 min Winter	26.840	0.0	35.4	174	
240 min Winter	21.384	0.0	37.6	224	
360 min Winter	15.558	0.0	41.0	278	
480 min Winter	12.394	0.0	43.6	356	
600 min Winter	10.382	0.0	45.6	432	
720 min Winter	8.980	0.0	47.4	506	
960 min Winter	7.136	0.0	50.2	652	
1440 min Winter	5.154	0.0	54.4	924	
2160 min Winter	3.716	0.0	58.8	1320	
2880 min Winter	2.943	0.0	62.1	1700	
4320 min Winter	2.116	0.0	67.0	2420	
5760 min Winter	1.672	0.0	70.6	3112	
7200 min Winter	1.393	0.0	73.5	3816	
8640 min Winter	1.199	0.0	76.0	4488	
10080 min Winter	1.056	0.0	78.1	0	

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Infrastructure Design Studio		Page 3																														
31 Dyer Street Cirencester Glos GL7 2PP	1708 - BLUEMAY PH3 PROPOSED BASIN 100 YEAR +45%																															
Date 16/10/2025 File 1708 - PROPOSED SWALE 1...	Designed by LTB Checked by MS																															
Causeway Source Control 2020.1																																
<u>Rainfall Details</u> <table><tr><td>Rainfall Model</td><td>FSR</td><td>Winter Storms</td><td>Yes</td></tr><tr><td>Return Period (years)</td><td>100</td><td>Cv (Summer)</td><td>1.000</td></tr><tr><td>Region</td><td>England and Wales</td><td>Cv (Winter)</td><td>1.000</td></tr><tr><td>M5-60 (mm)</td><td>20.700</td><td>Shortest Storm (mins)</td><td>15</td></tr><tr><td>Ratio R</td><td>0.400</td><td>Longest Storm (mins)</td><td>10080</td></tr><tr><td>Summer Storms</td><td>Yes</td><td>Climate Change %</td><td>+45</td></tr></table> <u>Time Area Diagram</u> Total Area (ha) 0.044 <table><tr><th>Time (mins)</th><th>Area</th></tr><tr><th>From:</th><th>To: (ha)</th></tr><tr><td>0</td><td>4 0.044</td></tr></table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	1.000	Region	England and Wales	Cv (Winter)	1.000	M5-60 (mm)	20.700	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+45	Time (mins)	Area	From:	To: (ha)	0	4 0.044
Rainfall Model	FSR	Winter Storms	Yes																													
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0	4 0.044																															
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31 Dyer Street Cirencester Glos GL7 2PP	1708 - BLUEMAY PH3 PROPOSED BASIN 100 YEAR +45%									
Date 16/10/2025 File 1708 - PROPOSED SWALE 1...	Designed by LTB Checked by MS									
Causeway		Source Control 2020.1								
<u>Model Details</u> Storage is Online Cover Level (m) 60.200 <u>Tank or Pond Structure</u> Invert Level (m) 59.800 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>75.0</td><td>0.400</td><td>122.0</td></tr></table> <u>Orifice Outflow Control</u> Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 59.750			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	75.0	0.400	122.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)							
0.000	75.0	0.400	122.0							
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APPENDIX K – Maintenance Schedule

Drainage Maintenance Schedule

The below schedule indicates the recommended minimum maintenance requirement to provide a fully functioning drainage system. It is recommended that this schedule is regularly reviewed by the operator and where necessary the actions and frequency are updated to reflect the ongoing operation of the facility.

The development will be under single ownership so there will be no conflict. The owner will undertake maintenance where practical and specialist contractors will be used where necessary.

No man entry is permitted into manholes or enclosed spaces unless performed by fully qualified personnel. Main yearly inspection to be undertaken after leaf fall in Autumn.

Approved safety procedures must be followed.

Ref	Maintenance Item	Required Action	Frequency
01	Below Ground Drainage Pipework	All drainage to be fully jetted and inspected for integrity by CCTV survey.	10 yearly
		Where pipework is damaged or obstructed localised repairs will be needed immediately to ensure operation of drainage systems.	As required
02	Manholes	Inspect manholes and for integrity and debris. Remove cover and ensure water is flowing freely and unobstructed.	5 yearly
		Clean out blockages and repair damage	As required
03	Channel drains	Inspect surface water channels for silt accumulation	Annually
		To be cleaned with vacuum excavator or by hand (not jetted) when silt exceeds 50% of the depth of the channel.	As required
04	Roof Gutters	Visually inspect gutters for leaves and debris.	Annually
		Clearing/jetting of gutters to remove build-up of debris and leaves to prevent carry of material to below ground system. Waste material to be disposed to refuse.	As required

Ref	Maintenance Item	Required Action	Frequency
05	Basins	Cut grass in and around detention basin, including; embankment, access routes, across main storage area and amenity areas (e.g. footpath). Retain grass lengths 75-150mm across main treatment area. Dispose of cuttings to prevent blocking outlet and controls.	Half yearly (Spring – before nesting season and Autumn)
		Inspect inlets and outlets for blockages, and clear if required.	6 monthly
		Remove sediment from inlets, outlets and forebay and main basin once deposits exceed 25mm in depth..	Every 5 years or as required
06	Overland flow paths	Inspection of overland flow routes to ensure route not blocked by new structures, furniture, overgrown vegetation, walls or debris. Remove and maintain as necessary	6 Monthly
07	Flow Control devices (Orifice and Hydrobrake)	Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt	Annually

Record Keeping

To ensure the above maintenance regime is followed the operator will draw up a suitable maintenance schedule for completion by the site operatives and to be signed off by the relevant manager. The schedule will be based on the above table and will include:

- Date of maintenance inspection.
- 'Undertaken By' boxes to confirm inspection items carried out and by whom.
- A comments column to record condition of items inspected and what maintenance actions need to be taken or procedures to be instigated to correct any non-compliance with the operation strategy
- A column for confirming maintenance and/or rectification works have been carried out.
- An overall signature space for sign off by a competent member of the company's management team.