Drainage Strategy

Residential Development on land at Thakeham Tiles, Storrington

Prepared for:
Thakeham Concrete Products Ltd

Prepared by:
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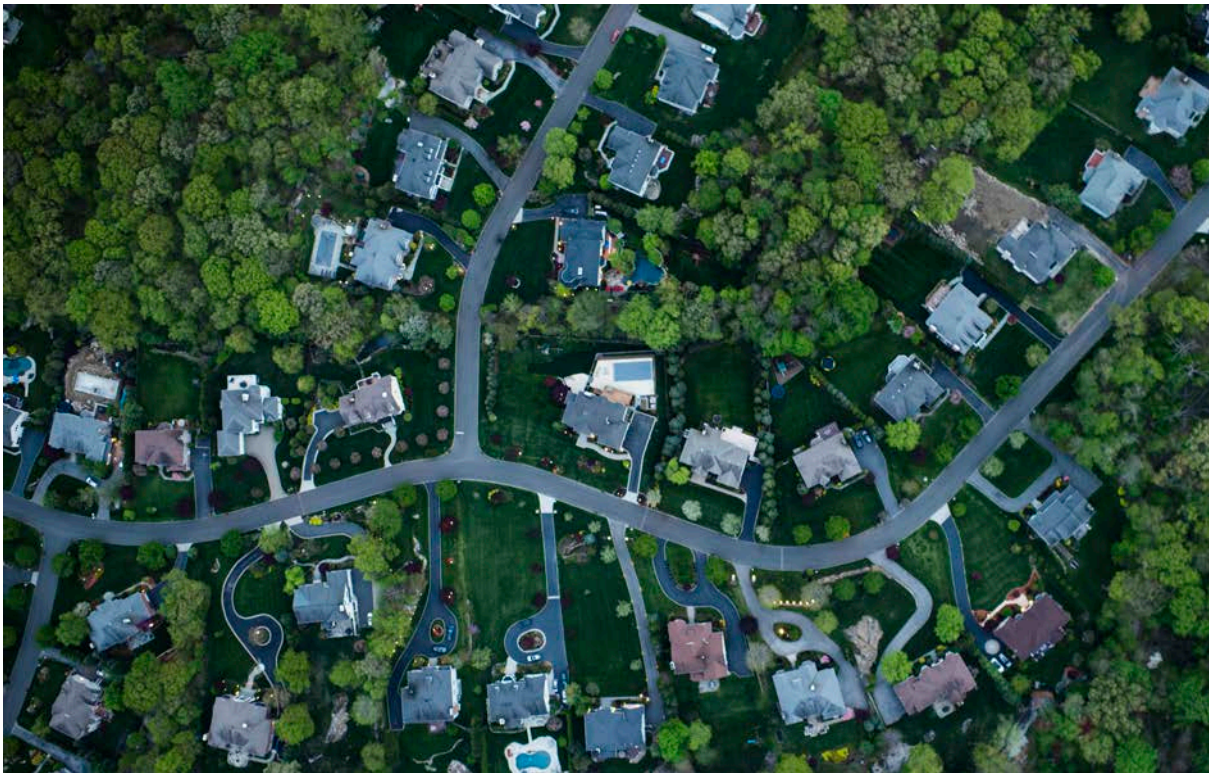

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Executive Summary

This Drainage Strategy outlines foul and surface water drainage proposals in relation to the proposed redevelopment of a brownfield site in accordance with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and the new National standards for sustainable drainage systems (SuDS).

Surface water runoff generated from the development will be managed through a combination of an on-site pond, below ground tank and permeable paving with additional consideration given to sustainable features such as raingardens and tree pits. Together these features will contribute to sustainable runoff management while delivering water quality improvements, amenity value and biodiversity enhancements.

The proposed SuDS scheme will be designed to manage surface water runoff from rainfall events up to the 1 in 100 year return period, including an appropriate climate change allowance. Runoff will be discharged into the adjoining watercourse network at greenfield rates, ensuring no increase in surface water flood risk on-site or in the surrounding area.

A long term maintenance arrangement will be established to ensure the continued performance and integrity of the proposed SuDS features as designed.

Foul water generated from the development will be discharged into the public sewer by gravity subject to appropriate agreements with Southern Water.

The drainage proposals as discussed demonstrates that a robust and sustainable drainage solution can be delivered within the proposed development that can function over its lifetime while safeguarding the interests of the wider community and environment.

Acronyms / Abbreviations

AOD	Above Ordnance Datum
bgl	below ground level
DCG	Design and Construction Guidance
EA	Environment Agency
HDC	Horsham District Council
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
WSCC	West Sussex County Council
SFRA	Strategic Flood Risk Assessment
SSG	Sewerage Sector Guidance
SuDS	Sustainable Drainage Systems

1 Introduction

This report has been prepared by Stantec Hydrock Ltd on behalf of Thakeham Tiles Ltd. in support of an outline planning application to be submitted to Horsham District Council for a proposed residential redevelopment of Thakeham Tiles Manufacturing Factory located at Rock Road, Storrington, West Sussex.

The development proposal comprises the demolition of all existing buildings and the erection of 108 dwellings, with associated landscaping, open space and the formation of a new access onto Rock Road. A proposed layout plan is included in Appendix B.

This Study has been prepared to discuss surface water and foul drainage issues associated with the development in line with the national and local guidance, including the National Planning Policy Framework (NPPF) and its accompanying Planning Practice Guidance (PPG), The SuDS Manual and the recently published National standards for sustainable drainage systems (19 June 2025). The Study also considers the requirements of the Environment Agency (EA), West Sussex County Council (WSCC) as a Lead Local Flood Authority (LLFA) and Southern Water.

The site had an outline planning permission for a residential development with up to 90 dwellings (Horsham District Council Planning Application Reference: DC/18/2095), granted permission in February 2020. A Flood Risk Assessment and Drainage Strategy (FRA & DS) (Hydrock Ref: STO-HYD-XX-XX-RP-D-5001-P03 dated 21 September 2018) and a Technical Note (Hydrock Ref: STO-HYD-XX-XX-TN-D-5001-P01, dated 5 December 2018) supported the outline planning, which was subsequently approved in principle by the Horsham District Council (HDC) drainage team and WSCC LLFA.

A Desktop Study and Ground Investigation Report has also been undertaken (Hydrock Report Ref: TRS-HYD-XX-GI-RP-GE-1001-P03, dated 25th September 2018) in support of the previous Application. A Supplementary Ground Investigation Report (Hydrock Report Ref: 08347-HYD-XX-XX-RP-GE-1002-P02, dated 8th June 2021) has since been undertaken; this has been referenced accordingly within this report.

This Drainage Strategy report has been prepared to address the requirements of the NPPF and LLFA through the:

- *investigation of the existing drainage regime;*
- *evaluation of the main constraints and opportunities to inform suitable drainage strategy for the development;*
- *incorporation of the sustainable drainage measures to manage surface water runoff adequately and to ensure that the development does not increase flood risk within the site and the locality; and*
- *investigation of the appropriate foul drainage solution to ensure the development does not put additional pressure on the local sewerage infrastructure.*

Note that a separate Flood Risk Assessment (FRA) study will support the Planning Application which will discuss fluvial, surface water and other flood risk issues associated with the development site.

2 Site Information

2.1 Location and Setting

The application site is located at the premises of Thakeham Tiles Ltd, Rock Road, Storrington, West Sussex, RH20 3AD (grid reference: TQ 10428 14898).

The site covers approximately 6.12 hectares (ha), and was formerly a quarry and tile / block making facility. The site currently comprises an active concrete product manufacturing plant and includes a series of warehouses / industrial units containing the manufacturing plant and hoppers for sand and cement in the northern half of site. A disused quarry occupies the southern half of the site, which is understood to have been partly infilled with inert waste materials from the manufacturing plant, including surplus aggregate and waste concrete products, such as blocks and paving slabs. The area is predominantly used for aggregate storage.

The site is enclosed by mature trees with residential housing to the east, south and west of the site. Agricultural fields lie beyond Rock Road to the north of the site.

Table 2.1: Site Location Information

Site Referencing Information	
Site Address	Rock Road, Storrington, West Sussex, RH20 3AD
Grid Reference	TQ 10428 14898 510428, 114898

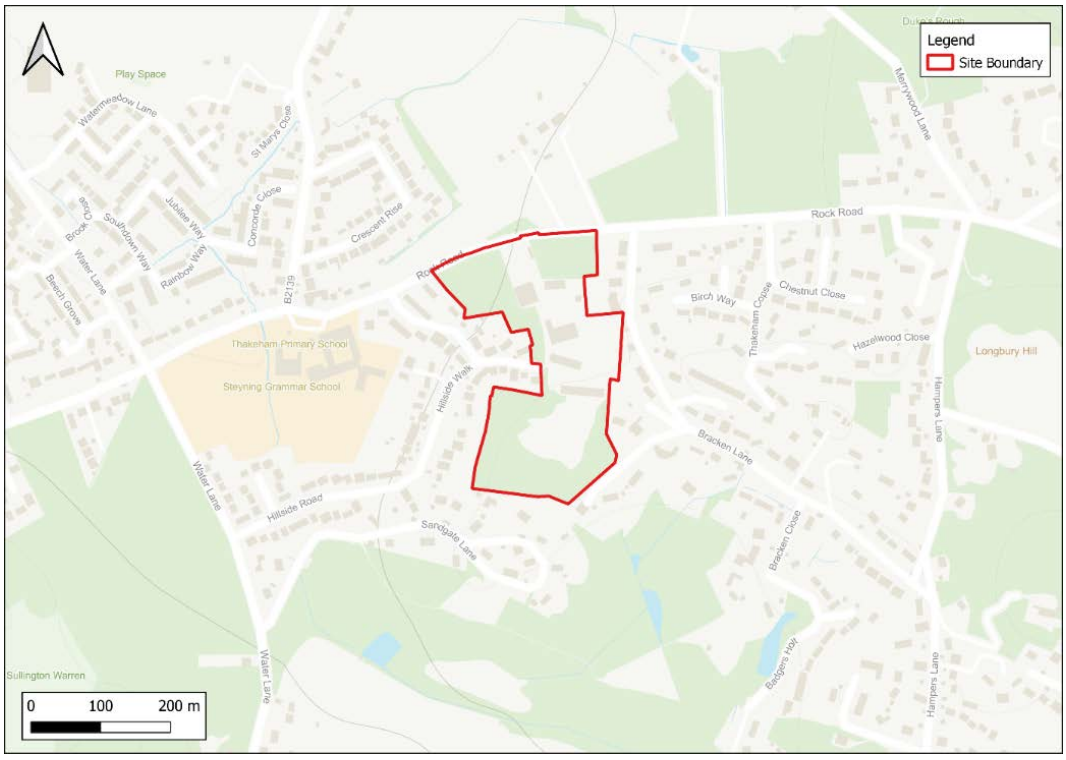

Figure 2.1 Site Location Plan

2.2 Topography

Ground levels generally fall in a north-westerly route. Ground levels fall from 76.10m AOD within the southern extent to 45.00mAOD within the northwestern extent by Rock Road. The land surrounding the former quarry slopes from 70.00m AOD down to 61.50m AOD, with steep slopes around the edges. Along the site boundaries, concrete and brick retaining walls and embankments have been incorporated to manage the steep slopes and differences in ground levels.

A Topographical Survey of the site is included in Appendix A.

2.3 Existing Surface Water Features

A head tributary of the River Stor originates within the woods, c. 80m to the southeast, and flows in a general south westerly route through the eastern part of Storrington, coming within 260m at its closest from the western site boundary by Rock Road.

A watercourse / drainage ditch occurs along Rock Road, flowing west to join the above watercourse.

A small ditch rises within the site, which then flows west and north along the western site boundary to drain into the above drainage ditch by Rock Road.

2.4 Existing Sewers

A copy of the public sewer record plan for the area has been obtained from Southern Water, refer to Appendix C. Records show a 150mm diameter public foul sewer in Rock Road, flowing from east to west. There are no recorded public surface water sewers within the site boundaries.

The Topographic Survey, in Appendix A, has identified a network of surface water drains across the site, including manholes, gulleys and drainage channels. Although no definite routes were visible, these generally drain westerly towards the watercourses to the west and north as mentioned above in Section 2.3.

Also refer to Plan No. STO-HYD-XX-XX-DR-D-2001-P01 Existing Drainage Plan in Appendix E, which is based on information included in the topographical survey and historical drainage records.

2.5 Geology & Hydrogeology

Based on the British Geological Survey (BGS) mapping, the site is underlain by Folkestone Formation (Sandstone) beneath the southern extent and by Fittleworth Member (Sandstone and mudstone) beneath the northern half, with Hythe Formation at depth. No superficial deposits are shown to occur. Refer to BGS map below. However, Made Ground is anticipated across the site as a result of the sites land usage and the infilling of the former sand pit.

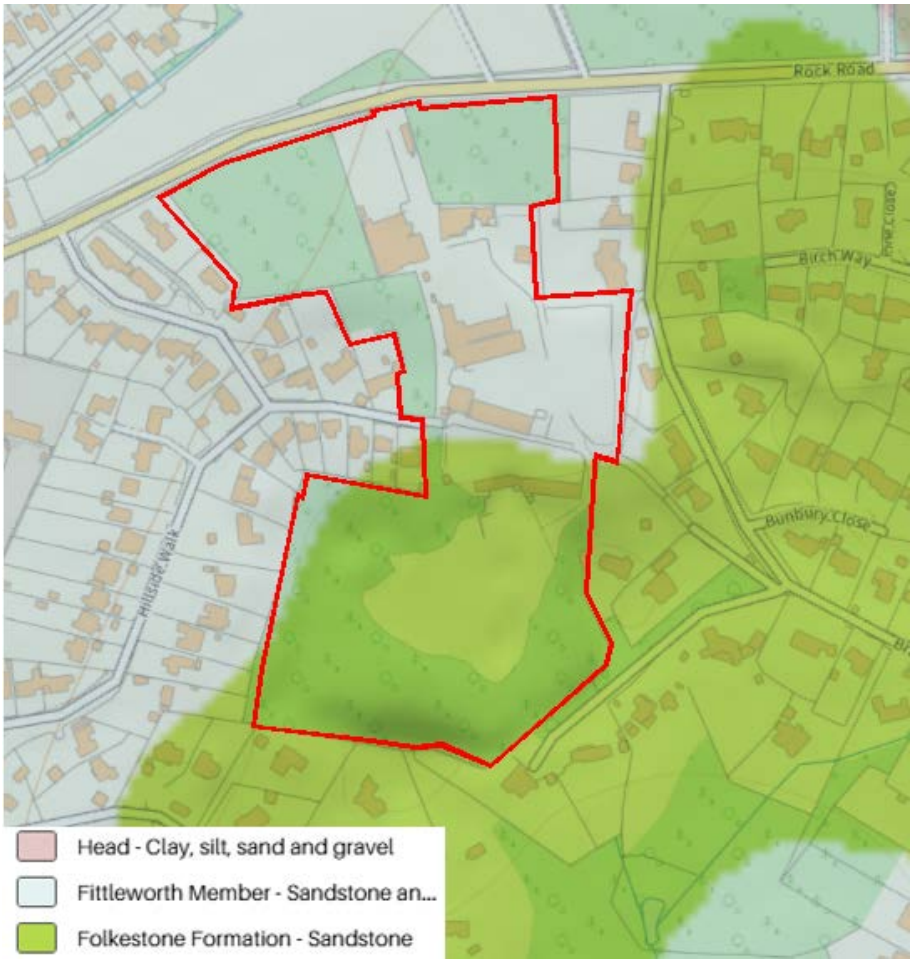

Figure 2.2: BGS Combined Geology Map

Ground investigation works undertaken by Hydrock in 2018 and 2021 recorded the underlying geology as below:

- Made Ground – including concrete hardstanding/paving slabs and general made ground between ground level and 4.80m bgl within the northern area of the site, and reinforced concrete and landfilled madeground, to a maximum depth of 5.45m bgl at the southern area of the site, comprising a mixture of sand and gravel with different proportions of silt and clay and occasionally asbestos locally; over
- Fittleworth Member – in the northern area of the site, between 0.40m and 5.45m bgl, comprising clayey silty, locally coarse Sand and sandy Clay,
- Folkestone Formation – in the southern area of the site between 1.20m and 5.45m bgl, comprising locally gravelly fine to medium sand with occasional organic matter.

A groundwater abstraction borehole has been installed at the site to a depth of 58m bgl. This recorded Fittleworth Member to a depth of 27mbgl beneath Made Ground, with Hythe Formation occurring to the full depth of investigation.

Shallow groundwater was encountered during field works in the northern half of the site within the Made Ground at depth of 0.40 – 1.3m bgl, and within the Fittleworth Member at depth of 1.0 – 2.2m bgl. Subsequent monitoring recorded groundwater at 0.78m bgl within the Made Ground and as shallow as 0.22m bgl within Fittleworth Member.

In the southern half of the site, groundwater was encountered during the field works within the Made

Ground only at 0.47m bgl. No groundwater was encountered during the field works within the Folkestone Formation. However, monitoring visits recorded a highest groundwater level of 1.60m bgl within the Folkestone Formation.

Groundwater levels during the drilling of the groundwater abstraction borehole encountered an initial seepage within the pit at 1.25m bgl. During drilling, a deeper water strike was encountered at 19.80m bgl rising to 12.25m bgl after 40 minutes. Resting groundwater after the drilling was recorded between 13.65m and 14.43m bgl. Based on data from a diver data-logger installed within the borehole, the highest recorded groundwater level was 11.83 m bgl in March 2025.

Refer to ground investigation report extracts in Appendix D.

The Folkestone Formation and the Hythe Formation are classified by the Environment Agency as Principal aquifers, with high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.

The Fittleworth Member as a ‘Secondary A’ Aquifer which comprises permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The site is not within a groundwater source protection zone.

3 Surface Water Drainage Strategy

3.1 Pre-Development

The site (6.12ha) is currently a concrete products manufacturing facility comprising predominately hard paved areas, and buildings and structures associated with the existing site use. The site currently comprises approximately 1.50ha of impermeable area, which generates 1:100 year runoff of 535.6l/s. The site would generate equivalent greenfield runoff of 115.0 l/s in the 1:100 year event. Refer to Table 3.1 below and existing drainage plan (Plan No. STO-HYD-XX-XX-DR-D-2001-P03) in Appendix E.

As discussed in Section 2.4 above, the Topographic Survey and historic records confirm that there are existing drainage systems serving the site. Given the absence of public surface water sewers in the vicinity of the site and poor infiltration, it is evident that all current runoff discharges into the existing ditches located immediately to the north and west of the site.

Table 3.1: Existing Runoff Rates

	Existing Brownfield Rate (l/s)	**Equivalent Greenfield Rate (l/s)**
Q_{BAR}	-	36.1 (5.9l/s/ha)
1:1yr	168.2	30.6 (5l/s/ha)
1:30yr	412.7	82.0 (13.4l/s/ha)
1:100r	535.6	115.0 (18.8l/s/ha)

3.2 Post Development

The redeveloped site will include slightly more impermeable area when compared to the current brownfield site. Notwithstanding, surface water runoff generated from the impermeable areas will be managed appropriately to ensure that the new development does not increase surface water flood risk within the site and the local area in line with national and local policy and guidance, namely NPPF, PPG, CIRIA C753 The SuDS Manual and Buildings Regulations Part H. The proposals detailed below are also broadly consistent with the technical criteria and performance objectives outlined in DEFRA's National Standards for SuDS.

3.2.1 Drainage Discharge Hierarchy

In compliance with the drainage disposal hierarchy as advocated within the national and local guidance, including the new national Standard for SuDS (June 2025), priority should be given to rainwater reuse and infiltration, and runoff should be discharged as high up the hierarchy as reasonably practical, in the following order of preference:

- Collected for non-potable use;
- Infiltrated to ground;
- Discharged into an above ground surface water body (watercourses);
- Discharged to a public surface water sewer or another drainage system;

- To a public combined sewer when all other options have been exhausted.

The new National SuDS standard guidance requires rainwater harvesting to be considered where reuse, such as for landscape irrigation, is feasible. Accordingly, the proposal should seek to incorporate rainwater harvesting within the scheme. This is further discussed below. Rainwater butts will also be provided in each dwelling.

Infiltration tests undertaken as part of the previous ground investigation works determined negligible infiltration within the northern extent and an infiltration rate in the order of 10^{-5}m/s in a test pit placed in the Folkestone Formation within the southern extent, implying infiltration drainage may be feasible within the southern region.

However, based on the extent of Made Ground present across the site and potential contamination associated with the historical industrial activities, loose fibres detected at location SA103 and visible asbestos at SA107), petroleum hydrocarbons in soils, it is deduced that infiltration drainage will not be suitable for the site.

Accordingly, following the drainage discharge hierarchy, the proposal will seek a discharge into the adjoining watercourse system at a restricted rate, as per the approved 2018 Drainage Strategy.

3.2.2 Proposed Drainage Strategy

Based on the current masterplan (in Appendix B), the development will comprise circa 2.02ha of impermeable area (34% impermeability), an increase over 8% over the existing site impermeability. Note that the design hard area increases to 2.13ha with 10% urban creep applied to private curtilages.

Surface water runoff from the development will be discharged into the adjoining watercourse network located to the north west of the site, with runoff restricted to the 'greenfield' Q_{BAR} rate and attenuation storage provided for the 1 in 100 year + 40% storm event.

The 'greenfield' Q_{BAR} rate has been calculated as 5.9l/s/ha using the ICP SUDS methodology (based on IH124 Method) in the industry standard Source Control module of Windes Microdrainage (see Appendix F for calculations). This translates to a total discharge from the site of 11.9l/s based on an estimated impermeable area of 2.02ha.

Surface water runoff will be managed within onsite SuDS comprising permeable paving, a below ground tank located centrally beneath a Public Open Space (POS) and a surface attenuation basin provided within the lower north western extent of the site. Flows will be controlled at various location using orifice and vortex flow control devices (such as Hydrobrakes). The drainage system will eventually discharge into the watercourse by Rock Road at 10.9 l/s.

Incorporation of bioretention tree pits and raingardens along the internal roads and within individual plot levels will be investigated at the detailed design. Rainwater butts will also be provided in each dwelling as part of a subsequent Reserved Matters application.

To meet the new national SuDS standards, the central POS storage tank can be upgraded to a ‘smart’ system for both rainwater harvesting and stormwater attenuation. Using a smart control and monitoring system (such as SDS SYMBiotIC™), the system can remotely monitor forecasts and automatically adjusts water levels by operating a valve or pumps to ensure there is sufficient free capacity for upcoming storms.

A small development area within the western extent will drain at 1.0l/s to a small watercourse located nearby to preserve the existing ecology of this watercourse system. This watercourse flow westerly and then northerly along the north western site boundary to drain into the above watercourse by Rock Road.

In combination, these SuDS features will be designed to accommodate runoff up to the 1:100 year + 40% climate change event. Total discharge into the watercourse network will be limited to the Q_{BAR} of 11.9l/s. In reality, the proposed discharge at Q_{BAR} offers a significant reduction in runoff (98%) compared to brownfield rate (11.9l/s as opposed to the proposed 535.6l/s).

The preliminary drainage strategy is shown on Drawing 37212-STN-XX-XX-DR-C-2200-P01 in Appendix E; drainage calculations are included in Appendix F.

3.2.3 Design Exceedance

Should the drainage system block/fail or under extreme events of flooding exceeding the design standard, floodwater will be routed along the onsite highways and directed towards the adjoining landscaped areas, as shown within Drawing 37212-STN-XX-XX-DR-C-2200-P01 in Appendix E.

3.2.4 Water Quality

Adequate mitigation measures will be put in place to offset any detrimental effects of the development on water quality of the receiving waters. Runoff will primarily be treated using permeable paving and surface water basin which will treat runoff through its vegetated surfaces, permanent pool and / or gravel medium. Runoff will pass through catch pits prior to entering the SuDS devices.

CIRIA C753 The SuDS Manual, chapter 26, recommends the use of the 'Simple Index Approach' for assessing the minimum water quality management requirements and this method has been used to check the suitability of the above proposals as follows;

1. *Step 1 – Allocate suitable pollution hazard indices for the proposed land use.*
2. *Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.*

The pollution hazard indices for the proposed land uses are shown in Table 3.2 below.

Table 3.2: Pollution hazard level for different land use classification (taken from table 26.2 CIRIA C753 SuDS Manual)

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Private Driveways & low traffic roads	Low	0.5	0.4	0.4

The indicative pollution mitigation Indices for the proposed SuDS devices are shown in Table 3.3 below.

Table 3.3: Pollution Mitigation Indices for different SuDS Components (based on Tables 26.3 of CIRIA C753 The SuDS Manual)

Type of SuDS Component	Total suspended solids (TSS)	Metals	Hydrocarbons
Pond	0.7	0.7	0.5
Permeable Paving	0.7	0.6	0.7
Catch Pits	Mitigation indices unavailable, although considered adequate to treat roof runoff.		

From the above tables, it is confirmed that the proposed SuDS system will provide sufficient water quality treatment prior to its discharge into the public sewers.

3.2.5 Adoption & Maintenance

All surface water drains and SuDS features will be privately maintained via the engagement of a private management company.

Regular inspection and maintenance are important for the effective operation of SuDS systems as designed. Routine inspection and silt removal form the basis of any maintenance regime. Regular maintenance of SuDS should be carried out in line with the C753 The SuDS Manual or as per manufacturer's specification, as outlined in tables below. Frequency of maintenance is dependent upon site specific circumstance and activities should be undertaken as necessary.

Table 3.4 Draft Maintenance Schedule for Ponds

Schedule	Maintenance Requirement	Frequency
Regular	• Remove litter and debris	• Monthly
	• Mow grass	• Monthly, or as required
	• Manage other vegetation and manage nuisance plants	• Monthly at start, then as required
Occasional	• Reseed areas of poor vegetation growth • Prune and trim trees • Remove sediment from pre-treatment system when 50% full	• As required
Remedial	• Repair erosion or other damage by reseeding • Realign the rip-rap • Repair or rehabilitate inlets, outlets and overflows • Reinstate uneven surface and design levels	• As required
Monitoring	• Inspect inlets, outlets, and overflows for blockages	• Monthly
	• Inspect banksides, structures, pipework etc. for evidence of damage	• Monthly
	• Inspect inlets and pre-treatment systems for silt accumulation	• Half yearly
	• Inspect infiltration surfaces for ponding and compacting	• Monthly

Table 3.5: Draft Maintenance Schedule for Attenuation Tanks

Maintenance Schedule	Required action	Typical Frequency
Regular	• Inspect and identify any areas which are not operating correctly. If required take remedial action	• Monthly for first 3 months, annually after this period
	• Remove debris from catchment surface, where it may cause a risk to performance (i.e. litter, leaf fall, sticks and branches)	• Monthly

	• Remove sediment from pre-treatment structures (gullies and catchpits)	• Annually or as required.
Remedial actions	• Repair/rehabilitate structure and connecting pipework, vents etc as required	• As required
Monitoring	• Inspect/check all inlets, outlets, vents and overflows to ensure they are in good condition and operating as designed	• Annually
	• Survey inside of carrier pipe for sediment build-up and remove is necessary.	• Every 5 years or as required.

Table 3.6: Draft Maintenance Schedule for Pervious Pavements

Maintenance Schedule	Required Action	Typical Frequency
Regular	• Brushing and vacuuming (standard cosmetic sweep over whole surface)	• Once a year, after autumn leaf fall, or reduced frequency as required
Occasional	• Stabilise and mow contributing and adjacent areas	• As required
	• Weeds removal	• As required
Remedial	• Remedial work to any depressions, rutting or cracked or broken blocks considered detrimental to performance or a hazard to users	• As required
	• Rehabilitate surface and upper substructure by remedial sweeping	• Every 10 to 15 years or as required
Monitoring	• Initial Inspection	• Monthly for 3 months after installation
	• Inspect for evidence of poor operation and/or weed growth	• Three monthly, 48 hours after large storms in first six months
	• Inspect silt accumulation rates	• Annually
	• Monitor inspection chambers	• Annually

Table 3.7: Draft Maintenance Schedule for Flow Controls, Catch Pits and Conveyance Pipes

Maintenance Schedule	Required Action	Typical Frequency
Inspection	• Inspect sump and benching in flow control chamber and note rate of sediment accumulation.	• Three times a year or after significant rainfall events
	• Inspect pull cables in flow control chamber and any moving parts to ensure operational.	• Three times a year or after significant rainfall events
	• Inspect inlets, outlets and overflows for blockages.	• Three times a year or after significant rainfall events
	• Observe condition of flow control chamber and carry out CCTV survey to check condition of pipes.	• Every two years or if issues are identified.
Maintenance	• Remove sediment and debris from sump	• As required, based on inspection
	• Grease moving parts in flow control chamber as appropriate	• As required, based on inspection.
	• Jet through pipelines	• As required, based on inspection.
Remedial Action	• Reconstruct inspection chamber structure	• As required
	• Replacement of flow control device and/or overflow pipe	• As required
	• Repair damaged joints in pipes or relay new pipes	• As required

4 Foul Water

4.1 Pre-Development

The Southern Water sewer record plan shows a 150mm diameter public foul sewer in Rock Road, flowing from east to west. A copy of the Southern Water sewer records and a plan showing the existing drainage information is included in Appendix C.

The existing site comprises offices, store sheds and workshops. Historical information provided by the Client indicates that the toilet block in the north-west of the site and office block in the north-east each discharge to a cess pit, which are still active and regularly maintained. The historical records also indicate that a toilet from another office block, located at the Rock Road entrance, has a connection heading out towards the main road, presumably into the public foul sewer mentioned above.

Any foul flows from the existing site are likely to be very limited.

4.2 Post-Development

The proposal is for a total of 108 residential dwellings. Using the recommendations in Sewerage Sector Guidance (SSG) Appendix C Design and Construction Guidance, using an allowance of 4,000 litres per dwelling per day, the peak flow from the development will be 5.0l/s.

Foul flows generated from the development will be discharged into the existing foul sewer located at Rock Road via a new manhole connection.

Considering the site levels which generally falls to the north, most of the site will be able to drain by gravity into the public sewer located at Rock Road; it is likely the western catchment will require some land raising or a pumping arrangement to discharge into the proposed main system.

A preliminary foul network is shown on the drainage strategy drawing (37212-STN-XX-XX-DR-C-2200-P01) in Appendix E. The drainage is subject to detailed design including detailed road / site levels design. A survey of the public sewer should be undertaken to ascertain the invert level at the connecting manhole and to inform the detailed design.

In their response to the earlier 90 dwellings application, Southern Water had advised the below (SW ref: PLAN-024909, dated 26th October 2018):

"Southern Water has undertaken a desk study of the impact that the additional foul sewerage flows from the proposed development will have on the existing public sewer network.

This initial study indicates that there is an increased risk of flooding unless any required network reinforcement is provided by Southern Water. Any such network reinforcement will be part funded through the New Infrastructure Charge with the remainder funded through Southern Water's Capital Works programme.

Southern Water and the Developer will need to work together in order to review if the delivery of our network reinforcement aligns with the proposed occupation of the development, as it will take time to design and deliver any such reinforcement."

Accordingly, the developer will work closely with Southern Water to ensure any necessary works are delivered to suit the development programme.

5 Conclusions

Preliminary surface and foul water drainage strategies have been developed for the proposed scheme which demonstrate that the site can be drained without detrimental effects within the wider environment in accordance with the NPPF, PPG and local policy.

To effectively manage the additional surface water runoff generated by the proposed development, a multifunctional SuDS scheme has been incorporated into the design. This incorporates permeable paving, a landscaped pond, and below ground attenuation tanks with additional consideration given to sustainable features such as raingardens and tree pits, where feasible. Rainwater harvesting opportunity will also be explored at detailed design stage. Together these features contribute to sustainable runoff management while delivering water quality improvements, amenity value and biodiversity enhancements.

Surface water runoff generated by the development will be discharged into the adjoining watercourse network at greenfield rates, ensuring no increase in surface water flood risk on-site or in the surrounding area. In fact, the proposal offers a reduction in surface water runoff of 98% over the existing brownfield runoff state.

Design exceedance flow routes will be managed by diverting such flows towards the adjoining landscaped areas and into the pond.

Foul water will discharge into the public foul sewer located at Rock Road subject to an agreement with Southern Water. Southern Water in their earlier correspondence advised of the capacity constraints within their sewerage infrastructure and confirmed that network upgrading will be necessary. It is expected that Southern Water and the developer can work together to ensure that necessary improvements are implemented to align with the development schedule.

All drainage components including SuDS features will be managed appropriately in accordance with the recommended guidance, such as The SuDS Manual.

The drainage proposals are subject to discussions with the LLFA and Southern Water.

Provided the development adheres to the conditions as discussed in this Report, the proposals are concluded to meet the requirements of the NPPF and relevant local and national guidance and should be considered acceptable on drainage grounds.

Appendices

Appendix A Topographical Survey

510300 E

510400 E

115100 N

115000 N

Notes:

1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GPS NETWORK. LOCAL SCALE FACTOR (0.999750) APPLIED.
2. DRAINAGE INFORMATION HAS BEEN DETERMINED WITHOUT MAN ENTRY INTO CHAMBERS AND WHILST EVERY EFFORT HAS BEEN MADE TO CORRECTLY IDENTIFY THIS INFORMATION, IT SHOULD ALWAYS BE CHECKED IN AREAS THAT ARE CRITICAL TO THE FUTURE PROPOSAL.
3. ALL SEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS, WITH ROUTES /CONNECTIVITY OBTAINED USING ACOUSTIC METHODS ONLY. THESE ARE TO BE CONSIDERED ASSUMED AND SHOULD BE INVESTIGATED FURTHER IN CRITICAL AREAS.
4. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.
6. BACKGROUND INFORMATION TAKEN FROM ORDNANCE SURVEY DIGITAL DATA SHOWN IN BLUE.

Coordinate Table

Station	Description	Easting	Northing	Level
S1	ROAD NAIL	510350.961	115079.721	50.946
S2	ROAD NAIL	510367.150	115034.399	51.787
S3	ROAD NAIL	510380.506	114999.218	51.751
S4	ROAD NAIL	510417.000	115001.834	55.838
S5	ROAD NAIL	510454.249	114924.442	55.924
S6	PEG	510475.633	114868.840	61.371
S7	ROAD NAIL	510443.172	114837.759	54.212
S8	HILTI NAIL	510414.787	114867.135	63.674
S9	ROAD NAIL	510388.930	114904.923	58.252
S10	PEG	510386.791	114943.304	56.919
S100	ROAD NAIL	510331.549	115087.192	49.249
S200	PEG	510373.431	114936.861	55.201
S200A	PEG	510374.400	114920.697	55.615
S201	PEG	510360.552	114970.968	52.505
S202	PEG	510333.946	114964.789	52.910
S203	PEG	510325.901	114985.900	48.442
S204	HILTI NAIL	510352.327	114992.591	50.381
S30	ROAD NAIL	510367.467	115000.454	51.750
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S500	HILTI NAIL	510408.406	114937.289	54.731
S90	ROAD NAIL	510442.823	114888.756	58.574
S91	ROAD NAIL	510391.717	114911.866	55.515
S101	ROAD NAIL	510283.104	115073.738	46.929
S110	ROAD NAIL	510416.176	115106.153	52.655

TOPOGRAPHICAL KEY

SURVEY STATION — 5

BANKING — TOP / BOTTOM

HEDGE SPREADS

WOODLAND CANOPY

ARROW ON STEPS / RAMPS INDICATING DIRECTION UPWARDS

TREES — SPREAD & GIRTH SHOWN TO SCALE

GATE

KERB CHANNEL

ROAD UNKERBED

FOOTPATH

CHANGE IN SURFACE

FENCE

WALL

OVERHEAD ELECTRIC

OVERHEAD TELECOM

FOUL SEWER

SURFACE SEWER

P-TRAP

BACK DROP (EXTERNAL)

BACK DROP (INTERNAL)

BUILDING

OPEN SIDED BUILDING

OVERHANG / CANOPY

GLASSHOUSE

CONTOUR — 26.50

SPOT LEVEL — + 127.13

SONAR LEVEL — O 127.13

BORE HOLE — BH

TRIAL HOLE — TH

GENERAL ABBREVIATIONS

AIR CONDITIONING UNIT	ACU
AIR VALVE	AV
AVERAGE	Av
BACK DROP	BD
BACK OF KERB	BK
BELISHA BEACON	BB
BRICK	BK
BOLLARD	BO
BOLLARD LIGHT	BOL
BUSH	BT
BT INSPECTION COVER	BT
CABLE RISER	CR
CABLE TV COVER	CATV
CABLES TO GROUND	CTG
CONTROL BOX	CB
COVER LEVEL	CL
CONIFER	CONIF
DAMP PROOF COURSE	DPC
DRAINAGE CHANNEL	DCH
DROP KERB	DK
ELECTRICITY CONTROL BOX	EB
ELECTRICITY POLE	EP
EARTH ROD	ER
FIRE HYDRANT	FH
FLOOR LEVEL	FL
FOOTPATH	FP
FOUL WATER	FW
GAS RISER	GR
GAS VALVE	GV
GULLY	GY
HARD BED	HB
INSPECTION COVER	IC
INVERT LEVEL	IL
LAMP BOLLET	LB
LAMP POST	LP
MANHOLE	MH
MARKER POST	MK
METER	MT
NO PIPES VISIBLE	NPV
ORDNANCE SURVEY BENCH MARK	OSBM
PUMP	PU
POST	PO
POST BOX	P BOX
RODDING EYE	RE
ROAD SIGN	RS
RAIN WATER PIPE	RWP
RETAINING WALL	RW
SOIL PIPE	SP
STOP COCK	SC
STREET NAME PLATE	SNP
STAY CABLES	ST
STOP VALVE	SV
SURFACE WATER	SWP
SURFACE WATER	SW
TACTILE PAVING	TAC
TELECOM POLE	TP
TELEPHONE CALL BOX	TCB
TOP OF WALL	TOW
TRAFFIC LIGHT	TL
TRAFFIC LIGHT COVER	TLC
THRESHOLD LEVEL	THL
UNABLE TO LOCATE	UTL
UNABLE TO RAISE	UTR
UNABLE TO SURVEY	UTS
VENT PIPE	VP
WATER LEVEL	WL
WATER METER	WM
WASH OUT	WO
WATER RISER	WR

FENCE ABBREVIATIONS

BARBED WIRE FENCE	B/W	IRON RAILINGS	IR
CLOSE BOARDED FENCE	C/B	LARCH LAP FENCE	L/L
CONCRETE PANEL FENCE	C/PL	POST AND RAIL FENCE	P/R
CORRUGATED IRON FENCE	C/I	POST AND WIRE FENCE	P/W
CHAIN LINK FENCE	CL	WIRE MESH FENCE	W/M
CHESTNUT PALING	CNP		

Sheet Layout: (Not to Scale)

1

2

3

Revision	Description	Date

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28

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Thakeham Tiles

Thakeham Tiles
Rock Road
Storrington
West Sussex

Topographical Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:250	A0	1	July 2016
Project Number:	Rev:	Surveyed By:	Approved By:
22664	-	SW/CP	CP / NS

Notes:

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6. BACKGROUND INFORMATION TAKEN FROM ORDNANCE SURVEY DIGITAL DATA SHOWN IN BLUE.

Coordinate Table

Station	Description	Easting	Northing	Level
S1	ROAD NAIL	510350.961	115079.721	50.946
S2	ROAD NAIL	510367.150	115034.399	51.787
S3	ROAD NAIL	510380.506	114999.218	51.751
S4	ROAD NAIL	510417.000	115001.834	55.838
S5	ROAD NAIL	510454.249	114924.442	55.924
S6	PEG	510475.633	114868.840	61.371
S7	ROAD NAIL	510443.172	114837.759	64.212
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S9	ROAD NAIL	510388.930	114904.923	58.252
S10	PEG	510386.791	114943.304	56.919
S100	ROAD NAIL	510331.549	115087.192	49.249
S200	PEG	510373.431	114936.861	55.201
S200A	PEG	510374.400	114920.697	55.615
S201	PEG	510360.552	114970.968	52.505
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TOPOGRAPHICAL KEY

SURVEY STATION

BANKING (TOP / BOTTOM)

HEDGE SPREADS

WOODLAND CANOPY

ARROW ON STEPS / RAMPS INDICATES DIRECTION UP/AWARDS

TREES (SPREAD & GIRTH SHOWN TO SCALE)

GATE

KERB CHANNEL

ROAD UNKERBED

FOOTPATH

CHANGE IN SURFACE

FENCE

WALL

OVERHEAD ELECTRIC

OVERHEAD TELECOM

FOUL SEWER

SURFACE SEWER

P-TRAP

BACK DROP (EXTERNAL)

BACK DROP (INTERNAL)

BUILDING

OPEN SIDED BUILDING

OVERHANG / CANOPY

GLASSHOUSE

CONTOUR

SPOT LEVEL

SONAH LEVEL

BORE HOLE

TRIAL HOLE

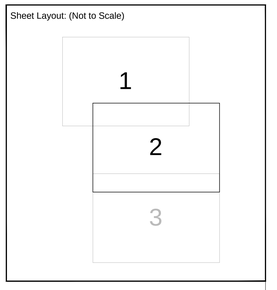
GENERAL ABBREVIATIONS

AIR CONDITIONING UNIT	ACU	MANHOLE	MH
AIR VALVE	AV	MARKER POST	MK
ASPHALT	AS	METER	MT
BACK DROP	BD	NO PIPES VISIBLE	NPV
BASE LEVEL	BL	ORDNANCE SURVEY BENCH MARK	OSBM
BELISHA BEACON	BB	PUMP	PU
BRICK	BK	POST	PO
BOLLARD	BOL	POST BOX	P-BOX
BOLLARD LIGHT	BOL	RODDING EYE	RE
BOTTOM	BOT	ROAD SIGN	RS
BT INSPECTION COVER	BT	RAINWATER PIPE	RWP
CABLE RISER	CR	RETAINING WALL	RW
CABLE TV COVER	CATV	SOFT BED	SB
CABLES TO GROUND	CTG	STOP COCK	SC
CONCRETE	CO	STREET NAME PLATE	SNP
COVER LEVEL	CL	STAY CABLES	ST
CATCH PIT	CPIT	STOP VALVE	SV
DAMP PROOF COURSE	DPC	SURFACE WATER PIPE	SWP
DRAINAGE CHANNEL	DCH	SURFACE WATER	SW
DROP KERB	DK	TACTILE PAVING	TAC
ELECTRICITY CONTROL BOX	EB	TELECOM POLE	TP
ELECTRICITY POLE	EP	TELEPHONE CALL BOX	TCB
EARTH ROD	ER	TOP OF WALL	TOW
FIRE HYDRANT	FH	TRAFFIC LIGHT	TL
FLOOR LEVEL	FL	TRAFFIC LIGHT COVER	TLC
FOOTPATH	FP	THRESHOLD LEVEL	THL
GAS FLOW METER	GFM	UNABLE TO LOCATE	UTL
GAS RISER	GR	UNABLE TO RAISE	UTR
GAS VALVE	GV	UNABLE TO SURVEY	UTS
GULLY	GY	VENT PIPE	VP
HARD BED	HB	WATER LEVEL	WL
INSPECTION COVER	IC	WATER METER	WM
INVERT LEVEL	IL	WASH OUT	WO
KERB LEVEL	KD	WATER RISER	WR
LAMP POST	LP		

FENCE ABBREVIATIONS

BARBED WIRE FENCE	BWF	IRON RAILINGS	IR
CLOSE BOARDED FENCE	CBF	LATCH LAP FENCE	LFL
CONCRETE PANEL FENCE	CPL	POST AND RAIL FENCE	PRF
CROWN LIFTED IRON FENCE	CF	POST AND WIRE FENCE	PWF
CHAIN LINK FENCE	CLF	WIRE MESH FENCE	WFM
CHESTNUT PALING	CP		

Sheet Layout: (Not to Scale)



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Thakeham Tiles

Thakeham Tiles
Rock Road
Storrington
West Sussex

Topographical Survey

Scale	Sheet Size:	Sheet Number:	Date:
1:250	A0	2	July 2016
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22664	-	SW/CP	CP / NS

DENSE VEGETATION COVERS BANKING IN THIS AREA. LEVELS SURVEYED WHERE POSSIBLE.

MIXED TREES AVERAGE GIRTH 0.8m AVERAGE HT 15m

FENCE MEASUREMENTS ONLY POSSIBLE IN LIMITED AREAS DUE TO VEGETATION. APPROXIMATE POSITION ONLY

PLEASE NOTE ONLY LEVELS SURVEYED IN THIS AREA WHERE POSSIBLE FROM TOP OF BANKING. VEGETATION CLEARANCE NEEDED TO SURVEY BOUNDARIES.

TOP OF BANK LOOSES DEFINITION IN THIS AREA

GROUP OF UNKNOWN SPECIES IN THIS AREA, AVERAGE GIRTH 0.8m, AVERAGE HT 15m

POSSIBLE KINK IN BOUNDARY IN THIS AREA. UNABLE TO SURVEY DUE TO DENSE VEGETATION.

REAR OF BUILDING FOOTPRINT ASSUMED. UNABLE TO MEASURE DUE TO MACHINERY. PARTLY MEASURED REMOTELY FROM INSIDE WALL

R.WALL AND BUILDING SLOPE MEASUREMENTS TAKEN AT GROUND LEVEL

BELT BUND THROUGH UNDER BUILDING FOOTPRINT

WOODLAND

Overlea

Chetwynd

Quiet Hills

Cedar Cottage

Corner Cottage

Pikers Pad

Bourne Cottage

Slemdal

Heathside

Whispers

Gads Hill

Maple Lodge

Providence Cottage

Ridge Top

115000 N

114900 N

510300 E

510400 E

510500 E

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TOPOGRAPHICAL KEY

SURVEY STATION
BANKING
HEDGE SPREADS
WOODLAND CANOPY
ARROW ON STEPS / RAMPS INDICATING DIRECTION UPWARDS
TREES
GATE
KERB CHANNEL
ROAD UNKERBED
FOOTPATH
CHANGE IN SURFACE
FENCE
WALL
OVERHEAD ELECTRIC
OVERHEAD TELECOM
FOUL SEWER
SURFACE SEWER
P-TRAP
BACK DROP (EXTERNAL)
BACK DROP (INTERNAL)
BUILDING
OPEN SIDED BUILDING
OVERHANG / CANOPY
GLASSHOUSE
CONTOUR
SPOT LEVEL
SONAR LEVEL
BORE HOLE
TRIAL HOLE

GENERAL ABBREVIATIONS

AIR CONDITIONING UNIT	ACU
AIR VALVE	AV
AVERAGE	Av
BACK DROP	BD
BELL BOLLARD	BB
BELISHA BEACON	BE
BRICK	BK
BOLLARD	BO
BOLLARD LIGHT	BOL
BUS STOP	BT
BT INSPECTION COVER	BT
CABLE RISER	CR
CABLE TV COVER	CATV
CABLES TO GROUND	CTG
CONTROL BOX	CB
COVER LEVEL	CL
CONIFER	CONIFT
DAMP PROOF COURSE	DPC
DRAINAGE CHANNEL	DCH
DROP KERB	DK
ELECTRICITY CONTROL BOX	EB
ELECTRICITY POLE	EP
EARTH ROD	ER
FIRE HYDRANT	FH
FLOOR LEVEL	FL
FOOTPATH	FP
FOUL WATER	FW
GAS RISER	GR
GAS VALVE	GV
GULLY	GY
HARD BED	HB
INSPECTION COVER	IC
INVERT LEVEL	IL
LAMP BOLLET	LBO
LAMP POST	LP
MANHOLE	MH
MARKER POST	MK
METER	MT
NO PIPES VISIBLE	NPV
ORDNANCE SURVEY BENCH MARK	OSBM
PEDESTAL	PED
POST	PO
POST BOX	P.BOX
RODDING EYE	RE
ROAD SIGN	RS
RAIN WATER PIPE	RWP
RETAINING WALL	RW
SOIL PIPE	SP
STOP COCK	SC
STREET NAME PLATE	SNP
STAY CABLES	ST
STOP VALVE	SV
SURFACE WATER	SWP
SURFACE WATER	SW
TACTILE PAVING	TAC
TELECOM POLE	TP
TELEPHONE CALL BOX	TCB
TOP OF WALL	TOW
TRAFFIC LIGHT	TL
TELECOM COVER	TLC
THRESHOLD LEVEL	THL
UNABLE TO LOCATE	UTL
UNABLE TO RAISE	UTR
UNABLE TO SURVEY	UTS
VENT PIPE	VP
WATER LEVEL	WL
WATER METER	WM
WATER OUT	WO
WATER RISER	WR

FENCE ABBREVIATIONS

BARBED WIRE FENCE	B/W	IRON RAILINGS	I/R
CLOSE BOARDED FENCE	C/B	LARCH LAP FENCE	LL
CONCRETE PANEL FENCE	C/PL	POST AND RAIL FENCE	P/R
CORRUGATED IRON FENCE	C/I	POST AND WIRE FENCE	P/W
CHAIN LINK FENCE	C/L	WIRE MESH FENCE	W/M
CHESTNUT PALING	CNP		

Sheet Layout: (Not to Scale)

1
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0 2 4 6 8 10 12 14 16 18 20 22 24 26 28

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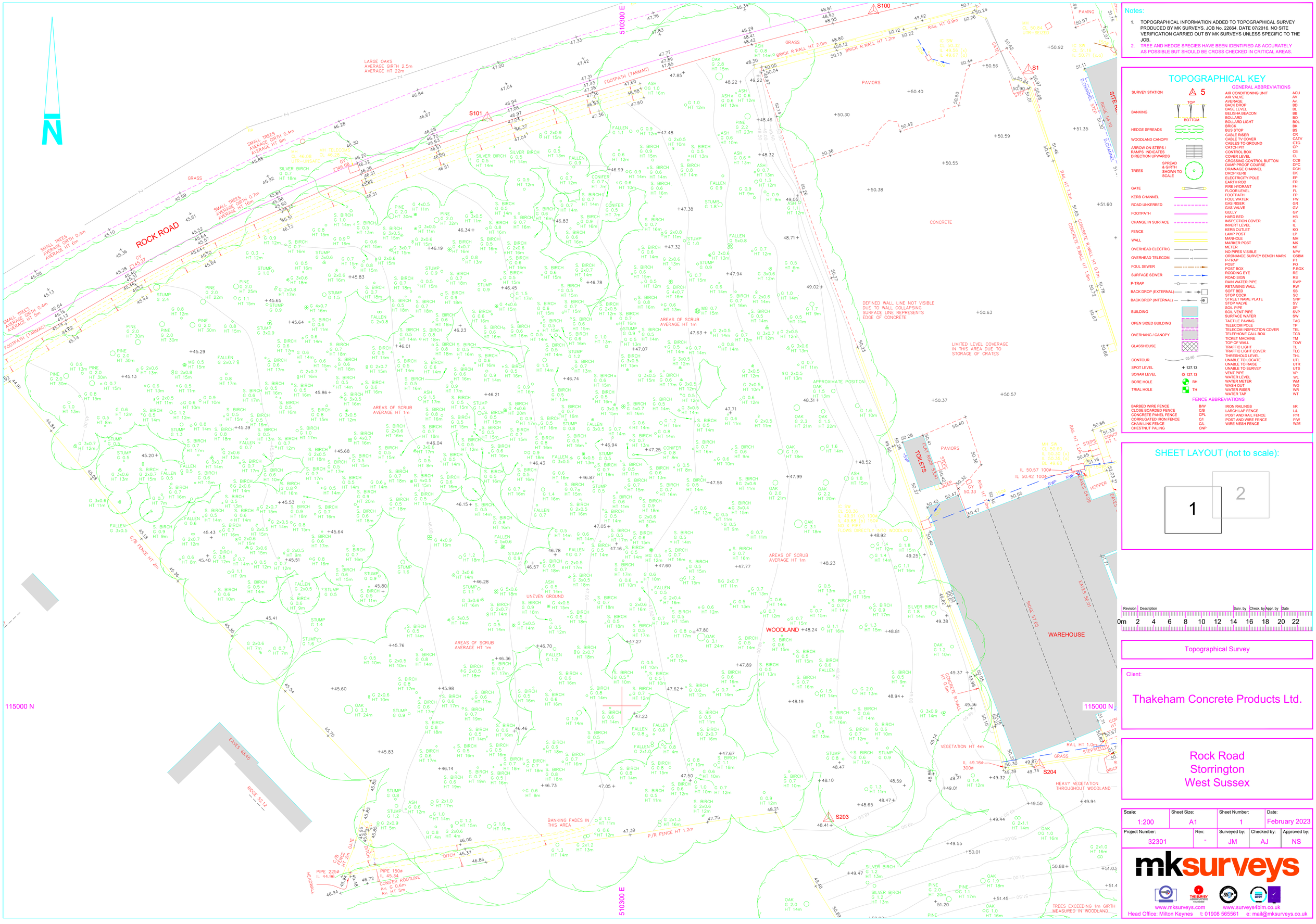

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TOPOGRAPHICAL KEY

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CONTOUR 25.50
SPOT LEVEL + 127.13
SONAR LEVEL O 127.13
BORE HOLE BH
TRIAL HOLE TH

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AIR CONDITIONING UNIT	ACU
AIR VALVE	AV
AVERAGE	Av.
BACK DROP	BD
BASE LEVEL	BL
BELISHA BEACON	BB
BOLLARD	BO
BOLLARD LIGHT	BOL
BRICK	BK
BUS STOP	BS
CABLE RISER	CR
CABLE TV COVER	CATV
CABLES TO GROUND	CTG
CATCH PIT	CP
CONTROL BOX	CB
COVER LEVEL	CL
CROSSING CONTROL BUTTON	CCB
DAMP PROOF COURSE	DPC
DRAINAGE CHANNEL	DCH
DROP KERB	DK
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FOUL WATER	FW
GAS RISER	GR
GAS VALVE	GV
GULLY	GY
HARD BED	HB
INSPECTION COVER	IC
INVERT LEVEL	IL
KERB OUTLET	KO
LAMP POST	LP
MANHOLE	MH
MARKER POST	MK
METER	MT
NO PIPES VISIBLE	NPV
ORDNANCE SURVEY BENCH MARK	OSBM
P-TRAP	PT
POST	PO
POST BOX	P.BOX
RODDING EYE	RE
ROAD SIGN	RS
RAIN WATER PIPE	RWP
RETAINING WALL	RW
SOFT BED	SB
STOP COCK	SC
STREET NAME PLATE	SNP
STOP VALVE	SV
SOIL PIPE	SP
SOIL VENT PIPE	SVP
SURFACE WATER	SW
TACTILE PAVING	TAC
TELECOM POLE	TP
TELECOM INSPECTION COVER	TEL
TELEPHONE CALL BOX	TCB
TICKET MACHINE	TM
TOP OF WALL	TOW
TRAFFIC LIGHT	TL
TRAFFIC LIGHT COVER	TLC
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UNABLE TO LOCATE	UTL
UNABLE TO RAISE	UTR
UNABLE TO SURVEY	UTS
VENT PIPE	VP
WATER LEVEL	WL
WATER METER	WM
WASH OUT	WO
WATER RISER	WR
WATER TAP	WT

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CONCRETE PANEL FENCE	CPL
CORRUGATED IRON FENCE	C/I
CHAIN LINK FENCE	C/L
CHESTNUT PALING	CNP
IRON RAILINGS	I/R
LARCH LAP FENCE	L/L
POST AND RAIL FENCE	P/R
POST AND WIRE FENCE	P/W
WIRE MESH FENCE	W/M

SHEET LAYOUT (not to scale):

1 | 2

Revision	Description	Surv. by	Check. by	Appr. by	Date

0m 2 4 6 8 10 12 14 16 18 20 22

Topographical Survey

Client:

Thakeham Concrete Products Ltd.

Rock Road
Storrington
West Sussex

Scale:	Sheet Size:	Sheet Number:	Date:
1:200	A1	1	February 2023

Project Number:	Rev:	Surveyed by:	Checked by:	Approved by:
32301	-	JM	AJ	NS

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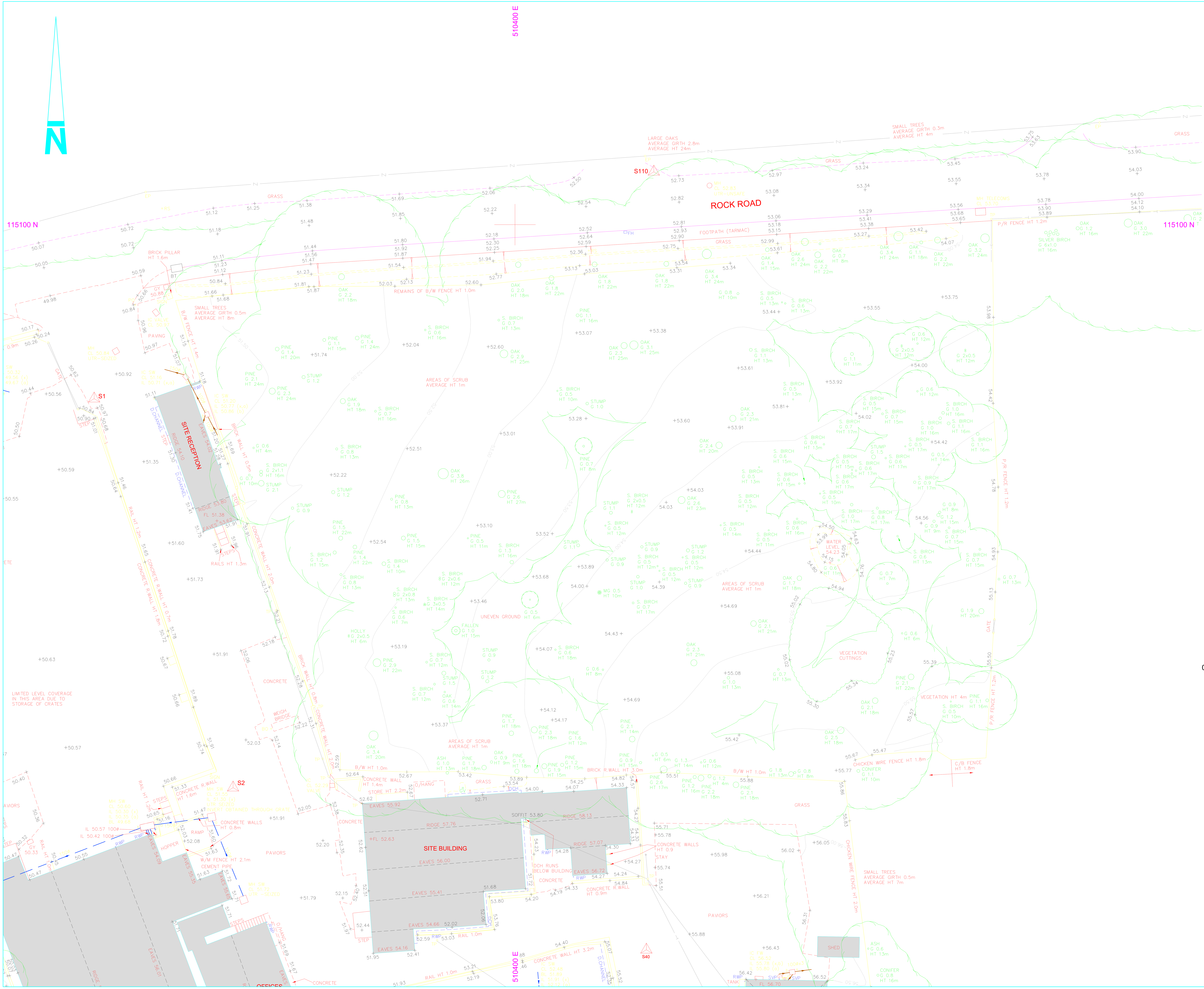

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BANKING (TOP / BOTTOM)
HEDGE SPREADS
WOODLAND CANOPY
ARROW ON STEPS / RAMPS INDICATES DIRECTION UPWARDS
TREES — SPREAD & GIRTH SHOWN TO SCALE
GATE
KERB CHANNEL
ROAD UNKERBED
FOOTPATH
CHANGE IN SURFACE
FENCE
WALL
OVERHEAD ELECTRIC
OVERHEAD TELECOM
FOUL SEWER
SURFACE SEWER
P-TRAP
BACK DROP (EXTERNAL)
BACK DROP (INTERNAL)
BUILDING
OPEN SIDED BUILDING
OVERHANG / CANOPY
GLASSHOUSE
CONTOUR 25.50
SPOT LEVEL + 127.13
SONAR LEVEL O 127.13
BORE HOLE BH
TRIAL HOLE TH

GENERAL ABBREVIATIONS

AIR CONDITIONING UNIT	ACU
AIR VALVE	AV
AVERAGE	Av.
BACK DROP	BD
BASE LEVEL	BL
BELISHA BEACON	BB
BOLLARD	BO
BOLLARD LIGHT	BOL
BRICK	BK
BUS STOP	BS
CABLE RISER	CR
CABLE TV COVER	CATV
CABLES TO GROUND	CTG
CATCH PIT	CP
CONTROL BOX	CB
COVER LEVEL	CL
CROSSING CONTROL BUTTON	CCB
DAMP PROOF COURSE	DPC
DRAINAGE CHANNEL	DCH
DROP KERB	DK
ELECTRICITY POLE	EP
EARTH ROD	ER
FIRE HYDRANT	FH
FLOOR LEVEL	FL
FOOTPATH	FP
FOUL WATER	FW
GAS RISER	GR
GAS VALVE	GV
GULLY	GY
HARD BED	HB
INSPECTION COVER	IC
INVERT LEVEL	IL
KERB OUTLET	KO
LAMP POST	LP
MANHOLE	MH
MARKER POST	MK
METER	MT
NO PIPES VISIBLE	NPV
ORDNANCE SURVEY BENCH MARK	OSBM
P-TRAP	PT
POST	PO
POST BOX	P.BOX
RODDING EYE	RE
ROAD SIGN	RS
RAIN WATER PIPE	RWP
RETAINING WALL	RW
SOFT BED	SB
STOP COCK	SC
STREET NAME PLATE	SNP
STOP VALVE	SV
SOIL PIPE	SP
SOIL VENT PIPE	SVP
SURFACE WATER	SW
TACTILE PAVING	TAC
TELECOM POLE	TP
TELECOM INSPECTION COVER	TEL
TELEPHONE CALL BOX	TCB
TICKET MACHINE	TM
TOP OF WALL	TOW
TRAFFIC LIGHT	TL
TRAFFIC LIGHT COVER	TLC
THRESHOLD LEVEL	THL
UNABLE TO LOCATE	UTL
UNABLE TO RAISE	UTR
UNABLE TO SURVEY	UTS
VENT PIPE	VP
WATER LEVEL	WL
WATER METER	WM
WASH OUT	WO
WATER RISER	WR
WATER TAP	WT

FENCE ABBREVIATIONS

BARBED WIRE FENCE	B/W	IRON RAILINGS	I/R
CLOSE BOARDED FENCE	C/B	LARCH LAP FENCE	L/L
CONCRETE PANEL FENCE	CPL	POST AND RAIL FENCE	P/R
CORRUGATED IRON FENCE	C/I	POST AND WIRE FENCE	P/W
CHAIN LINK FENCE	C/L	WIRE MESH FENCE	W/M
CHESTNUT PALING	CNP		

SHEET LAYOUT (not to scale):

1 2

Revision	Description	Surv. by	Check. by	Appr. by	Date

0m 2 4 6 8 10 12 14 16 18 20 22

Topographical Survey

Client:

Thakeham Concrete Products Ltd.

Rock Road
Storrington
West Sussex

Scale:	Sheet Size:	Sheet Number:	Date:
1:200	A1	2	February 2023

Project Number:	Rev:	Surveyed by:	Checked by:	Approved by:
32301	-	JM	AJ	NS

mksurveys

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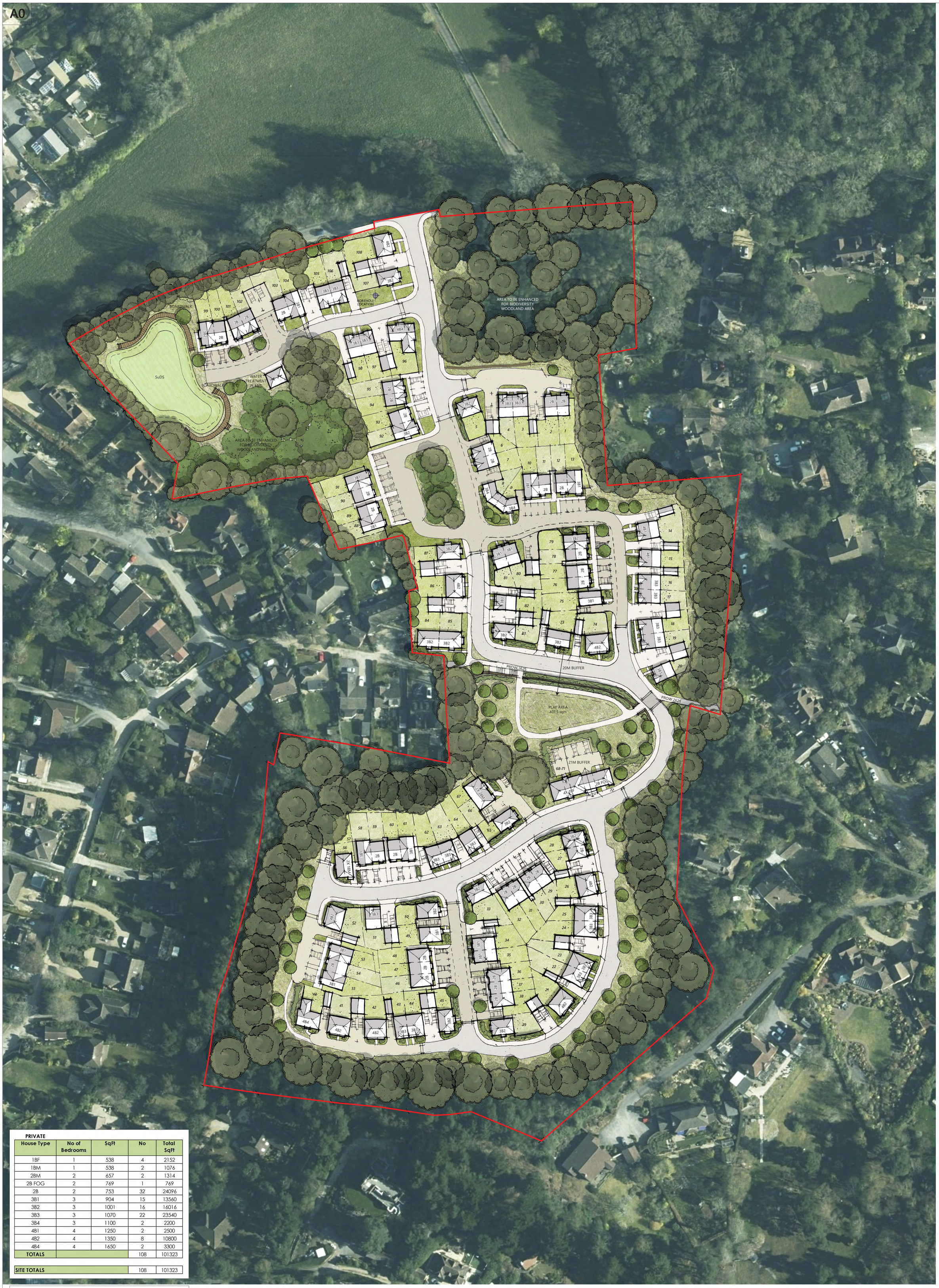
Head Office: Milton Keynes t: 01908 565561 e: mail@mksurveys.co.uk

Appendix B Development Plan

A0



PRIVATE

House Type	No of Bedrooms	SqFt	No	Total SqFt
1BF	1	538	4	2152
1BM	1	538	2	1076
2BM	2	657	2	1314
2B FOG	2	769	1	769
2B	2	753	32	24096
3B1	3	904	15	13560
3B2	3	1001	16	16016
3B3	3	1070	22	23540
3B4	3	1100	2	2200
4B1	4	1250	2	2500
4B2	4	1350	8	10800
4B4	4	1650	2	3300
TOTALS			108	101323

SITE TOTALS	108	101323

— Site Boundary
26 Plot Number
3B2 House Type

0 5 10 15 20 25 30 35 40 45 50m
1:500

N

Romsey T: 01794 367703
Portishead T: 01275 407000
London T: 01794 367703

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Rev	Description	Date	Au	Ch
A	Issued for Planning	10.09.25	CI/HP	--/--

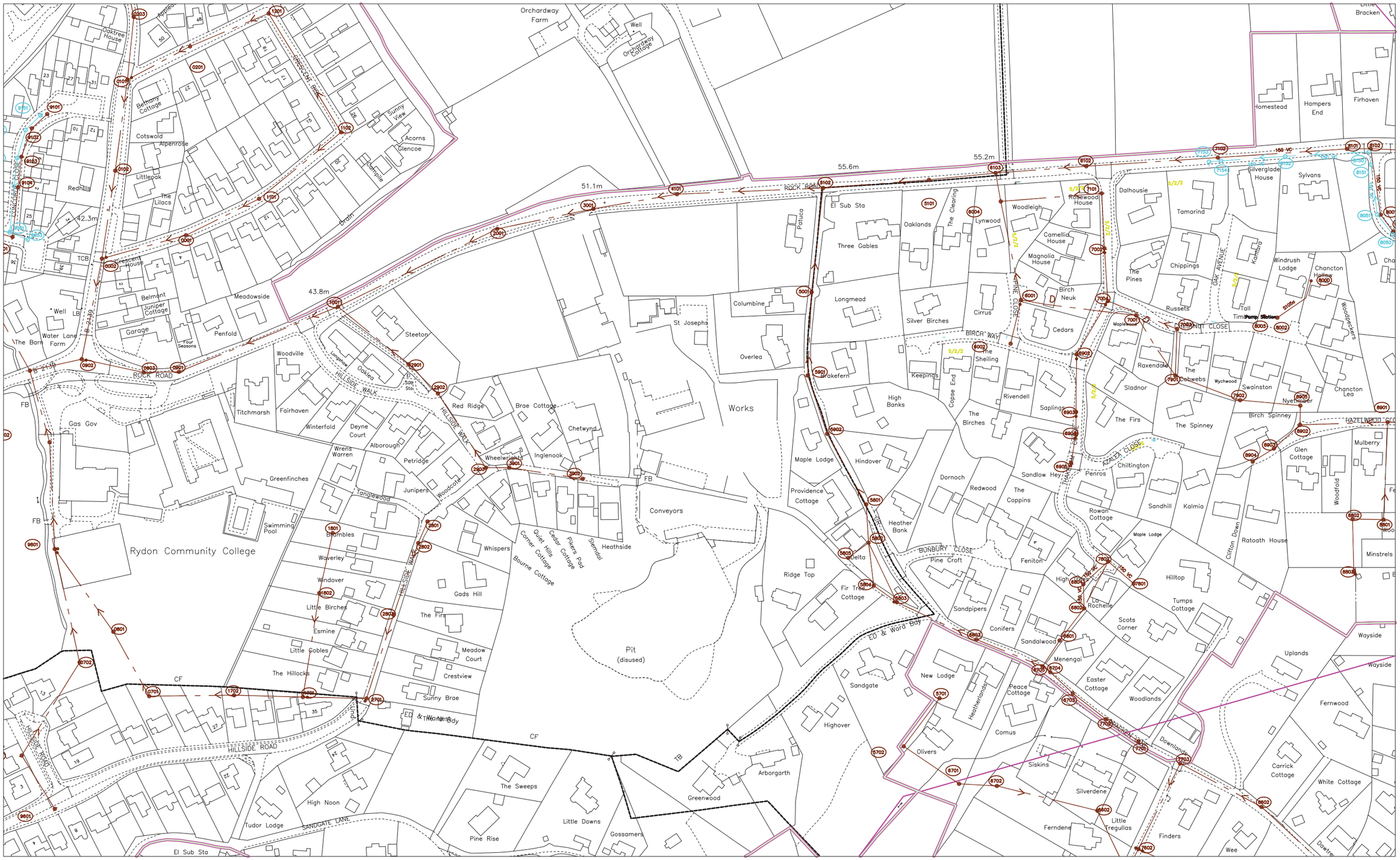
Project	**Land at Thakeham Tiles, Storrington**
Drawing	**Illustrative Masterplan - 04**
	-
Client	**Thakeham Tiles Ltd**
Job no.	**THAK230417**
Dwg no.	**IMP-04**
Date	**10.09.25**
Rev.	**A**
Author	**CI/HP**
Checked	**-/-**
Scale	**1:500@A0**
Status	**PLANNING**
Office	**Romsey**
Client ref.	-

thrive. architects

Appendix C Sewer Records

SEWER RECORDS PAGE 1 OF 2

115234



114656

509959

510901

O.S. REF. TQ1014NW	Drawn by: okuneyf	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may Include Bonded Asbestos Cement
	Scale: 1:2500	
Title: 283547_X:510430 Y:114945	Date: 12/03/2018	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

N

Southern Water

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape		Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
0001X	44.06	42.43	150	CP	CIRC		7002X	59.02	56.99	150	VC	CIRC												
0002X	41.41	39.01	150	CP	CIRC		7003X	64.01	62.35	150	VC	CIRC												
0101X	41.96	39.7	150	CP	CIRC		7004X	61.24	59.71	150	VC	CIRC												
0102X	42.46	39.35	150	CP	CIRC		7101X	56.63	55.48	150	VC	CIRC												
0201X	42.88	41.21	150	CP	CIRC		7102X	58.78	57.06	150	VC	CIRC												
0203X	41.56	39.95	150	CP	CIRC		7153X	58.652	57.672	150	VC	CIRC												
0701X			150	CP	CIRC		7154X	59.118	57.896	150	VC	CIRC												
0702X			150	VC	CIRC		7602X	61.37	58.03	150	CI	CIRC												
0801X			150	CP	CIRC		7701X	66.19	65.29	100	VC	CIRC												
0901X	41.82	40.21	150	CP	CIRC		7702X	65.82	64.22	150	VC	CIRC												
0902X	40.8	38.65	225	CP	CIRC		7703X	66.26	64.38	150	VC	CIRC												
0903X	41.42	39.86	150	CP	CIRC		7801X			150	VC	CIRC												
1001X	43.83	42.22	150	VC	CIRC		7802X	78.005	76.595	150	VC	CIRC												
1101X	45.83	43.58	150	CP	CIRC		7901X			150	VC	CIRC												
1102Y	45.71	44.05	150	VC	CIRC	*	7902X			UNK	UNK	CIRC												
1102X	45.71	44.01	150	CP	CIRC	*	8000X	66.107	63.882	150	VC	CIRC												
1201X	43.93	42.19	150	CP	CIRC		8001X	65.258	63.433	150	VC	CIRC												
1701X	49.19	46.28	150	CP	CIRC		8002X			UNK	UNK	CIRC												
1702X	46.3	44.9	150	CP	CIRC		800DX			UNK	UNK	CIRC												
1801X			150	CP	CIRC		8050X	66.165	63.96	150	VC	CIRC												
1802X			150	CP	CIRC		8051X	65.245	63.4	150	VC	CIRC												
2001X	46.08	44.58	150	VC	CIRC		8101X	62.92	61.28	150	VC	CIRC												
2701X	51.02	48.03	150	CP	CIRC		8102X	63.75	62.32	150	VC	CIRC												
2801X	52.11	50.58	150	CP	CIRC		8150X	63.611	62.1	150	VC	CIRC												
2802X	51.49	50.01	150	CP	CIRC		8151X	63.882	62.472	150	VC	CIRC												
2803X			150	CP	CIRC		8152X	60.983	60.073	150	VC	CIRC												
2901X			150	VC	CIRC		8602X	66.69	64.91	150	VC	CIRC												
2902X			150	VC	CIRC		8801X	69.43	67.93	150	VC	CIRC												
2903X			150	VC	CIRC		8802X	69.43	68.47	150	VC	CIRC												
3001X			150	VC	CIRC		8803X	72.9	71	150	VC	CIRC												
3901X	53.25	52.07	150	CP	CIRC		8901X	68.65	66.73	150	VC	CIRC												
3902X	56.15	54.6	150	CP	CIRC		8902X	67.31	65.82	150	VC	CIRC												
4101X	52.84	51.33	150	VC	CIRC		8903X	68.6	66.93	150	VC	CIRC												
5001X	57.98	55.68	150	VC	CIRC		8904X	70.35	68.93	150	VC	CIRC												
5101X	55.85	52.98	150	VC	CIRC		8905X	66.75	65.75	150	VC	CIRC												
5102X	56.15	53.68	150	VC	CIRC		9001X	48.08	45.67	150	VC	CIRC												
5701X			UNK	UNK	UNK		9051X	48.01	46.34	300	CP	CIRC												
5702X	60.74	59.45	150	VC	CIRC		9053X	48.21	46.72	150	VC	CIRC												
5801X	64.11	61.54	150	VC	CIRC		9101X	48.5	46.59	150	VC	CIRC												
5802X			150	VC	CIRC		9102X			150	VC	CIRC												
5803X	66.45	62.71	150	VC	CIRC	*	9103X	48.28	46.15	150	VC	CIRC												
5803Y	66.45		UNK	UNK	CIRC	*	9104X	48.15	45.96	150	VC	CIRC												
5804X			UNK	UNK	CIRC		9151X	48.46	47.09	225	VC	CIRC												
5805X			150	VC	CIRC		9152X	48.36	46.96	225	VC	CIRC												
5901X	61.34	59.33	150	VC	CIRC		9153X	48.27	46.87	225	VC	CIRC												
5902X	63.73	60.43	150	VC	CIRC		9601X	51.1	48.35	150	VC	CIRC												
6001X	60.58	58.3	150	VC	CIRC		9701X	50.26	47.9	150	VC	CIRC												
6002X	63.03		150	VC	CIRC		9801X	40.94	39.16	150	CP	CIRC												
6004X			150	VC	CIRC		9901X	40.43		225	CP	CIRC												
6102X	55.65	53.75	150	VC	CIRC		9902X	40.79	38.64	225	CP	CIRC												
6103X	55.32	53.35	150	VC	CIRC																			
6602X			UNK	UNK	UNK																			
6701X			UNK	UNK	UNK																			
6702X			UNK	UNK	UNK																			
6703X	65.36	63.63	150	VC	CIRC																			
6704X	65.51	63.21	150	VC	CIRC																			
6705X	65.38	63.2	150	VC	CIRC																			
6801X			UNK	UNK	CIRC																			
6802X	75.75	73.935	150	VC	CIRC																			
6803X			150	VC	CIRC																			
6804X	76.28	74.715	150	VC	CIRC																			
6902X	64.32	62.37	150	VC	CIRC																			
6903X	67.21	64.72	150	VC	CIRC																			
6904X	69	67.18	150	VC	CIRC																			
6905X	70.65	68.41	150	VC	CIRC																			

LINE STYLES / COLOURS

- Brown — Foul
- Brown — Foul Syphon Sewer
- Brown — Foul Vacuum Main
- Brown — Foul Rising Main
- Red — Combined
- Red — Combined Syphon Sewer
- Red — Combined Rising Main
- Red — Lateral Drain
- Orange — Building Over Agreement Area
- Dark Blue — Treated Effluent
- Purple — Sludge
- Purple — Sewer Catchment
- Purple — Section 104 Area
- Light Blue — Surface Water
- Light Blue — Surface Water Rising Main
- Yellow — Private
- Green — Access Shaft
- Green — Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
XXX	Other
ZZZ	Unknown

LEGEND - SEWERS

- Manhole (SW)
- Manhole (F&C)
- Lamp hole (SW)
- Lamp hole (F&C)
- Pumping Station (SW)
- Pumping Station (F&C)
- Side entry manhole (SW)
- Side entry Manhole (F&C)
- Blind shaft (SW)
- Blind shaft (F&C)
- Ejector station (SW)
- Ejector station (F&C)
- Watertight door (SW)
- Watertight door (F&C)
- Flushing ch. Mn-e (SW)
- Flushing ch. Mn-e (F&C)
- Flushing ch. No-e (SW)
- Flushing ch. No-e (F&C)
- Demarcation Chamber
- Washout (SW)
- Washout (F&C)
- Rodding Eye (SW)
- Rodding Eye (F&C)
- Gauging point (SW)
- Gauging point (F&C)
- Intercept chamber (SW)
- Intercept chamber (F&C)
- Storm Tank (SW)
- Storm Tank (F&C)
- Vortex chamber (SW)
- Vortex chamber (F&C)
- Label ellipse
- Dummy/S24 manhole
- Outfall
- Penstock chamber
- Damboards
- Storm Overflow
- Backdrop manhole
- Other (s)
- Other
- Change in sewer (s)
- Change in sewer
- Reflux valve
- Flap valve
- Cascade
- Anode
- Valve
- Closed Valve
- Air Valve
- Hatch box (SW)
- Hatch box (F&C)
- Direction arrow
- Emptying valve
- Catchpit
- Soakaway
- Inlet
- Balancing Pond
- Wastewater treatment works
- Marine treatment works
- Outfall headworks
- Vent
- Vent column
- Tidal storage tank
- Blank end
- Head of Public Sewer
- Micro Pumping Station

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

NODE REFERENCING SYSTEM

- 1st digit: hundred metre easting identifier
- 2nd digit: hundred metre northing identifier
- 3rd digit: sewer type identifier
  - 0-4 = Foul/Combined
  - 5-9 = Surface Water
- 4th digit: next sequential node

Drawn by:	okuneyf
Title:	283547_X:510430 Y:114945
Date:	12/03/2018

Southern Water

Appendix D Ground Investigation Reports Extracts

6. GROUND INVESTIGATION RECORDS AND DATA

6.1 Physical ground conditions

6.1.1 Summary of strata encountered

The following presents a summary of the properties of the ground and groundwater conditions encountered, based on field observations, interpretation of the field data and laboratory test results, taking into account drilling, excavation and sampling methods, transport, handling and specimen preparation.

All relevant data from the Hydrock investigation discussed in Section 5 as well as any reliable data from previous investigations noted in Section 3 are used from this point forward.

Details of the Hydrock ground investigation works are provided in the logs in Appendix C, previous data are provided in Appendix B.

In the northern area of the site, the ground model consists of made ground to a maximum depth of 3.20m bgl underlying by Fittleworth Member to a maximum depth within the layer of 5.45m bgl. The base of the Fittleworth Member was not proven; however, available data show the thickness of this unit is between 10m to 60m (see section 2.5).

On the other hand, the southern area of the site presents Made Ground to a maximum depth of 4.65m bgl underlain by Folkestone Formation which was proven to a maximum depth of 5.45m bgl within the landfilled sand pit area. Within the woodlands area, organic matter was encountered in the Made Ground above the Folkestone Formation to a maximum depth of 0.90m bgl. The base of the Folkestone Formation was not proven; however, available data indicate the maximum thickness of this unit is up to 80m (see Section 2.5).

A summary of the strata encountered is shown in Table 6.1.

Table 6.1: Strata encountered

Stratum	Depth to top (m bgl)	Depth to base (m bgl)	Thickness Average (m)
Northern area (Industrial production area)			
'General' Made Ground	0.00	0.40 – 4.80	1.86
Fittleworth Member	0.40 – 4.80	>5.45*	>4.85*
Southern area (Former quarry area)			
'Landfilled' Made Ground	0.00	>5.45*	>5.45*
Folkestone Formation	1.20 – 2.60	>5.45*	>1.45*
*Depth not proven			

The individual strata are described in the sections below. Relevant isopachyte diagrams are presented in Appendix A.

rates were encountered the available time may not have been sufficient to fully comply with the BRE test method (i.e. three runs of the test).

Table 6.7: Infiltration test results

Stratum	Location	Depth to base of pit (m bgl)	Infiltration rate (m/s)		
			Run 1	Run 2	Run 3
Northern area of the site					
Fittleworth Member - Cohesive	SA101	2.20	9.86×10^{-7}	- *	- *
Fittleworth Member - Granular	SA102	1.78	No infiltration recorded	-	-
	SA106	1.91	No infiltration recorded	-	-
	SA107	2.20	No infiltration recorded	-	-
Southern area of the site					
Folkestone Formation	SA104	1.88	2.83×10^{-5}	1.63×10^{-5}	1.44×10^{-5}

*Where less than three tests were possible in a particular location the results provided should be considered indicative only and should not be used for design purposes. If infiltration is critical to the development of the site, multi-day infiltration testing should be undertaken.

6.4.4 *Groundwater summary*

In general, shallow groundwater (<1m bgl) was encountered during field works in the northern half of the site within the Made Ground at levels between 49.97m OD and 57.98m OD, and within the Fittleworth Member between 48.27m and 56.41m OD. Monitoring indicates the presence of groundwater at between 49.02m and 50.89m OD within the Made Ground; and between 48.20m and 56.28m OD within the Fittleworth Member.

In the southern half of the site, groundwater was encountered during the field works within the Made Ground only at location WS115A at 63.92m OD. Groundwater was not encountered during the field works within the Folkestone Formation. However, monitoring indicates the presence of groundwater between 60.00m and 60.79m OD.

Visual and olfactory evidence of petroleum hydrocarbon was noted at locations WS102 (where previously diesel AST was identified), WS108 (site run-off), WS116 and SA103 (loading area). However, these appear to be localised, as no evidence of petroleum hydrocarbons was encountered across the remainder of the site.

Within the Fittleworth Member, it was observed that infiltration rate at location SA101 was 9.86×10^{-7} m/s, which indicates a very low permeability rate. An increase of water level was recorded at locations SA102 and SA106, which indicates the groundwater level was above the base of the test pit. No infiltration was recorded at location SA107 due to shallow groundwater after an initial moderate seepage at 2.0m.

Within the Folkestone Formation, recorded permeability rates were between 1.44×10^{-5} and 2.83×10^{-6} m/s, indicating higher permeability rates than the Fittleworth Member.

6.2 Obstructions

Obstructions were encountered in a number of boreholes during the investigation. These intrusive locations are summarised in Table 6.2.

Table 6.2: Obstructions encountered

Stratum	Location	Depth (m bgl)	Description
Made Ground	WS105	0.35	Possible concrete surface.
Made Ground	WS105A	0.40	Metal surface (possible tank).
Made Ground	WS106	1.10	Possible concrete surface.
Made Ground	WS107	0.85	Possible concrete surface.
Made Ground	WS115	0.55	Concrete.
Made Ground	WS115A	0.50	Concrete.
Made Ground	WS118	3.20	Possible concrete surface.
Made Ground	WS120	0.35	Concrete.
Made Ground	WS120A	0.28	Concrete.

6.3 Visual and olfactory evidence of contamination (soil)

In addition to the more common man-made constituents (brick, concrete, clinker, plastic, metal, glass), described above in Section 6.1.2, visual and olfactory evidence of contamination was noted in a number of locations, summarised in Table 6.3.

Table 6.3: Visual and olfactory evidence of contamination - soils

Stratum	Location	Depth (m bgl)	Description
Made Ground	WS102	0.20 to 3.45	Moderate to strong hydrocarbon odour related to old diesel tank next to the workshop.
Made Ground	WS108	1.30 to 1.60	Mild hydrocarbon odour related to surface run-off from workshops.
Made Ground	WS116	0.40	Mild hydrocarbon odour related to load/unload operation area.
Surface stockpile	Adjacent to former quarry access road	0.00	Stockpiles of cement bound asbestos sheets understood to historically be used within moulding plant. North of SA104, south east of WS119.

6.4 Groundwater

6.4.1 Groundwater observations and levels

Groundwater encountered during the investigation is listed in Table 6.4. A groundwater observation represents the depth at which groundwater was first observed and is likely to be deeper than the actual water table level at that location.

Table 6.4: Groundwater occurrence

Stratum	Date	Location	Groundwater observation		Comment
			m bgl	m AOD	
Northern area					
Made Ground	27/01/21	SA101	0.50	49.97	Slow groundwater seepage.
	26/01/21	SA103	0.70	53.94	Strong groundwater inflow, causing trial pit to collapse. Slightly oily sheen on surface.
	26/01/21	SA107	0.60	56.02	Slow groundwater seepage.
	02/02/21	WS106	0.90	50.77	Slow groundwater seepage.
	05/02/21	WS107	0.75	51.09	Slow groundwater seepage.
	05/02/21	WS107A	0.50	51.30	Slow groundwater seepage.
	05/02/21	WS107B	0.40	51.40	Slow groundwater seepage.
	05/02/21	WS108	1.30	49.22	Soil recovered wet.
	04/02/21	WS110	0.50	52.50	Soil recovered wet.
	04/02/21	WS111	0.40	55.63	Strong run-off water ingress. Borehole cased to 1.00m bgl.
	02/02/21	WS112	0.40	57.98	Strong groundwater seepage.
Fittleworth Member	27/01/21	SA101	1.40	49.07	Slow groundwater seepage.
	02/02/21	WS101	1.00	50.03	Slow groundwater seepage.
	02/02/21	WS102	1.20	50.81	Slow groundwater seepage.
	02/02/21	WS111	2.00	54.03	Soil recovered wet.
	02/02/21	WS118	2.00	56.41	Soil recovered wet.
	27/01/21	SA101	2.20	48.27	Slow groundwater seepage.
	27/01/21	SA102	1.65	51	Slow groundwater seepage.
	26/01/21	SA107	2.00	54.62	Moderate groundwater seepage.
	02/02/21	WS109	1.20	51.45	Soil recovered wet.
Southern area					
Made Ground	05/02/21	WS115A	0.47	63.92	Slow groundwater seepage.

Groundwater levels recorded during post-fieldwork monitoring are summarised in Table 6.5.

Table 6.5: Groundwater level data summary

Stratum	Date range	Location	Post-fieldwork monitoring	
			Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
Northern area				
Made Ground	16/02/21 – 15/04/21	WS106	0.78 – 1.02	50.65 – 50.89
		WS108	1.09 – 1.50	49.02 – 49.43
Fittleworth Member	16/02/21 – 15/04/21	WS102	0.37 – 0.87	51.14 - 51.64
		WS103	1.44 – 2.27	48.20 - 49.03
		WS110	0.22 – 0.32	52.68 – 52.78
		WS101	1.00 – 1.32	49.71 – 50.03
		WS104	1.14 – 1.99	54.21 – 55.06
		WS109	1.24 – 1.46	51.19 – 51.41
		WS111	0.00	56.03
		WS112	2.10 – 2.74	55.64 – 56.28
Southern area				
Made Ground	16/02/21 – 15/04/21	WS115B	3.60 – 3.71	60.68 – 60.79
		WS119	2.85 – 2.91	60.72 – 60.78
Folkestone Formation	16/02/21 – 15/04/21	WS113	3.43 – 3.46	60.74 – 60.77
		WS114	1.60 – 2.00	60.00 – 60.40

6.4.2 *Visual / olfactory evidence of contamination (water)*

Visual and olfactory evidence of contamination in water was noted in a number of trial pits and boreholes and is summarised in Table 6.6.

Table 6.6: Visual and olfactory evidence of contamination - waters

Stratum	Location	Depth (m bgl)	Comment
Made Ground	SA103	0.70	Slightly oily sheen on groundwater surface (possible grease from excavator bucket).
Made Ground	WS102	1.20	Soil recovered wet with strong hydrocarbon odour (related to old diesel tank near the workshop).

6.4.3 *Infiltration tests*

The results of the infiltration testing undertaken are summarised in Table 6.7. The results sheets are presented in Appendix C.

Testing was carried out in accordance with Hydrock's 1-day assessment methodology (see reference in Appendix J). This is in general accordance with BRE Digest 365 (BRE DG 2016) where infiltration rates allow three test runs during a working day (or where there is no infiltration), but where low infiltration

rates were encountered the available time may not have been sufficient to fully comply with the BRE test method (i.e. three runs of the test).

Table 6.7: Infiltration test results

Stratum	Location	Depth to base of pit (m bgl)	Infiltration rate (m/s)		
			Run 1	Run 2	Run 3
Northern area of the site					
Fittleworth Member - Cohesive	SA101	2.20	9.86×10^{-7}	- *	- *
Fittleworth Member - Granular	SA102	1.78	No infiltration recorded	-	-
	SA106	1.91	No infiltration recorded	-	-
	SA107	2.20	No infiltration recorded	-	-
Southern area of the site					
Folkestone Formation	SA104	1.88	2.83×10^{-5}	1.63×10^{-5}	1.44×10^{-5}

*Where less than three tests were possible in a particular location the results provided should be considered indicative only and should not be used for design purposes. If infiltration is critical to the development of the site, multi-day infiltration testing should be undertaken.

6.4.4 *Groundwater summary*

In general, shallow groundwater (<1m bgl) was encountered during field works in the northern half of the site within the Made Ground at levels between 49.97m OD and 57.98m OD, and within the Fittleworth Member between 48.27m and 56.41m OD. Monitoring indicates the presence of groundwater at between 49.02m and 50.89m OD within the Made Ground; and between 48.20m and 56.28m OD within the Fittleworth Member.

In the southern half of the site, groundwater was encountered during the field works within the Made Ground only at location WS115A at 63.92m OD. Groundwater was not encountered during the field works within the Folkestone Formation. However, monitoring indicates the presence of groundwater between 60.00m and 60.79m OD.

Visual and olfactory evidence of petroleum hydrocarbon was noted at locations WS102 (where previously diesel AST was identified), WS108 (site run-off), WS116 and SA103 (loading area). However, these appear to be localised, as no evidence of petroleum hydrocarbons was encountered across the remainder of the site.

Within the Fittleworth Member, it was observed that infiltration rate at location SA101 was 9.86×10^{-7} m/s, which indicates a very low permeability rate. An increase of water level was recorded at locations SA102 and SA106, which indicates the groundwater level was above the base of the test pit. No infiltration was recorded at location SA107 due to shallow groundwater after an initial moderate seepage at 2.0m.

Within the Folkestone Formation, recorded permeability rates were between 1.44×10^{-5} and 2.83×10^{-6} m/s, indicating higher permeability rates than the Fittleworth Member.

7. GEO-ENVIRONMENTAL CONCLUSIONS AND RECOMMENDATIONS

7.1 Key risk drivers

7.1.1 Human health

No chemicals of potential concern were recorded at concentrations above their GAC in the Made Ground, with the exception of a slight exceedance of the petroleum hydrocarbon aliphatic fraction >EC12-EC16, recorded in a single sample taken at 0.5m depth in TP07. However, due its marginal nature this exceedance is not considered significant, although a watching brief is recommended during redevelopment works to identify any potentially significant petroleum hydrocarbon contamination in the vicinity of TP07.

ACM was recorded in two samples of the Made Ground in the area of the infilled sand pit in the south of the site, and its presence is considered to pose a potential risk to human health which may require remediation.

Although a single sample of the natural soils was found to contain elevated concentrations of arsenic, this is believed to be representative of the natural geology and is not considered to pose an unacceptable risk to human health. However, further sampling and arsenic bioavailability testing is recommended to confirm this assertion.

7.1.2 Plant life

The Made Ground and natural soils are considered to pose a low risk to present and future planting and no further consideration of chemical contamination is required. However, the Made Ground is physically unsuitable as a growing medium and would need to be replaced in garden areas and other areas of soft landscaping with clean, imported soils.

7.1.3 Controlled waters

Although there are exceedances of the WQT for some metals and PAHs, these are not considered to pose a significant risk to controlled waters and no further consideration is necessary.

7.2 Mitigation measures

Asbestos

The key source of contamination identified at the site is the presence of ACM in the Made Ground in the south of the site, in the area of the infilled sand pit. The most appropriate remedial method to deal with this contamination is likely to be the installation of an engineered cover system in all garden areas and other areas of proposed soft landscaping in those areas underlain by the infilled sand pit. Additional testing should be undertaken in these areas to confirm this requirement. The precise details of the cover system would need to be presented in a Detailed Remediation Method Statement (DRMS) for the site, but is likely to comprise the following:

Rear gardens (former sand pit area)

- 150mm of clean, imported topsoil; over
- 450mm of clean, imported subsoils; over
- A warning layer comprising a high-visibility geomembrane; over

- 200mm thick compacted layer of crushed concrete (6F2) or clean, freshly quarried stone ('hard dig' layer).

Front gardens and public open space (former sand pit area)

- 150mm of clean, imported topsoil; over
- 300mm of clean, imported subsoils; over
- A warning layer comprising a high-visibility geomembrane; over
- 150mm thick compacted layer of crushed concrete (6F2) or clean, freshly quarried stone ('hard dig' layer).

Other Issues

It should be noted that many areas in the north of the site could not be investigated due to the presence of the buildings and other structures. Additional site investigation and risk assessment is therefore required in order to assess the potential for ground gas generation within the natural and anthropogenic deposits on site; to further identify and / or delineate petroleum hydrocarbon-impacted areas; to investigate previously inaccessible areas of the site; and to obtain geotechnical information to enable appropriate foundation design, road pavement design etc. to be undertaken.

Site preparation works are likely to include removal by specialist contractors of asbestos from buildings in accordance with a Refurbishment / Demolition Asbestos Survey and relevant legislation, followed by controlled decommissioning, decontamination and demolition of site buildings and ancillary structures, such as tanks and the existing drainage system.

Once these areas become accessible and have been investigated, the most appropriate remedial methods to deal with any contamination found to be present will need to be provided in a DRMS, which should provide an options appraisal and preferred remedial strategy for the site, including the design of any gas protection measures that may be deemed necessary following the proposed gas monitoring.

The RMS will need to be developed in consultation with the design team and should be submitted to the NHBC and the regulatory authorities for approval prior to any remedial works commencing. Liaison should be continued during implementation and subsequent verification. Verification reports should be produced a suitably qualified, independent geo-environmental specialist following completion of any remedial works. In addition, the writing and approval of a Materials Management Plan will be required to allow re-use of suitable material at the site.

Note that additional site investigation works to allow more detailed zoning of the site and/or higher tiers of risk assessment may result in a reduced remedial requirement.

Earthworks on site should be subject to a watching brief by an independent geo-environmental specialist to identify any areas of suspected contamination and recommend remedial measures.

The use of barrier pipe for potable water supplies is recommended.

7.3 Waste management

Any material excavated on site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. This includes determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose. Further details are given in Appendix H.

Notes:

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
3. Based on Topographical Survey No: 22664 by MK Surveys. Survey dated: July 2016.

Legend

- Site Boundary (approximate)
- TPXX — Historical Trial Pit (Hydrock 2018)
- SAXX — Trial Pit soakage test
- WSXX — Windowless sampler borehole

ROCK ROAD
Overlea
Chetwynd
Cedar Cottage
Pikers Pad
Quiet Hills
Corner Cottage
Slemdal
Heathside
Whispers
Ridge Top
Arborgarth
The Sweeps

Rev	Date	Description	By	Ckd
P05	02-02-21	Site Investigation locations updated following survey	SD	AJ
P4-S2	20-01-21	Addition and slight reposition of locations	DP	AJ
P3-S2	12-01-21	Proposed additional SI locations added	DP	AJ
P2-S2	11-06-18	SI updated, title & Client name amended	SD	AJ

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Client :
THAKEHAM CONCRETE PRODUCTS LTD

Project Title:
THAKEHAM TILES, ROCK ROAD, STORRINGTON

Drawing Title:
Exploratory Hole Location Plan

Reference:
TRS-HYD-XX-ZZ-DR-GE-1001

Hydrock Job No:
C-08347-C

Drawn	Checked	Scale @ A1	Date	Issue Date
SD	AJ	1:500	02/02/18	02/02/21

Revision: P05
Status: S2

Notes:

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
3. Based on Topographical Survey No: 22664 by MK Surveys. Survey dated: July 2016.

Legend

- Site Boundary (approximate)
- Trial Pit (TPXX)
- Petroleum Hydrocarbon Hotspot
- Asbestos and potential ground gas risk
- Area of fuel storage tanks

TP01
TP02
TP03
TP04
TP05
TP06
TP07
TP08
TP09
TP10
TP11
TP12
TP13
TP14
TP15

ROCK ROAD
Overlea
Chetwynd
Cedar Cottage
Pikers Pad
Quiet Hills
Corner Cottage
Slemdal
Heathside
Whispers
Ridge Top
Arborgarth
The Sweeps

Rev	Date	Description	By	Ckd

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Client :
THAKEHAM CONCRETE PRODUCTS LTD

Project Title:
THAKEHAM TILES, ROCK ROAD, STORRINGTON

Drawing Title:
SITE ZONATION PLAN

Reference:
TRS-HYD-XX-ZZ-DR-GE-1003

Hydrock Job No:
C-08347-C

Drawn	Checked	Scale @ A1	Date	Issue Date
DP	AJ	1:500	18/05/18	18/05/18

Revision: P1
Status: S2

KEY PLAN

Borehole

NOTES

1. Contains OS data © Crown copyright and database right (2021)

REVISIONS

REV.	DRAWN BY INITIALS	CHECKED BY INITIALS	DATE	REVISION NOTES/COMMENTS
P01	LC	AJ	05/12/23	First Issue
P02	LC	AJ	17/06/24	Second Issue

Hydrock

CLIENT
Thakeham Tiles Ltd

PROJECT
Thakeham Tiles, Rock Road

TITLE
Abstraction Well Locations

HYDROCK PROJECT	SCALE @ A3
08347	1:1,500

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO.	REVISIC
08347-HYD-XX-XX-DR-GE-1011	P02

Hydrock now Stantec

Project: Thakeham Tiles

Borehole No
BH1

Method: Hand-dug Pit	Date(s): 27/08/2024 - 13/09/2024	Logged By: LC	Drilled By: Marshall Drilling
Client: Thakeham Tiles Ltd	Co-ords: 510353.00, 115060.00	Checked By: MG	Flush: Air/Mist
Hydrock Project No: 08347	Ground Level: 50.59m OD		Scale: 1:100

Run (m)	Samples / Tests			Drilling Record			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	Weight (Kg)	Mins	Secs							
	0.35	ES						Cream slightly sandy subangular to angular fine to coarse GRAVELS AND COBBLES of concrete and flint. Sand is fine to coarse. (MADE GROUND).	0.30	(0.30)	50.29		
	0.60	ES							0.50	(0.20)	50.09		
	1.10	ES						Brown gravelly fine to coarse SAND with rare subangular cobbles of flint and brick. Gravel is subangular to angular fine to coarse of concrete, brick and flint. (MADE GROUND).	1.00	(0.50)	49.59		
								Very soft orange brown very sandy CLAY. Sand is fine to medium. (FITTLEWORTH MEMBER).	1.25	(0.25)	49.34		
								Soft grey mottled orange brown sandy CLAY. Sand is fine to medium. (FITTLEWORTH MEMBER).					
								Probably dark grey sandy CLAY with rare 2mm pockets of orange brown fine to coarse sand. Sand is fine and medium (FITTLEWORTH MEMBER).		(9.75)			
								Probably dark grey clayey fine to coarse SAND with fine and medium subangular gravels of glauconitic SANDSTONE (FITTLEWORTH MEMBER).	11.00	(16.00)	39.59		

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
Comacchio 602	09/09	1500	5.00	5.20	250		Air/Mist	Grey
	10/09	1000	5.00	6.20	203		Air/Mist	Grey
	10/09	1345	11.00	10.50	203		Air/Mist	Grey
	11/09	0800	19.80	19.50	203	14.40	Air/Mist	Grey
	11/09	1700	25.50	19.50	203	12.25	Air/Mist	Grey
	12/09	1730	58.00	19.50	203	14.20	Air/Mist	Grey. Noted green at 22m
	13/09	0715	56.50	19.50	203	14.20	Air/Mist	Grey
	13/09	1000	58.00	19.50	203	14.20	Air/Mist	

General Remarks:
1. Starter hand pit dug on 27/08/2024 prior to drilling to collect environmental samples for testing. 2. Slow water seepage encountered at base of pit. 3. Backfilled with arisings. 4. Rotary open hole drilling commencement on 09/09/2024, completed 13/09/2024. 5. Groundwater encountered at 19.80m bgl, rotary rods pulled out, after 20 minutes groundwater recorded at 12.25m bgl. 7. Final resting groundwater level recorded at 14.40m bgl. 7. Final borehole depth 58m bgl. 8. 126mm internal diameter UPVC pipe installed to 56.07m bgl (due to collapse of arisings at base of the borehole) - Response zone from 31.63m bgl to 55.07m bgl. 9. 1m plain sump pipe from 55.07m bgl to 56.07m bgl. 10. Ground level estimated based on nearby measurements.

Logged in general accordance with BS5930:2015

Hydrock now Stantec

Project: Thakeham Tiles

Borehole No
BH1

Method: Hand-dug Pit	Date(s): 27/08/2024 - 13/09/2024	Logged By: LC	Drilled By: Marshall Drilling
Client: Thakeham Tiles Ltd	Co-ords: 510353.00, 115060.00	Checked By: MG	Flush: Air/Mist
Hydrock Project No: 08347	Ground Level: 50.59m OD		Scale: 1:100

Run (m)	Samples / Tests			Drilling Record			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	Weight (Kg)	Mins	Secs							
								Probably dark grey clayey fine to coarse SAND with fine and medium subangular gravels of glauconitic SANDSTONE (FITTLEWORTH MEMBER).					
								... At 22.0m bgl drilling flush noted to become green in colour. Probable indication of nearing the base of the Fittleworth Member.					
								... Transition from Fittleworth Member to Hythe Formation inferred at approximately 27.0m bgl, due to drilling method.	27.00		23.59		
								Probably fine and medium glauconitic SANDSTONE recovered as dark grey sandy subangular fine and medium GRAVELS of glauconitic sandstone and occasional chert. Sand is coarse (HYTHE FORMATION).		(6.00)			
								Probably fine and medium glauconitic SANDSTONE. Recovered as dark grey sandy subangular fine and medium GRAVELS of glauconitic sandstone and occasional chert. Sand is coarse (HYTHE FORMATION).	33.00		17.59		

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

General Remarks:
1. Starter hand pit dug on 27/08/2024 prior to drilling to collect environmental samples for testing. 2. Slow water seepage encountered at base of pit. 3. Backfilled with arisings. 4. Rotary open hole drilling commencement on 09/09/2024, completed 13/09/2024. 5. Groundwater encountered at 19.80m bgl, rotary rods pulled out, after 20 minutes groundwater recorded at 12.25m bgl. 7. Final resting groundwater level recorded at 14.40m bgl. 7. Final borehole depth 58m bgl. 8. 126mm internal diameter UPVC pipe installed to 56.07m bgl (due to collapse of arisings at base of the borehole) - Response zone from 31.63m bgl to 55.07m bgl. 9. 1m plain sump pipe from 55.07m bgl to 56.07m bgl. 10. Ground level estimated based on nearby measurements.

Logged in general accordance with BS5930:2015

Hydrock now Stantec	Project: Thakeham Tiles	Borehole No BH1 Page No. 3 of 3

Method: Hand-dug Pit	Date(s): 27/08/2024 - 13/09/2024	Logged By: LC	Drilled By: Marshall Drilling
Client: Thakeham Tiles Ltd	Co-ords: 510353.00, 115060.00	Checked By: MG	Flush: Air/Mist
Hydrock Project No: 08347	Ground Level: 50.59m OD		Scale: 1:100

Run (m)	Samples / Tests			Drilling Record			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	Weight (Kg)	Mins	Secs							
								Probably fine and medium glauconitic SANDSTONE. Recovered as dark grey sandy subangular fine and medium GRAVELS of glauconitic sandstone and occasional chert. Sand is coarse (HYTHE FORMATION).					
								... At 45.50m bgl loss of arisings were noted and change in pressure during drilling. Probable fracture. No recovery of samples.		(25.00)			
									58.00		-7.41		
								End of Borehole at 58.00m					

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

General Remarks:
1. Starter hand pit dug on 27/08/2024 prior to drilling to collect environmental samples for testing. 2. Slow water seepage encountered at base of pit. 3. Backfilled with arisings. 4. Rotary open hole drilling commencement on 09/09/2024, completed 13/09/2024. 5. Groundwater encountered at 19.80m bgl, rotary rods pulled out, after 20 minutes groundwater recorded at 12.25m bgl. 7. Final resting groundwater level recorded at 14.40m bgl. 7. Final borehole depth 58m bgl. 8. 126mm internal diameter UPVC pipe installed to 56.07m bgl (due to collapse of arisings at base of the borehole) - Response zone from 31.63m bgl to 55.07m bgl. 9. 1m plain sump pipe from 55.07m bgl to 56.07m bgl. 10. Ground level estimated based on nearby measurements.

Logged in general accordance with BS5930:2015

Appendix E Drainage Strategy Plans

- STO-HYD-XX-XX-DR-D-2001-P03 Existing Drainage Plan
- 37212-HYD-XX-XX-DR-D-2200-P01 Proposed Drainage Strategy Plan

OS NORTH

ROCK ROAD

Ex FMH
CL. 46.08
IL. 44.58

Existing ditchline

150mm dia.

Culverted ditchline

Ex FMH
CL. 50.32
IL. 48.82

Ex FMH
CL. 52.83
IL. 51.33

Existing toilet as indicated by client

SITE BUILDING

WAREHOUSE

OFFICES

CUTTING BUILDING

WORKSHOPS

Overlea

Chetwynd

Cedar Cottage

Pikers Pad

Quiet Hills

Ex FMH
CL. 53.25
IL. 52.07

Ex FMH
CL. 56.15
IL. 54.60

Corner Cottage

Bourne Cottage

Slemdal

Heathside

Whispers

Gads Hill

Meadow Court

Crestview

Sunny Brae

The Nest

Ridge To

KEY

- Existing public foul sewer
- Existing private foul drain
- Existing private surface water drain
- Existing drainage channel
- Existing watercourse
- Existing cesspit (as indicated by client)
- Existing Impermeable Area

REVISIONS

Rev	Date	Description	By	Ckd	App
P03	23/09/25	Impermeable area shown, minor updates	NP		
P02	21/09/18	Updated to client comments	GLG		
P01	06/03/18	First Issue.	RJH		

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CLIENT
THAKEHAM CONCRETE PRODUCTS LTD

PROJECT
ROCK ROAD, STORRINGTON

TITLE
EXISTING DRAINAGE PLAN

HYDROCK PROJECT NO.
C-08347-C

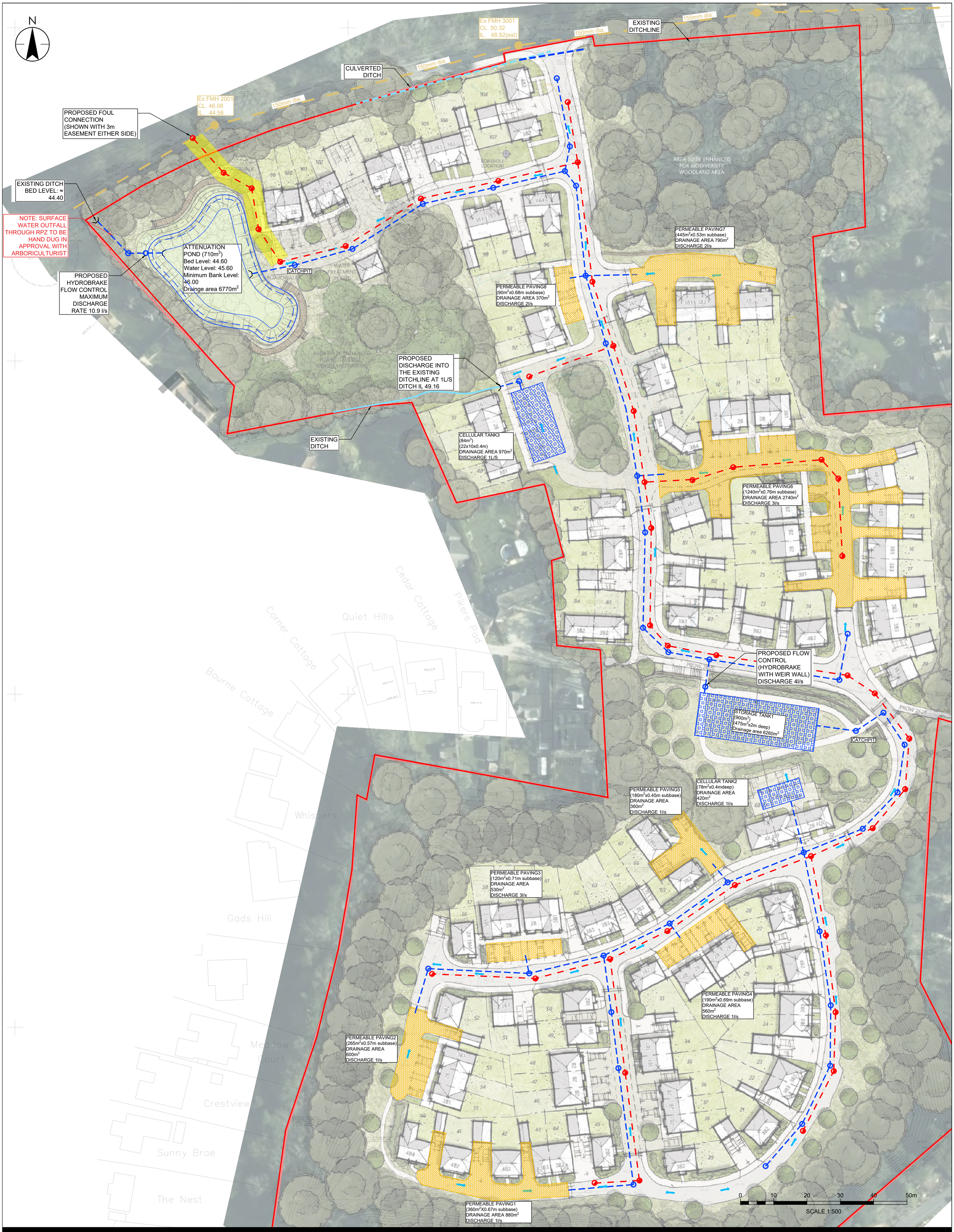
SCALE @ A1
1 : 500

STATUS DESCRIPTION
INFORMATION

STATUS
S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
STO-HYD-XX-XX-DR-D-2001

REVISION
P03



P01 FIRST ISSUE	-	-	-	
Issued/Revision	By	Appd	YYYY.MM.DD	

Issue Status

S0 - WORK IN PROGRESS

This document is suitable only for the purpose noted above. Use of this document for any other purpose is not permitted.

Colour Disclaimer

This drawing has been documented in colour. This drawing is required to be printed in colour. Failure to do so may result in loss of information. Black and white printing may be used if specific black and white documents have been obtained from Stantec.

Stantec

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Client/Project Logo:

Project:
Thakeham Tiles, Rock Road, Storrington

Proposed Residential Development

	NP	NP	JC	2025.09.24
	Dwn	Dsgn.	Chkd.	YYYY.MM.DD

Title
PROPOSED DRAINAGE STRATEGY PLAN

Project No. 333800445	A1 Scale 1:500
Revision **P01**	Drawing No. **37212-STN-XX-XX-DR-C-2200**

Appendix F Drainage Calculations

- Greenfield Runoff Calculations
- Existing Brownfield Runoff Calculations
- Storage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 900 Urban 0.000
Area (ha) 1.000 Soil 0.450 Region Number Region 7

Results l/s

QBAR Rural 5.9
QBAR Urban 5.9

Q100 years 18.8

Q1 year 5.0
Q30 years 13.4
Q100 years 18.8

Brownfield Run-off Rates

Project Name:	Thakeham Tiles	Revision:	P01
Contract no.	333800445	Date:	24/09/2025
Catchment Type:	Brownfield	Author:	NP
		Checked:	JC

Peak run-off rate for Brownfields sites is estimated using the following equation:

Q = 2.78CiA

Where

Q = Peak run-off (l/s)
C = Non-dimensional run-off coefficient which is dependent on the catchment characteristics
i = Rainfall intensity for the design return period (mm/hr)
A = Total catchment area being drained (ha)

And

C = CvCr
Cv = Volumetric run-off coefficient - usually set at 0.95 for brownfield sites
Cr = Dimensionless routing coefficient - usually set at 1.3

CATCHMENT DETAILS :

A = Impervious Area		1.5	Ha

RAINFALL DETAILS :

Cv = Volumetric run-off coefficient		1.0	
Cr = Dimensionless routing coefficient		1.3	
Storm Duration			
Average Rainfall intensity (i)	1 year	31.0	mm/hr
	30 year	76.1	mm/hr
	100 year	98.8	mm/hr

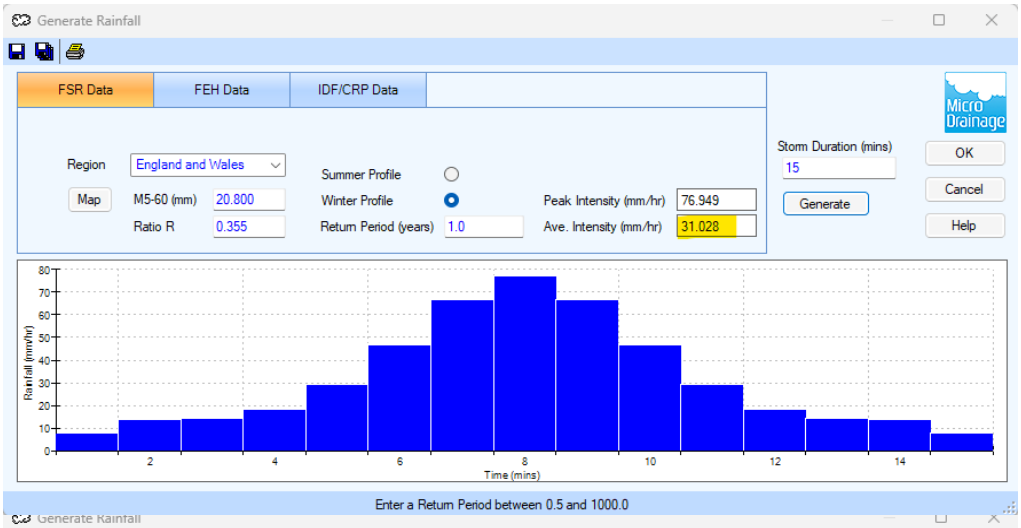
(storm duration 15min storm)
(taken from Microdrainage Event Simulator)

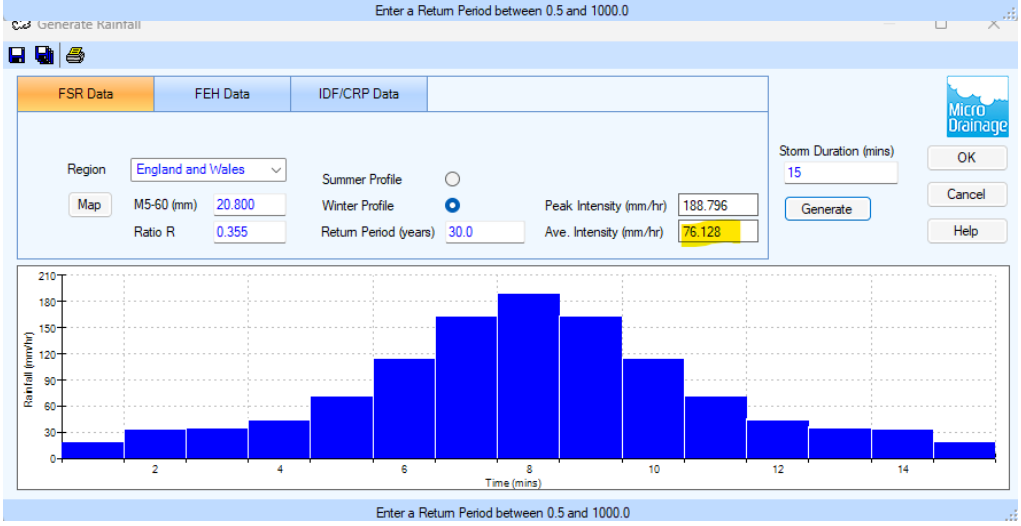
FLOW RATES :

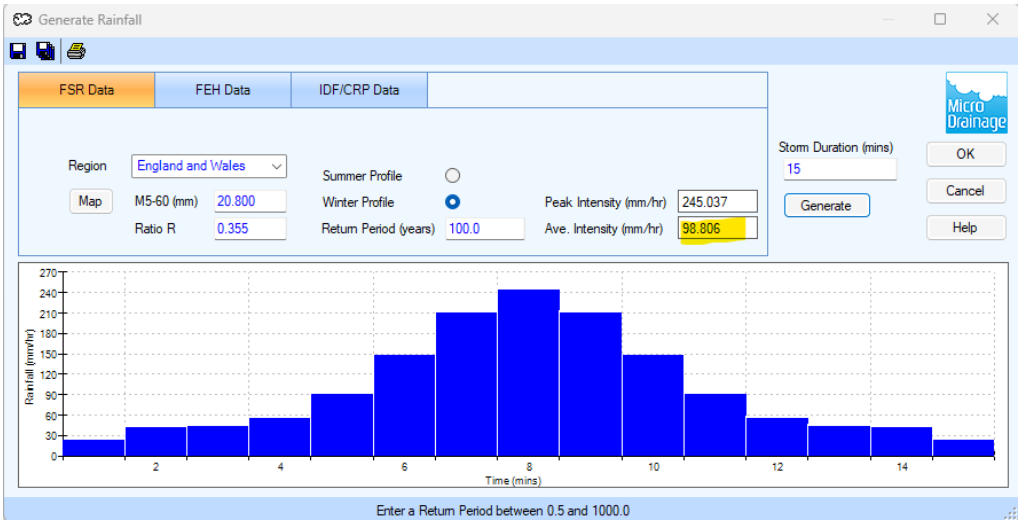
Return Period	Flow Rates (l/s)
1 Year	168.2
30 Year	412.7
100 Year	535.6

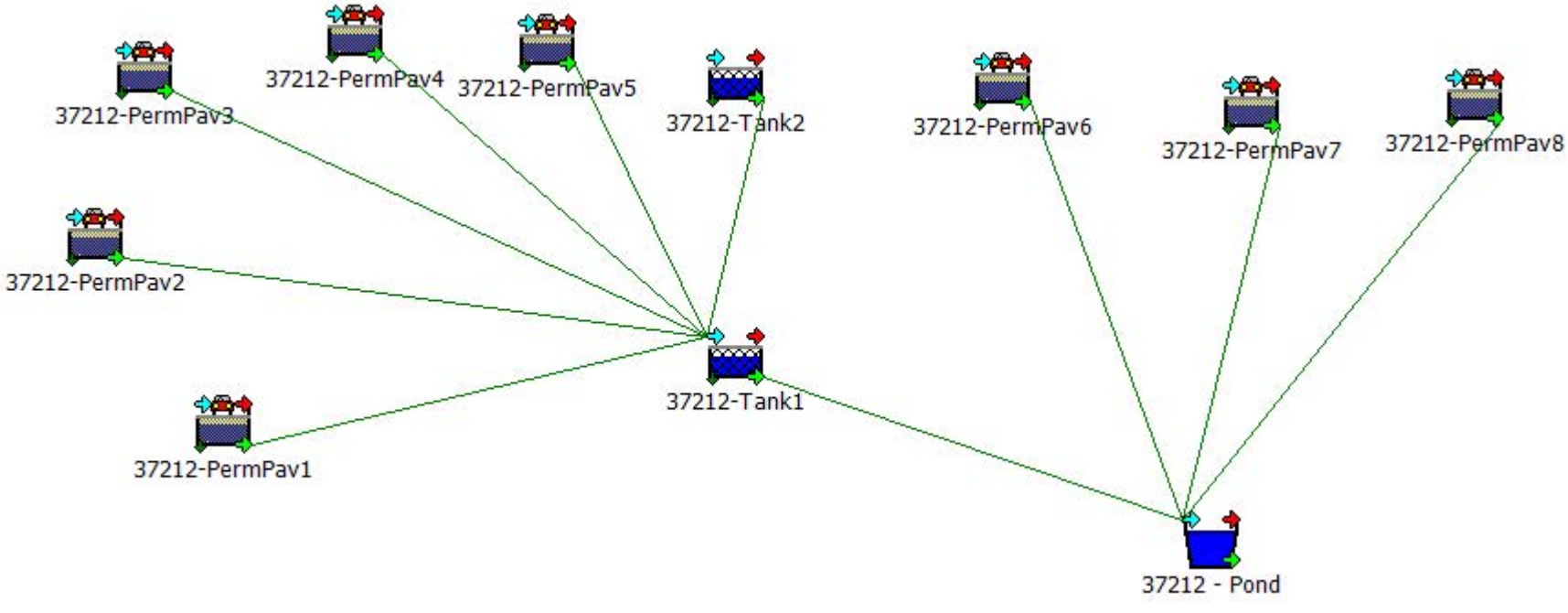
Brownfield Run-off Rates

Microdrainage Rainfall Simulator Output








37212-PermPav3
37212-PermPav4
37212-PermPav5
37212-Tank2
37212-PermPav6
37212-PermPav7
37212-PermPav8
37212-PermPav2
37212-Tank1
37212-PermPav1
37212 - Pond

Cascade Summary of Results for 37212-PermPav1.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212-Tank1.SRCX	(None)

Half Drain Time : 619 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	61.507	0.307	0.0	0.7	0.7	28.1	O K
30 min Summer	61.598	0.398	0.0	0.8	0.8	37.9	O K
60 min Summer	61.690	0.490	0.0	0.9	0.9	47.9	O K
120 min Summer	61.776	0.576	0.0	1.0	1.0	57.3	O K
180 min Summer	61.816	0.616	0.0	1.0	1.0	61.6	O K
240 min Summer	61.839	0.639	0.0	1.0	1.0	64.0	O K
360 min Summer	61.862	0.662	0.0	1.1	1.1	66.5	O K
480 min Summer	61.867	0.667	0.0	1.1	1.1	67.1	O K
600 min Summer	61.868	0.668	0.0	1.1	1.1	67.2	O K
720 min Summer	61.867	0.667	0.0	1.1	1.1	67.1	O K
960 min Summer	61.861	0.661	0.0	1.1	1.1	66.4	O K
1440 min Summer	61.839	0.639	0.0	1.0	1.0	64.1	O K
2160 min Summer	61.798	0.598	0.0	1.0	1.0	59.6	O K
2880 min Summer	61.757	0.557	0.0	1.0	1.0	55.2	O K
4320 min Summer	61.685	0.485	0.0	0.9	0.9	47.4	O K
5760 min Summer	61.627	0.427	0.0	0.8	0.8	41.0	O K
7200 min Summer	61.579	0.379	0.0	0.8	0.8	35.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	28.6	19
30 min Summer	92.613	0.0	38.9	34
60 min Summer	59.033	0.0	50.1	64
120 min Summer	36.216	0.0	61.8	122
180 min Summer	26.756	0.0	68.7	182
240 min Summer	21.503	0.0	73.7	242
360 min Summer	15.799	0.0	81.3	360
480 min Summer	12.674	0.0	87.1	458
600 min Summer	10.672	0.0	91.7	510
720 min Summer	9.269	0.0	95.5	570
960 min Summer	7.414	0.0	101.9	694
1440 min Summer	5.401	0.0	110.4	968
2160 min Summer	3.927	0.0	121.0	1384
2880 min Summer	3.128	0.0	128.1	1788
4320 min Summer	2.265	0.0	138.5	2592
5760 min Summer	1.800	0.0	145.9	3352
7200 min Summer	1.508	0.0	152.0	4112

Cascade Summary of Results for 37212-PermPav1.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	61.540	0.340	0.0	0.7	0.7	31.6	O K
10080 min Summer	61.506	0.306	0.0	0.7	0.7	28.0	O K
15 min Winter	61.507	0.307	0.0	0.7	0.7	28.1	O K
30 min Winter	61.598	0.398	0.0	0.8	0.8	37.9	O K
60 min Winter	61.691	0.491	0.0	0.9	0.9	48.0	O K
120 min Winter	61.777	0.577	0.0	1.0	1.0	57.3	O K
180 min Winter	61.818	0.618	0.0	1.0	1.0	61.7	O K
240 min Winter	61.841	0.641	0.0	1.0	1.0	64.3	O K
360 min Winter	61.865	0.665	0.0	1.1	1.1	66.9	O K
480 min Winter	61.872	0.672	0.0	1.1	1.1	67.7	O K
600 min Winter	61.871	0.671	0.0	1.1	1.1	67.5	O K
720 min Winter	61.867	0.667	0.0	1.1	1.1	67.1	O K
960 min Winter	61.858	0.658	0.0	1.0	1.0	66.1	O K
1440 min Winter	61.826	0.626	0.0	1.0	1.0	62.7	O K
2160 min Winter	61.769	0.569	0.0	1.0	1.0	56.5	O K
2880 min Winter	61.714	0.514	0.0	0.9	0.9	50.5	O K
4320 min Winter	61.622	0.422	0.0	0.8	0.8	40.5	O K
5760 min Winter	61.550	0.350	0.0	0.8	0.8	32.8	O K
7200 min Winter	61.495	0.295	0.0	0.7	0.7	26.8	O K
8640 min Winter	61.452	0.252	0.0	0.6	0.6	22.1	O K
10080 min Winter	61.417	0.217	0.0	0.6	0.6	18.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	157.1	4840
10080 min Summer	1.155	0.0	161.3	5552
15 min Winter	138.329	0.0	28.6	19
30 min Winter	92.613	0.0	38.9	33
60 min Winter	59.033	0.0	50.1	62
120 min Winter	36.216	0.0	61.8	120
180 min Winter	26.756	0.0	68.7	178
240 min Winter	21.503	0.0	73.7	236
360 min Winter	15.799	0.0	81.3	348
480 min Winter	12.674	0.0	87.1	458
600 min Winter	10.672	0.0	91.7	558
720 min Winter	9.269	0.0	95.5	582
960 min Winter	7.414	0.0	101.9	732
1440 min Winter	5.401	0.0	110.4	1038
2160 min Winter	3.927	0.0	121.0	1488
2880 min Winter	3.128	0.0	128.1	1904
4320 min Winter	2.265	0.0	138.5	2724
5760 min Winter	1.800	0.0	145.9	3512
7200 min Winter	1.508	0.0	152.0	4256
8640 min Winter	1.305	0.0	157.1	5016
10080 min Winter	1.155	0.0	161.4	5744

Cascade Rainfall Details for 37212-PermPav1.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.088

Time (mins) From:	To:	Area (ha)
0	4	0.088

Cascade Model Details for 37212-PermPav1.SRCX

Storage is Online Cover Level (m) 62.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	19.0
Membrane Percolation (mm/hr)	1000	Length (m)	19.0
Max Percolation (l/s)	100.3	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	61.200	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 61.200

Cascade Summary of Results for 37212-PermPav2.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212-Tank1.SRCX	(None)

Half Drain Time : 432 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	61.979	0.279	0.0	0.7	0.7	19.0	O K
30 min Summer	62.061	0.361	0.0	0.8	0.8	25.5	O K
60 min Summer	62.143	0.443	0.0	0.9	0.9	32.0	O K
120 min Summer	62.215	0.515	0.0	0.9	0.9	37.8	O K
180 min Summer	62.244	0.544	0.0	1.0	1.0	40.1	O K
240 min Summer	62.257	0.557	0.0	1.0	1.0	41.2	O K
360 min Summer	62.265	0.565	0.0	1.0	1.0	41.8	O K
480 min Summer	62.266	0.566	0.0	1.0	1.0	41.8	O K
600 min Summer	62.263	0.563	0.0	1.0	1.0	41.7	O K
720 min Summer	62.259	0.559	0.0	1.0	1.0	41.3	O K
960 min Summer	62.247	0.547	0.0	1.0	1.0	40.3	O K
1440 min Summer	62.214	0.514	0.0	0.9	0.9	37.8	O K
2160 min Summer	62.165	0.465	0.0	0.9	0.9	33.8	O K
2880 min Summer	62.122	0.422	0.0	0.8	0.8	30.4	O K
4320 min Summer	62.051	0.351	0.0	0.8	0.8	24.7	O K
5760 min Summer	61.997	0.297	0.0	0.7	0.7	20.4	O K
7200 min Summer	61.956	0.256	0.0	0.6	0.6	17.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	19.4	19
30 min Summer	92.613	0.0	26.4	33
60 min Summer	59.033	0.0	34.1	62
120 min Summer	36.216	0.0	42.1	122
180 min Summer	26.756	0.0	46.7	182
240 min Summer	21.503	0.0	50.1	240
360 min Summer	15.799	0.0	55.3	324
480 min Summer	12.674	0.0	59.2	382
600 min Summer	10.672	0.0	62.4	446
720 min Summer	9.269	0.0	65.0	512
960 min Summer	7.414	0.0	69.3	652
1440 min Summer	5.401	0.0	75.7	924
2160 min Summer	3.927	0.0	82.3	1336
2880 min Summer	3.128	0.0	87.2	1728
4320 min Summer	2.265	0.0	94.2	2504
5760 min Summer	1.800	0.0	99.2	3232
7200 min Summer	1.508	0.0	103.3	3968

Cascade Summary of Results for 37212-PermPav2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	61.923	0.223	0.0	0.6	0.6	14.5	O K
10080 min Summer	61.897	0.197	0.0	0.6	0.6	12.4	O K
15 min Winter	61.979	0.279	0.0	0.7	0.7	19.0	O K
30 min Winter	62.061	0.361	0.0	0.8	0.8	25.5	O K
60 min Winter	62.143	0.443	0.0	0.9	0.9	32.1	O K
120 min Winter	62.216	0.516	0.0	0.9	0.9	37.9	O K
180 min Winter	62.246	0.546	0.0	1.0	1.0	40.3	O K
240 min Winter	62.260	0.560	0.0	1.0	1.0	41.4	O K
360 min Winter	62.269	0.569	0.0	1.0	1.0	42.1	O K
480 min Winter	62.266	0.566	0.0	1.0	1.0	41.8	O K
600 min Winter	62.262	0.562	0.0	1.0	1.0	41.5	O K
720 min Winter	62.255	0.555	0.0	1.0	1.0	41.0	O K
960 min Winter	62.236	0.536	0.0	0.9	0.9	39.5	O K
1440 min Winter	62.191	0.491	0.0	0.9	0.9	35.9	O K
2160 min Winter	62.124	0.424	0.0	0.8	0.8	30.6	O K
2880 min Winter	62.068	0.368	0.0	0.8	0.8	26.1	O K
4320 min Winter	61.983	0.283	0.0	0.7	0.7	19.3	O K
5760 min Winter	61.923	0.223	0.0	0.6	0.6	14.5	O K
7200 min Winter	61.880	0.180	0.0	0.5	0.5	11.1	O K
8640 min Winter	61.849	0.149	0.0	0.5	0.5	8.6	O K
10080 min Winter	61.825	0.125	0.0	0.4	0.4	6.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	106.6	4672
10080 min Summer	1.155	0.0	109.5	5440
15 min Winter	138.329	0.0	19.4	19
30 min Winter	92.613	0.0	26.4	33
60 min Winter	59.033	0.0	34.1	62
120 min Winter	36.216	0.0	42.1	120
180 min Winter	26.756	0.0	46.7	178
240 min Winter	21.503	0.0	50.1	234
360 min Winter	15.799	0.0	55.3	342
480 min Winter	12.674	0.0	59.2	392
600 min Winter	10.672	0.0	62.4	464
720 min Winter	9.269	0.0	65.0	542
960 min Winter	7.414	0.0	69.3	694
1440 min Winter	5.401	0.0	75.7	994
2160 min Winter	3.927	0.0	82.3	1408
2880 min Winter	3.128	0.0	87.2	1820
4320 min Winter	2.265	0.0	94.2	2596
5760 min Winter	1.800	0.0	99.2	3344
7200 min Winter	1.508	0.0	103.3	4040
8640 min Winter	1.305	0.0	106.7	4760
10080 min Winter	1.155	0.0	109.5	5456

Cascade Rainfall Details for 37212-PermPav2.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.060

Time (mins) From:	To:	Area (ha)
0	4	0.060

Cascade Model Details for 37212-PermPav2.SRCX

Storage is Online Cover Level (m) 62.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	16.3
Membrane Percolation (mm/hr)	1000	Length (m)	16.3
Max Percolation (l/s)	73.8	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	61.700	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 61.700

Cascade Summary of Results for 37212-PermPav3.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212-Tank1.SRCX	(None)

Half Drain Time : 86 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	62.170	0.470	0.0	2.6	2.6	16.1	O K
30 min Summer	62.293	0.593	0.0	2.9	2.9	20.5	O K
60 min Summer	62.375	0.675	0.0	3.1	3.1	23.5	O K
120 min Summer	62.409	0.709	0.0	3.2	3.2	24.7	Flood Risk
180 min Summer	62.399	0.699	0.0	3.2	3.2	24.4	O K
240 min Summer	62.377	0.677	0.0	3.1	3.1	23.6	O K
360 min Summer	62.327	0.627	0.0	3.0	3.0	21.8	O K
480 min Summer	62.278	0.578	0.0	2.9	2.9	20.0	O K
600 min Summer	62.233	0.533	0.0	2.8	2.8	18.4	O K
720 min Summer	62.194	0.494	0.0	2.7	2.7	16.9	O K
960 min Summer	62.126	0.426	0.0	2.5	2.5	14.5	O K
1440 min Summer	62.029	0.329	0.0	2.1	2.1	10.9	O K
2160 min Summer	61.937	0.237	0.0	1.8	1.8	7.6	O K
2880 min Summer	61.881	0.181	0.0	1.5	1.5	5.6	O K
4320 min Summer	61.820	0.120	0.0	1.2	1.2	3.3	O K
5760 min Summer	61.789	0.089	0.0	1.0	1.0	2.2	O K
7200 min Summer	61.771	0.071	0.0	0.9	0.9	1.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	17.7	18
30 min Summer	92.613	0.0	23.9	31
60 min Summer	59.033	0.0	30.7	58
120 min Summer	36.216	0.0	37.8	88
180 min Summer	26.756	0.0	41.9	122
240 min Summer	21.503	0.0	44.9	158
360 min Summer	15.799	0.0	49.5	226
480 min Summer	12.674	0.0	53.0	292
600 min Summer	10.672	0.0	55.8	356
720 min Summer	9.269	0.0	58.2	420
960 min Summer	7.414	0.0	62.0	548
1440 min Summer	5.401	0.0	67.7	792
2160 min Summer	3.927	0.0	73.8	1148
2880 min Summer	3.128	0.0	78.2	1500
4320 min Summer	2.265	0.0	84.8	2208
5760 min Summer	1.800	0.0	89.5	2936
7200 min Summer	1.508	0.0	93.5	3672

Cascade Summary of Results for 37212-PermPav3.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	61.760	0.060	0.0	0.8	0.8	1.2	O K
10080 min Summer	61.755	0.055	0.0	0.7	0.7	1.0	O K
15 min Winter	62.171	0.471	0.0	2.6	2.6	16.1	O K
30 min Winter	62.295	0.595	0.0	2.9	2.9	20.6	O K
60 min Winter	62.380	0.680	0.0	3.1	3.1	23.7	O K
120 min Winter	62.404	0.704	0.0	3.2	3.2	24.6	Flood Risk
180 min Winter	62.383	0.683	0.0	3.1	3.1	23.8	O K
240 min Winter	62.349	0.649	0.0	3.1	3.1	22.6	O K
360 min Winter	62.278	0.578	0.0	2.9	2.9	20.0	O K
480 min Winter	62.212	0.512	0.0	2.7	2.7	17.6	O K
600 min Winter	62.155	0.455	0.0	2.5	2.5	15.5	O K
720 min Winter	62.106	0.406	0.0	2.4	2.4	13.7	O K
960 min Winter	62.029	0.329	0.0	2.1	2.1	10.9	O K
1440 min Winter	61.928	0.228	0.0	1.8	1.8	7.3	O K
2160 min Winter	61.848	0.148	0.0	1.4	1.4	4.4	O K
2880 min Winter	61.806	0.106	0.0	1.1	1.1	2.9	O K
4320 min Winter	61.768	0.068	0.0	0.8	0.8	1.5	O K
5760 min Winter	61.755	0.055	0.0	0.7	0.7	1.0	O K
7200 min Winter	61.749	0.049	0.0	0.6	0.6	0.8	O K
8640 min Winter	61.745	0.045	0.0	0.5	0.5	0.7	O K
10080 min Winter	61.741	0.041	0.0	0.4	0.4	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	96.8	4384
10080 min Summer	1.155	0.0	99.7	5088
15 min Winter	138.329	0.0	17.7	17
30 min Winter	92.613	0.0	23.9	31
60 min Winter	59.033	0.0	30.7	58
120 min Winter	36.216	0.0	37.8	92
180 min Winter	26.756	0.0	41.9	132
240 min Winter	21.503	0.0	44.9	168
360 min Winter	15.799	0.0	49.5	240
480 min Winter	12.674	0.0	53.0	308
600 min Winter	10.672	0.0	55.8	374
720 min Winter	9.269	0.0	58.2	440
960 min Winter	7.414	0.0	62.0	566
1440 min Winter	5.401	0.0	67.7	808
2160 min Winter	3.927	0.0	73.8	1164
2880 min Winter	3.128	0.0	78.2	1504
4320 min Winter	2.265	0.0	84.8	2208
5760 min Winter	1.800	0.0	89.5	2936
7200 min Winter	1.508	0.0	93.5	3600
8640 min Winter	1.305	0.0	96.8	4400
10080 min Winter	1.155	0.0	99.7	5136

Cascade Rainfall Details for 37212-PermPav3.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.053

Time (mins) From:	To:	Area (ha)
0	4	0.053

Cascade Model Details for 37212-PermPav3.SRCX

Storage is Online Cover Level (m) 62.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	33.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	61.700	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.043 Discharge Coefficient 0.600 Invert Level (m) 61.700

Cascade Summary of Results for 37212-PermPav4.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212-Tank1.SRCX	(None)

Half Drain Time : 350 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	63.548	0.348	0.0	0.8	0.8	17.9	O K
30 min Summer	63.653	0.453	0.0	0.9	0.9	23.9	O K
60 min Summer	63.756	0.556	0.0	1.0	1.0	29.8	O K
120 min Summer	63.843	0.643	0.0	1.0	1.0	34.8	O K
180 min Summer	63.874	0.674	0.0	1.1	1.1	36.5	O K
240 min Summer	63.884	0.684	0.0	1.1	1.1	37.1	O K
360 min Summer	63.889	0.689	0.0	1.1	1.1	37.4	O K
480 min Summer	63.888	0.688	0.0	1.1	1.1	37.3	O K
600 min Summer	63.882	0.682	0.0	1.1	1.1	37.0	O K
720 min Summer	63.874	0.674	0.0	1.1	1.1	36.5	O K
960 min Summer	63.851	0.651	0.0	1.0	1.0	35.2	O K
1440 min Summer	63.802	0.602	0.0	1.0	1.0	32.4	O K
2160 min Summer	63.732	0.532	0.0	0.9	0.9	28.4	O K
2880 min Summer	63.673	0.473	0.0	0.9	0.9	25.1	O K
4320 min Summer	63.582	0.382	0.0	0.8	0.8	19.8	O K
5760 min Summer	63.515	0.315	0.0	0.7	0.7	16.0	O K
7200 min Summer	63.466	0.266	0.0	0.7	0.7	13.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	18.4	19
30 min Summer	92.613	0.0	25.0	33
60 min Summer	59.033	0.0	32.1	62
120 min Summer	36.216	0.0	39.6	122
180 min Summer	26.756	0.0	43.9	180
240 min Summer	21.503	0.0	47.1	240
360 min Summer	15.799	0.0	52.0	296
480 min Summer	12.674	0.0	55.6	358
600 min Summer	10.672	0.0	58.6	424
720 min Summer	9.269	0.0	61.1	492
960 min Summer	7.414	0.0	65.1	632
1440 min Summer	5.401	0.0	71.1	908
2160 min Summer	3.927	0.0	77.4	1300
2880 min Summer	3.128	0.0	82.0	1700
4320 min Summer	2.265	0.0	88.7	2460
5760 min Summer	1.800	0.0	93.5	3176
7200 min Summer	1.508	0.0	97.5	3896

Cascade Summary of Results for 37212-PermPav4.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	63.427	0.227	0.0	0.6	0.6	11.0	O K
10080 min Summer	63.398	0.198	0.0	0.6	0.6	9.3	O K
15 min Winter	63.548	0.348	0.0	0.8	0.8	17.9	O K
30 min Winter	63.653	0.453	0.0	0.9	0.9	23.9	O K
60 min Winter	63.757	0.557	0.0	1.0	1.0	29.9	O K
120 min Winter	63.845	0.645	0.0	1.0	1.0	34.9	O K
180 min Winter	63.877	0.677	0.0	1.1	1.1	36.7	O K
240 min Winter	63.889	0.689	0.0	1.1	1.1	37.4	O K
360 min Winter	63.890	0.690	0.0	1.1	1.1	37.5	O K
480 min Winter	63.886	0.686	0.0	1.1	1.1	37.2	O K
600 min Winter	63.876	0.676	0.0	1.1	1.1	36.7	O K
720 min Winter	63.863	0.663	0.0	1.1	1.1	35.9	O K
960 min Winter	63.830	0.630	0.0	1.0	1.0	34.0	O K
1440 min Winter	63.761	0.561	0.0	1.0	1.0	30.1	O K
2160 min Winter	63.670	0.470	0.0	0.9	0.9	24.9	O K
2880 min Winter	63.596	0.396	0.0	0.8	0.8	20.7	O K
4320 min Winter	63.491	0.291	0.0	0.7	0.7	14.7	O K
5760 min Winter	63.422	0.222	0.0	0.6	0.6	10.7	O K
7200 min Winter	63.375	0.175	0.0	0.5	0.5	8.0	O K
8640 min Winter	63.342	0.142	0.0	0.5	0.5	6.1	O K
10080 min Winter	63.318	0.118	0.0	0.4	0.4	4.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	100.9	4592
10080 min Summer	1.155	0.0	103.7	5344
15 min Winter	138.329	0.0	18.4	18
30 min Winter	92.613	0.0	25.0	33
60 min Winter	59.033	0.0	32.1	62
120 min Winter	36.216	0.0	39.6	120
180 min Winter	26.756	0.0	43.9	176
240 min Winter	21.503	0.0	47.1	230
360 min Winter	15.799	0.0	52.0	326
480 min Winter	12.674	0.0	55.6	372
600 min Winter	10.672	0.0	58.6	450
720 min Winter	9.269	0.0	61.1	526
960 min Winter	7.414	0.0	65.1	676
1440 min Winter	5.401	0.0	71.1	966
2160 min Winter	3.927	0.0	77.4	1384
2880 min Winter	3.128	0.0	82.0	1784
4320 min Winter	2.265	0.0	88.7	2548
5760 min Winter	1.800	0.0	93.5	3280
7200 min Winter	1.508	0.0	97.5	3968
8640 min Winter	1.305	0.0	100.9	4672
10080 min Winter	1.155	0.0	103.7	5352

Cascade Rainfall Details for 37212-PermPav4.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.056

Time (mins) From:	To:	Area (ha)
0	4	0.056

Cascade Model Details for 37212-PermPav4.SRCX

Storage is Online Cover Level (m) 64.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.8
Membrane Percolation (mm/hr)	1000	Length (m)	13.8
Max Percolation (l/s)	52.9	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	63.200	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 63.200

Cascade Summary of Results for 37212-PermPav5.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212-Tank1.SRCX	(None)

Half Drain Time : 262 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	61.940	0.240	0.0	0.6	0.6	11.1	O K
30 min Summer	62.010	0.310	0.0	0.7	0.7	14.9	O K
60 min Summer	62.077	0.377	0.0	0.8	0.8	18.5	O K
120 min Summer	62.128	0.428	0.0	0.8	0.8	21.3	O K
180 min Summer	62.142	0.442	0.0	0.9	0.9	22.0	O K
240 min Summer	62.145	0.445	0.0	0.9	0.9	22.2	O K
360 min Summer	62.146	0.446	0.0	0.9	0.9	22.2	O K
480 min Summer	62.141	0.441	0.0	0.9	0.9	21.9	O K
600 min Summer	62.133	0.433	0.0	0.8	0.8	21.5	O K
720 min Summer	62.124	0.424	0.0	0.8	0.8	21.0	O K
960 min Summer	62.103	0.403	0.0	0.8	0.8	19.9	O K
1440 min Summer	62.063	0.363	0.0	0.8	0.8	17.7	O K
2160 min Summer	62.011	0.311	0.0	0.7	0.7	15.0	O K
2880 min Summer	61.970	0.270	0.0	0.7	0.7	12.7	O K
4320 min Summer	61.910	0.210	0.0	0.6	0.6	9.5	O K
5760 min Summer	61.868	0.168	0.0	0.5	0.5	7.3	O K
7200 min Summer	61.839	0.139	0.0	0.5	0.5	5.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	11.5	18
30 min Summer	92.613	0.0	15.8	33
60 min Summer	59.033	0.0	20.3	62
120 min Summer	36.216	0.0	25.1	122
180 min Summer	26.756	0.0	27.9	180
240 min Summer	21.503	0.0	30.0	206
360 min Summer	15.799	0.0	33.1	268
480 min Summer	12.674	0.0	35.4	336
600 min Summer	10.672	0.0	37.3	404
720 min Summer	9.269	0.0	38.9	474
960 min Summer	7.414	0.0	41.4	610
1440 min Summer	5.401	0.0	45.2	880
2160 min Summer	3.927	0.0	49.2	1276
2880 min Summer	3.128	0.0	52.1	1644
4320 min Summer	2.265	0.0	56.2	2380
5760 min Summer	1.800	0.0	59.2	3112
7200 min Summer	1.508	0.0	61.6	3824

Cascade Summary of Results for 37212-PermPav5.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	61.817	0.117	0.0	0.4	0.4	4.5	O K
10080 min Summer	61.801	0.101	0.0	0.4	0.4	3.6	O K
15 min Winter	61.940	0.240	0.0	0.6	0.6	11.1	O K
30 min Winter	62.011	0.311	0.0	0.7	0.7	14.9	O K
60 min Winter	62.078	0.378	0.0	0.8	0.8	18.5	O K
120 min Winter	62.130	0.430	0.0	0.8	0.8	21.4	O K
180 min Winter	62.145	0.445	0.0	0.9	0.9	22.2	O K
240 min Winter	62.147	0.447	0.0	0.9	0.9	22.3	O K
360 min Winter	62.144	0.444	0.0	0.9	0.9	22.1	O K
480 min Winter	62.136	0.436	0.0	0.8	0.8	21.7	O K
600 min Winter	62.124	0.424	0.0	0.8	0.8	21.0	O K
720 min Winter	62.110	0.410	0.0	0.8	0.8	20.3	O K
960 min Winter	62.081	0.381	0.0	0.8	0.8	18.7	O K
1440 min Winter	62.027	0.327	0.0	0.7	0.7	15.8	O K
2160 min Winter	61.962	0.262	0.0	0.7	0.7	12.3	O K
2880 min Winter	61.913	0.213	0.0	0.6	0.6	9.7	O K
4320 min Winter	61.849	0.149	0.0	0.5	0.5	6.2	O K
5760 min Winter	61.810	0.110	0.0	0.4	0.4	4.1	O K
7200 min Winter	61.786	0.086	0.0	0.4	0.4	2.8	O K
8640 min Winter	61.770	0.070	0.0	0.3	0.3	1.9	O K
10080 min Winter	61.759	0.059	0.0	0.3	0.3	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	63.5	4504
10080 min Summer	1.155	0.0	65.2	5248
15 min Winter	138.329	0.0	11.5	18
30 min Winter	92.613	0.0	15.8	32
60 min Winter	59.033	0.0	20.3	62
120 min Winter	36.216	0.0	25.1	118
180 min Winter	26.756	0.0	27.9	174
240 min Winter	21.503	0.0	30.0	226
360 min Winter	15.799	0.0	33.1	280
480 min Winter	12.674	0.0	35.4	358
600 min Winter	10.672	0.0	37.3	434
720 min Winter	9.269	0.0	38.9	508
960 min Winter	7.414	0.0	41.4	654
1440 min Winter	5.401	0.0	45.2	936
2160 min Winter	3.927	0.0	49.2	1336
2880 min Winter	3.128	0.0	52.1	1704
4320 min Winter	2.265	0.0	56.2	2460
5760 min Winter	1.800	0.0	59.2	3168
7200 min Winter	1.508	0.0	61.6	3888
8640 min Winter	1.305	0.0	63.5	4576
10080 min Winter	1.155	0.0	65.2	5240

Cascade Rainfall Details for 37212-PermPav5.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.036

Time (mins) From:	To:	Area (ha)
0	4	0.036

Cascade Model Details for 37212-PermPav5.SRCX

Storage is Online Cover Level (m) 62.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.4
Membrane Percolation (mm/hr)	1000	Length (m)	13.4
Max Percolation (l/s)	49.9	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	61.700	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 61.700

Cascade Summary of Results for 37212-Tank2.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212-Tank1.SRCX	(None)

Half Drain Time : 367 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	60.791	0.191	0.0	0.6	0.6	14.2	O K
30 min Summer	60.852	0.252	0.0	0.6	0.6	18.7	O K
60 min Summer	60.913	0.313	0.0	0.7	0.7	23.2	O K
120 min Summer	60.964	0.364	0.0	0.8	0.8	27.0	O K
180 min Summer	60.983	0.383	0.0	0.8	0.8	28.4	O K
240 min Summer	60.990	0.390	0.0	0.8	0.8	28.9	O K
360 min Summer	60.995	0.395	0.0	0.8	0.8	29.2	O K
480 min Summer	60.995	0.395	0.0	0.8	0.8	29.3	O K
600 min Summer	60.993	0.393	0.0	0.8	0.8	29.1	O K
720 min Summer	60.989	0.389	0.0	0.8	0.8	28.8	O K
960 min Summer	60.978	0.378	0.0	0.8	0.8	28.0	O K
1440 min Summer	60.951	0.351	0.0	0.8	0.8	26.0	O K
2160 min Summer	60.912	0.312	0.0	0.7	0.7	23.1	O K
2880 min Summer	60.878	0.278	0.0	0.7	0.7	20.6	O K
4320 min Summer	60.825	0.225	0.0	0.6	0.6	16.7	O K
5760 min Summer	60.787	0.187	0.0	0.5	0.5	13.9	O K
7200 min Summer	60.759	0.159	0.0	0.5	0.5	11.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	14.1	19
30 min Summer	92.613	0.0	19.0	33
60 min Summer	59.033	0.0	24.6	62
120 min Summer	36.216	0.0	30.2	122
180 min Summer	26.756	0.0	33.5	180
240 min Summer	21.503	0.0	35.9	240
360 min Summer	15.799	0.0	39.6	296
480 min Summer	12.674	0.0	42.4	358
600 min Summer	10.672	0.0	44.6	424
720 min Summer	9.269	0.0	46.5	492
960 min Summer	7.414	0.0	49.5	628
1440 min Summer	5.401	0.0	54.1	908
2160 min Summer	3.927	0.0	59.3	1300
2880 min Summer	3.128	0.0	62.9	1700
4320 min Summer	2.265	0.0	68.3	2460
5760 min Summer	1.800	0.0	72.5	3176
7200 min Summer	1.508	0.0	75.9	3896

Cascade Summary of Results for 37212-Tank2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	60.737	0.137	0.0	0.5	0.5	10.1	O K
10080 min Summer	60.720	0.120	0.0	0.4	0.4	8.9	O K
15 min Winter	60.791	0.191	0.0	0.6	0.6	14.2	O K
30 min Winter	60.853	0.253	0.0	0.6	0.6	18.7	O K
60 min Winter	60.913	0.313	0.0	0.7	0.7	23.2	O K
120 min Winter	60.965	0.365	0.0	0.8	0.8	27.1	O K
180 min Winter	60.985	0.385	0.0	0.8	0.8	28.5	O K
240 min Winter	60.993	0.393	0.0	0.8	0.8	29.1	O K
360 min Winter	60.995	0.395	0.0	0.8	0.8	29.3	O K
480 min Winter	60.993	0.393	0.0	0.8	0.8	29.2	O K
600 min Winter	60.989	0.389	0.0	0.8	0.8	28.8	O K
720 min Winter	60.982	0.382	0.0	0.8	0.8	28.3	O K
960 min Winter	60.965	0.365	0.0	0.8	0.8	27.0	O K
1440 min Winter	60.927	0.327	0.0	0.7	0.7	24.2	O K
2160 min Winter	60.876	0.276	0.0	0.7	0.7	20.4	O K
2880 min Winter	60.834	0.234	0.0	0.6	0.6	17.3	O K
4320 min Winter	60.773	0.173	0.0	0.5	0.5	12.8	O K
5760 min Winter	60.733	0.133	0.0	0.5	0.5	9.9	O K
7200 min Winter	60.706	0.106	0.0	0.4	0.4	7.9	O K
8640 min Winter	60.688	0.088	0.0	0.4	0.4	6.5	O K
10080 min Winter	60.674	0.074	0.0	0.3	0.3	5.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	78.8	4592
10080 min Summer	1.155	0.0	81.3	5344
15 min Winter	138.329	0.0	14.1	18
30 min Winter	92.613	0.0	19.0	33
60 min Winter	59.033	0.0	24.6	62
120 min Winter	36.216	0.0	30.2	120
180 min Winter	26.756	0.0	33.5	176
240 min Winter	21.503	0.0	35.9	232
360 min Winter	15.799	0.0	39.6	328
480 min Winter	12.674	0.0	42.4	372
600 min Winter	10.672	0.0	44.6	450
720 min Winter	9.269	0.0	46.5	528
960 min Winter	7.414	0.0	49.5	676
1440 min Winter	5.401	0.0	54.1	966
2160 min Winter	3.927	0.0	59.3	1384
2880 min Winter	3.128	0.0	62.9	1764
4320 min Winter	2.265	0.0	68.3	2512
5760 min Winter	1.800	0.0	72.5	3240
7200 min Winter	1.508	0.0	75.9	3968
8640 min Winter	1.305	0.0	78.8	4672
10080 min Winter	1.155	0.0	81.3	5352

Cascade Rainfall Details for 37212-Tank2.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.042

Time (mins) From:	To:	Area (ha)
0	4	0.042

Cascade Model Details for 37212-Tank2.SRCX

Storage is Online Cover Level (m) 62.000

Cellular Storage Structure

Invert Level (m) 60.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	78.0	78.0	0.400	78.0	92.1

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 60.600

Cascade Summary of Results for 37212-PermPav6.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212 - Pond.SRCX	(None)

Half Drain Time : 711 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	52.407	0.407	0.0	2.1	2.1	85.7	O K
30 min Summer	52.489	0.489	0.0	2.3	2.3	116.3	O K
60 min Summer	52.574	0.574	0.0	2.5	2.5	147.9	O K
120 min Summer	52.654	0.654	0.0	2.7	2.7	177.7	O K
180 min Summer	52.693	0.693	0.0	2.7	2.7	192.0	O K
240 min Summer	52.715	0.715	0.0	2.8	2.8	200.5	O K
360 min Summer	52.741	0.741	0.0	2.8	2.8	209.8	O K
480 min Summer	52.749	0.749	0.0	2.9	2.9	213.1	O K
600 min Summer	52.750	0.750	0.0	2.9	2.9	213.2	O K
720 min Summer	52.748	0.748	0.0	2.9	2.9	212.7	O K
960 min Summer	52.742	0.742	0.0	2.8	2.8	210.4	O K
1440 min Summer	52.722	0.722	0.0	2.8	2.8	203.1	O K
2160 min Summer	52.686	0.686	0.0	2.7	2.7	189.4	O K
2880 min Summer	52.649	0.649	0.0	2.6	2.6	175.8	O K
4320 min Summer	52.583	0.583	0.0	2.5	2.5	151.4	O K
5760 min Summer	52.528	0.528	0.0	2.4	2.4	130.7	O K
7200 min Summer	52.481	0.481	0.0	2.3	2.3	113.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	88.5	34
30 min Summer	92.613	0.0	120.6	48
60 min Summer	59.033	0.0	155.4	76
120 min Summer	36.216	0.0	191.9	134
180 min Summer	26.756	0.0	213.2	190
240 min Summer	21.503	0.0	228.8	248
360 min Summer	15.799	0.0	252.6	364
480 min Summer	12.674	0.0	270.3	482
600 min Summer	10.672	0.0	284.6	564
720 min Summer	9.269	0.0	296.7	618
960 min Summer	7.414	0.0	316.3	742
1440 min Summer	5.401	0.0	338.0	1008
2160 min Summer	3.927	0.0	375.5	1420
2880 min Summer	3.128	0.0	397.7	1828
4320 min Summer	2.265	0.0	429.6	2640
5760 min Summer	1.800	0.0	452.4	3408
7200 min Summer	1.508	0.0	471.0	4184

Cascade Summary of Results for 37212-PermPav6.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	52.441	0.441	0.0	2.2	2.2	98.6	O K
10080 min Summer	52.407	0.407	0.0	2.1	2.1	85.9	O K
15 min Winter	52.407	0.407	0.0	2.1	2.1	85.7	O K
30 min Winter	52.489	0.489	0.0	2.3	2.3	116.4	O K
60 min Winter	52.574	0.574	0.0	2.5	2.5	148.1	O K
120 min Winter	52.655	0.655	0.0	2.7	2.7	178.0	O K
180 min Winter	52.694	0.694	0.0	2.7	2.7	192.6	O K
240 min Winter	52.717	0.717	0.0	2.8	2.8	201.3	O K
360 min Winter	52.744	0.744	0.0	2.8	2.8	211.0	O K
480 min Winter	52.754	0.754	0.0	2.9	2.9	214.7	O K
600 min Winter	52.755	0.755	0.0	2.9	2.9	215.3	O K
720 min Winter	52.751	0.751	0.0	2.9	2.9	213.9	O K
960 min Winter	52.742	0.742	0.0	2.8	2.8	210.2	O K
1440 min Winter	52.715	0.715	0.0	2.8	2.8	200.3	O K
2160 min Winter	52.664	0.664	0.0	2.7	2.7	181.6	O K
2880 min Winter	52.614	0.614	0.0	2.6	2.6	162.8	O K
4320 min Winter	52.526	0.526	0.0	2.4	2.4	130.1	O K
5760 min Winter	52.454	0.454	0.0	2.2	2.2	103.5	O K
7200 min Winter	52.398	0.398	0.0	2.1	2.1	82.4	O K
8640 min Winter	52.352	0.352	0.0	1.9	1.9	65.3	O K
10080 min Winter	52.313	0.313	0.0	1.8	1.8	51.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	486.4	4928
10080 min Summer	1.155	0.0	499.4	5656
15 min Winter	138.329	0.0	88.5	34
30 min Winter	92.613	0.0	120.6	47
60 min Winter	59.033	0.0	155.4	76
120 min Winter	36.216	0.0	191.9	132
180 min Winter	26.756	0.0	213.2	188
240 min Winter	21.503	0.0	228.8	244
360 min Winter	15.799	0.0	252.6	358
480 min Winter	12.674	0.0	270.3	470
600 min Winter	10.672	0.0	284.6	576
720 min Winter	9.269	0.0	296.7	676
960 min Winter	7.414	0.0	316.3	764
1440 min Winter	5.401	0.0	338.1	1070
2160 min Winter	3.927	0.0	375.5	1524
2880 min Winter	3.128	0.0	397.7	1960
4320 min Winter	2.265	0.0	429.6	2780
5760 min Winter	1.800	0.0	452.4	3576
7200 min Winter	1.508	0.0	471.1	4328
8640 min Winter	1.305	0.0	486.5	5032
10080 min Winter	1.155	0.0	499.5	5760

Cascade Rainfall Details for 37212-PermPav6.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.274

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.064	8	12	0.050	16	20	0.050
4	8	0.060	12	16	0.050			

Cascade Model Details for 37212-PermPav6.SRCX

Storage is Online Cover Level (m) 53.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	35.2
Membrane Percolation (mm/hr)	1000	Length (m)	35.2
Max Percolation (l/s)	344.2	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.000	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 52.000

Cascade Summary of Results for 37212-PermPav7.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212 - Pond.SRCX	(None)

Half Drain Time : 244 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	52.556	0.356	0.0	1.5	1.5	24.0	O K
30 min Summer	52.617	0.417	0.0	1.6	1.6	32.3	O K
60 min Summer	52.676	0.476	0.0	1.7	1.7	40.0	O K
120 min Summer	52.720	0.520	0.0	1.8	1.8	45.9	O K
180 min Summer	52.730	0.530	0.0	1.8	1.8	47.4	O K
240 min Summer	52.731	0.531	0.0	1.8	1.8	47.5	O K
360 min Summer	52.729	0.529	0.0	1.8	1.8	47.1	O K
480 min Summer	52.722	0.522	0.0	1.8	1.8	46.2	O K
600 min Summer	52.713	0.513	0.0	1.8	1.8	45.0	O K
720 min Summer	52.703	0.503	0.0	1.8	1.8	43.7	O K
960 min Summer	52.682	0.482	0.0	1.7	1.7	40.9	O K
1440 min Summer	52.643	0.443	0.0	1.7	1.7	35.6	O K
2160 min Summer	52.592	0.392	0.0	1.6	1.6	28.9	O K
2880 min Summer	52.552	0.352	0.0	1.5	1.5	23.5	O K
4320 min Summer	52.487	0.287	0.0	1.3	1.3	15.7	O K
5760 min Summer	52.437	0.237	0.0	1.2	1.2	10.7	O K
7200 min Summer	52.399	0.199	0.0	1.1	1.1	7.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	25.1	18
30 min Summer	92.613	0.0	34.3	33
60 min Summer	59.033	0.0	44.4	62
120 min Summer	36.216	0.0	54.9	122
180 min Summer	26.756	0.0	61.0	180
240 min Summer	21.503	0.0	65.5	210
360 min Summer	15.799	0.0	72.3	272
480 min Summer	12.674	0.0	77.4	338
600 min Summer	10.672	0.0	81.5	408
720 min Summer	9.269	0.0	85.0	476
960 min Summer	7.414	0.0	90.6	614
1440 min Summer	5.401	0.0	98.8	880
2160 min Summer	3.927	0.0	107.4	1276
2880 min Summer	3.128	0.0	113.7	1644
4320 min Summer	2.265	0.0	122.6	2376
5760 min Summer	1.800	0.0	128.9	3064
7200 min Summer	1.508	0.0	134.1	3752

Cascade Summary of Results for 37212-PermPav7.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	52.368	0.168	0.0	1.0	1.0	5.4	O K
10080 min Summer	52.345	0.145	0.0	0.9	0.9	4.0	O K
15 min Winter	52.556	0.356	0.0	1.5	1.5	24.1	O K
30 min Winter	52.618	0.418	0.0	1.6	1.6	32.3	O K
60 min Winter	52.676	0.476	0.0	1.7	1.7	40.1	O K
120 min Winter	52.721	0.521	0.0	1.8	1.8	46.1	O K
180 min Winter	52.733	0.533	0.0	1.8	1.8	47.7	O K
240 min Winter	52.734	0.534	0.0	1.8	1.8	47.8	O K
360 min Winter	52.728	0.528	0.0	1.8	1.8	47.0	O K
480 min Winter	52.718	0.518	0.0	1.8	1.8	45.6	O K
600 min Winter	52.704	0.504	0.0	1.8	1.8	43.9	O K
720 min Winter	52.690	0.490	0.0	1.8	1.8	42.0	O K
960 min Winter	52.660	0.460	0.0	1.7	1.7	38.0	O K
1440 min Winter	52.606	0.406	0.0	1.6	1.6	30.8	O K
2160 min Winter	52.541	0.341	0.0	1.5	1.5	22.1	O K
2880 min Winter	52.488	0.288	0.0	1.3	1.3	15.7	O K
4320 min Winter	52.407	0.207	0.0	1.1	1.1	8.1	O K
5760 min Winter	52.352	0.152	0.0	0.9	0.9	4.4	O K
7200 min Winter	52.317	0.117	0.0	0.8	0.8	2.6	O K
8640 min Winter	52.293	0.093	0.0	0.7	0.7	1.6	O K
10080 min Winter	52.277	0.077	0.0	0.6	0.6	1.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	138.2	4488
10080 min Summer	1.155	0.0	141.7	5152
15 min Winter	138.329	0.0	25.1	18
30 min Winter	92.613	0.0	34.3	32
60 min Winter	59.033	0.0	44.4	62
120 min Winter	36.216	0.0	54.9	118
180 min Winter	26.756	0.0	61.0	174
240 min Winter	21.503	0.0	65.5	226
360 min Winter	15.799	0.0	72.3	282
480 min Winter	12.674	0.0	77.4	358
600 min Winter	10.672	0.0	81.5	436
720 min Winter	9.269	0.0	85.0	512
960 min Winter	7.414	0.0	90.6	656
1440 min Winter	5.401	0.0	98.8	938
2160 min Winter	3.927	0.0	107.4	1320
2880 min Winter	3.128	0.0	113.7	1700
4320 min Winter	2.265	0.0	122.6	2380
5760 min Winter	1.800	0.0	129.0	3056
7200 min Winter	1.508	0.0	134.1	3744
8640 min Winter	1.305	0.0	138.3	4408
10080 min Winter	1.155	0.0	141.8	5136

Cascade Rainfall Details for 37212-PermPav7.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.079

Time (mins) From:	To:	Area (ha)
0	4	0.079

Cascade Model Details for 37212-PermPav7.SRCX

Storage is Online Cover Level (m) 53.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	21.1
Membrane Percolation (mm/hr)	1000	Length (m)	21.1
Max Percolation (l/s)	123.7	Slope (1:X)	60.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.200	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 52.200

Cascade Summary of Results for 37212-PermPav8.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	37212 - Pond.SRCX	(None)

Half Drain Time : 96 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	51.641	0.441	0.0	1.7	1.7	11.3	O K
30 min Summer	51.758	0.558	0.0	1.9	1.9	14.5	O K
60 min Summer	51.842	0.642	0.0	2.0	2.0	16.7	O K
120 min Summer	51.877	0.677	0.0	2.1	2.1	17.7	O K
180 min Summer	51.871	0.671	0.0	2.1	2.1	17.5	O K
240 min Summer	51.854	0.654	0.0	2.0	2.0	17.1	O K
360 min Summer	51.811	0.611	0.0	2.0	2.0	15.9	O K
480 min Summer	51.767	0.567	0.0	1.9	1.9	14.7	O K
600 min Summer	51.726	0.526	0.0	1.8	1.8	13.6	O K
720 min Summer	51.689	0.489	0.0	1.8	1.8	12.6	O K
960 min Summer	51.626	0.426	0.0	1.6	1.6	10.9	O K
1440 min Summer	51.533	0.333	0.0	1.4	1.4	8.4	O K
2160 min Summer	51.443	0.243	0.0	1.2	1.2	5.9	O K
2880 min Summer	51.386	0.186	0.0	1.1	1.1	4.4	O K
4320 min Summer	51.323	0.123	0.0	0.8	0.8	2.7	O K
5760 min Summer	51.290	0.090	0.0	0.7	0.7	1.8	O K
7200 min Summer	51.271	0.071	0.0	0.6	0.6	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	12.3	18
30 min Summer	92.613	0.0	16.7	32
60 min Summer	59.033	0.0	21.4	60
120 min Summer	36.216	0.0	26.3	90
180 min Summer	26.756	0.0	29.2	124
240 min Summer	21.503	0.0	31.3	158
360 min Summer	15.799	0.0	34.6	228
480 min Summer	12.674	0.0	37.0	294
600 min Summer	10.672	0.0	38.9	360
720 min Summer	9.269	0.0	40.6	426
960 min Summer	7.414	0.0	43.3	550
1440 min Summer	5.401	0.0	47.2	794
2160 min Summer	3.927	0.0	51.4	1152
2880 min Summer	3.128	0.0	54.6	1524
4320 min Summer	2.265	0.0	59.1	2244
5760 min Summer	1.800	0.0	62.4	2944
7200 min Summer	1.508	0.0	65.2	3672

Cascade Summary of Results for 37212-PermPav8.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	51.259	0.059	0.0	0.5	0.5	0.9	O K
10080 min Summer	51.250	0.050	0.0	0.5	0.5	0.7	O K
15 min Winter	51.641	0.441	0.0	1.7	1.7	11.3	O K
30 min Winter	51.760	0.560	0.0	1.9	1.9	14.5	O K
60 min Winter	51.846	0.646	0.0	2.0	2.0	16.9	O K
120 min Winter	51.874	0.674	0.0	2.1	2.1	17.6	O K
180 min Winter	51.859	0.659	0.0	2.0	2.0	17.2	O K
240 min Winter	51.831	0.631	0.0	2.0	2.0	16.4	O K
360 min Winter	51.769	0.569	0.0	1.9	1.9	14.8	O K
480 min Winter	51.709	0.509	0.0	1.8	1.8	13.1	O K
600 min Winter	51.656	0.456	0.0	1.7	1.7	11.7	O K
720 min Winter	51.610	0.410	0.0	1.6	1.6	10.5	O K
960 min Winter	51.535	0.335	0.0	1.4	1.4	8.4	O K
1440 min Winter	51.436	0.236	0.0	1.2	1.2	5.7	O K
2160 min Winter	51.354	0.154	0.0	0.9	0.9	3.5	O K
2880 min Winter	51.310	0.110	0.0	0.8	0.8	2.3	O K
4320 min Winter	51.269	0.069	0.0	0.6	0.6	1.2	O K
5760 min Winter	51.250	0.050	0.0	0.5	0.5	0.7	O K
7200 min Winter	51.244	0.044	0.0	0.4	0.4	0.6	O K
8640 min Winter	51.240	0.040	0.0	0.3	0.3	0.5	O K
10080 min Winter	51.237	0.037	0.0	0.3	0.3	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.305	0.0	67.5	4408
10080 min Summer	1.155	0.0	69.4	5120
15 min Winter	138.329	0.0	12.3	17
30 min Winter	92.613	0.0	16.7	31
60 min Winter	59.033	0.0	21.4	58
120 min Winter	36.216	0.0	26.3	94
180 min Winter	26.756	0.0	29.2	132
240 min Winter	21.503	0.0	31.3	170
360 min Winter	15.799	0.0	34.6	242
480 min Winter	12.674	0.0	37.0	312
600 min Winter	10.672	0.0	38.9	380
720 min Winter	9.269	0.0	40.6	444
960 min Winter	7.414	0.0	43.3	570
1440 min Winter	5.401	0.0	47.2	820
2160 min Winter	3.927	0.0	51.4	1168
2880 min Winter	3.128	0.0	54.6	1528
4320 min Winter	2.265	0.0	59.1	2232
5760 min Winter	1.800	0.0	62.4	2936
7200 min Winter	1.508	0.0	65.2	3672
8640 min Winter	1.305	0.0	67.5	4384
10080 min Winter	1.155	0.0	69.4	5112

Cascade Rainfall Details for 37212-PermPav8.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.037

Time (mins) From:	To:	Area (ha)
0	4	0.037

Cascade Model Details for 37212-PermPav8.SRCX

Storage is Online Cover Level (m) 52.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.5
Membrane Percolation (mm/hr)	1000	Length (m)	9.5
Max Percolation (l/s)	25.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	51.200	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 51.200

Cascade Summary of Results for 37212-Tank1.SRCX

Upstream Structures	Outflow To	Overflow To
37212-PermPav1.SRCX 37212-PermPav2.SRCX 37212-PermPav3.SRCX 37212-PermPav4.SRCX 37212-PermPav5.SRCX 37212-Tank2.SRCX	37212 - Pond.SRCX	(None)

Half Drain Time : 2198 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	55.518	0.518	0.0	3.1	3.1	233.8	O K
30 min Summer	55.723	0.723	0.0	3.1	3.1	326.2	O K
60 min Summer	55.931	0.931	0.0	3.1	3.1	420.1	O K
120 min Summer	56.141	1.141	0.0	3.1	3.1	514.9	O K
180 min Summer	56.262	1.262	0.0	3.2	3.2	569.4	O K
240 min Summer	56.349	1.349	0.0	3.3	3.3	608.7	O K
360 min Summer	56.479	1.479	0.0	3.5	3.5	667.6	O K
480 min Summer	56.574	1.574	0.0	3.6	3.6	710.5	O K
600 min Summer	56.649	1.649	0.0	3.7	3.7	744.1	O K
720 min Summer	56.710	1.710	0.0	3.7	3.7	771.5	O K
960 min Summer	56.804	1.804	0.0	3.8	3.8	814.0	O K
1440 min Summer	56.921	1.921	0.0	3.9	3.9	867.0	O K
2160 min Summer	56.976	1.976	0.0	4.0	4.0	891.7	O K
2880 min Summer	56.943	1.943	0.0	3.9	3.9	876.8	O K
4320 min Summer	56.849	1.849	0.0	3.9	3.9	834.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	262.5	189
30 min Summer	92.613	0.0	237.7	377
60 min Summer	59.033	0.0	489.6	452
120 min Summer	36.216	0.0	496.5	526
180 min Summer	26.756	0.0	504.4	580
240 min Summer	21.503	0.0	514.4	624
360 min Summer	15.799	0.0	537.2	704
480 min Summer	12.674	0.0	552.4	776
600 min Summer	10.672	0.0	562.6	846
720 min Summer	9.269	0.0	569.6	914
960 min Summer	7.414	0.0	577.0	1050
1440 min Summer	5.401	0.0	576.4	1460
2160 min Summer	3.927	0.0	1088.1	2168
2880 min Summer	3.128	0.0	1085.4	2756
4320 min Summer	2.265	0.0	1051.0	3440

Cascade Summary of Results for 37212-Tank1.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	56.763	1.763	0.0	3.8	3.8	795.6	O K
7200 min Summer	56.689	1.689	0.0	3.7	3.7	762.1	O K
8640 min Summer	56.616	1.616	0.0	3.6	3.6	729.3	O K
10080 min Summer	56.546	1.546	0.0	3.5	3.5	697.4	O K
15 min Winter	55.518	0.518	0.0	3.1	3.1	233.8	O K
30 min Winter	55.723	0.723	0.0	3.1	3.1	326.1	O K
60 min Winter	55.931	0.931	0.0	3.1	3.1	420.1	O K
120 min Winter	56.141	1.141	0.0	3.1	3.1	514.9	O K
180 min Winter	56.262	1.262	0.0	3.2	3.2	569.5	O K
240 min Winter	56.349	1.349	0.0	3.3	3.3	609.0	O K
360 min Winter	56.481	1.481	0.0	3.5	3.5	668.2	O K
480 min Winter	56.577	1.577	0.0	3.6	3.6	711.4	O K
600 min Winter	56.652	1.652	0.0	3.7	3.7	745.4	O K
720 min Winter	56.713	1.713	0.0	3.7	3.7	773.2	O K
960 min Winter	56.809	1.809	0.0	3.8	3.8	816.5	O K
1440 min Winter	56.930	1.930	0.0	3.9	3.9	871.1	O K
2160 min Winter	56.993	1.993	0.0	4.0	4.0	899.1	O K
2880 min Winter	56.971	1.971	0.0	4.0	4.0	889.3	O K
4320 min Winter	56.854	1.854	0.0	3.9	3.9	836.5	O K
5760 min Winter	56.744	1.744	0.0	3.7	3.7	787.0	O K
7200 min Winter	56.635	1.635	0.0	3.6	3.6	737.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	1.800	0.0	1638.6	4184
7200 min Summer	1.508	0.0	1711.9	4968
8640 min Summer	1.305	0.0	1767.7	5760
10080 min Summer	1.155	0.0	1727.6	6560
15 min Winter	138.329	0.0	262.6	189
30 min Winter	92.613	0.0	237.8	377
60 min Winter	59.033	0.0	489.7	452
120 min Winter	36.216	0.0	496.5	526
180 min Winter	26.756	0.0	504.4	580
240 min Winter	21.503	0.0	514.3	624
360 min Winter	15.799	0.0	536.8	702
480 min Winter	12.674	0.0	551.8	776
600 min Winter	10.672	0.0	561.8	844
720 min Winter	9.269	0.0	568.5	912
960 min Winter	7.414	0.0	575.4	1046
1440 min Winter	5.401	0.0	573.8	1446
2160 min Winter	3.927	0.0	1085.2	2124
2880 min Winter	3.128	0.0	1082.7	2752
4320 min Winter	2.265	0.0	1049.1	3496
5760 min Winter	1.800	0.0	1638.6	4336
7200 min Winter	1.508	0.0	1712.0	5208

Cascade Summary of Results for 37212-Tank1.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Winter	56.526	1.526	0.0	3.5	3.5	688.5	O K
10080 min Winter	56.418	1.418	0.0	3.4	3.4	639.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.305	0.0	1768.7	6072
10080 min Winter	1.155	0.0	1739.7	6960

Cascade Rainfall Details for 37212-Tank1.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.626

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.106	8	12	0.110	16	20	0.100
4	8	0.110	12	16	0.100	20	24	0.100

Cascade Model Details for 37212-Tank1.SRCX

Storage is Online Cover Level (m) 58.000

Cellular Storage Structure

Invert Level (m) 55.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	475.0	470.0	2.000	475.0	643.4

Complex Outflow Control

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0082-4000-2000-4000
Design Head (m)	2.000
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82
Invert Level (m)	55.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	4.0
Flush-Flo™	0.356	3.1
Kick-Flo®	0.729	2.5
Mean Flow over Head Range	-	3.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.2	3.000	4.8	7.000	7.2
0.200	3.0	1.400	3.4	3.500	5.2	7.500	7.4
0.300	3.1	1.600	3.6	4.000	5.5	8.000	7.7
0.400	3.1	1.800	3.8	4.500	5.8	8.500	7.9
0.500	3.1	2.000	4.0	5.000	6.1	9.000	8.1
0.600	2.9	2.200	4.2	5.500	6.4	9.500	8.3
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

Weir

Discharge Coef 0.544 Width (m) 0.500 Invert Level (m) 57.000

Cascade Summary of Results for 37212 - Pond.SRCX

Upstream Structures	Outflow To	Overflow To
37212-Tank1.SRCX	(None)	(None)
37212-PermPav1.SRCX		
37212-PermPav2.SRCX		
37212-PermPav3.SRCX		
37212-PermPav4.SRCX		
37212-PermPav5.SRCX		
37212-Tank2.SRCX		
37212-PermPav6.SRCX		
37212-PermPav7.SRCX		
37212-PermPav8.SRCX		

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	44.984	0.384	10.9	231.6	O K
30 min Summer	45.099	0.499	10.9	310.6	O K
60 min Summer	45.217	0.617	10.9	396.7	O K
120 min Summer	45.335	0.735	10.9	487.9	O K
180 min Summer	45.397	0.797	10.9	538.2	O K
240 min Summer	45.439	0.839	10.9	573.0	O K
360 min Summer	45.497	0.897	10.9	621.9	O K
480 min Summer	45.533	0.933	10.9	653.3	O K
600 min Summer	45.557	0.957	10.9	674.1	O K
720 min Summer	45.572	0.972	10.9	687.7	O K
960 min Summer	45.586	0.986	10.9	700.4	O K
1440 min Summer	45.581	0.981	10.9	695.6	O K
2160 min Summer	45.543	0.943	10.9	661.8	O K
2880 min Summer	45.504	0.904	10.9	628.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	584.5	42
30 min Summer	92.613	0.0	682.4	57
60 min Summer	59.033	0.0	1072.0	86
120 min Summer	36.216	0.0	1220.8	148
180 min Summer	26.756	0.0	1313.6	208
240 min Summer	21.503	0.0	1386.5	266
360 min Summer	15.799	0.0	1501.4	384
480 min Summer	12.674	0.0	1583.5	502
600 min Summer	10.672	0.0	1642.4	620
720 min Summer	9.269	0.0	1673.4	736
960 min Summer	7.414	0.0	1655.2	972
1440 min Summer	5.401	0.0	1598.2	1442
2160 min Summer	3.927	0.0	2541.8	1844
2880 min Summer	3.128	0.0	2631.8	2216

Cascade Summary of Results for 37212 - Pond.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
4320 min Summer	45.426	0.826	10.9	562.5	O K
5760 min Summer	45.338	0.738	10.9	490.7	O K
7200 min Summer	45.212	0.612	10.9	393.0	O K
8640 min Summer	45.102	0.502	10.9	313.1	O K
10080 min Summer	45.010	0.410	10.9	249.2	O K
15 min Winter	44.984	0.384	10.9	231.6	O K
30 min Winter	45.099	0.499	10.9	310.7	O K
60 min Winter	45.216	0.616	10.9	396.5	O K
120 min Winter	45.334	0.734	10.9	487.2	O K
180 min Winter	45.396	0.796	10.9	537.3	O K
240 min Winter	45.438	0.838	10.9	572.1	O K
360 min Winter	45.496	0.896	10.9	621.2	O K
480 min Winter	45.533	0.933	10.9	653.0	O K
600 min Winter	45.557	0.957	10.9	674.3	O K
720 min Winter	45.573	0.973	10.9	688.4	O K
960 min Winter	45.588	0.988	10.9	702.1	O K
1440 min Winter	45.584	0.984	10.9	698.1	O K
2160 min Winter	45.536	0.936	10.9	655.7	O K
2880 min Winter	45.481	0.881	10.9	608.7	O K
4320 min Winter	45.352	0.752	10.9	502.0	O K
5760 min Winter	45.146	0.546	10.9	344.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
4320 min Summer	2.265	0.0	2726.5	2988
5760 min Summer	1.800	0.0	3447.2	3816
7200 min Summer	1.508	0.0	3599.4	4512
8640 min Summer	1.305	0.0	3713.3	5184
10080 min Summer	1.155	0.0	3712.1	5840
15 min Winter	138.329	0.0	584.5	42
30 min Winter	92.613	0.0	682.4	56
60 min Winter	59.033	0.0	1072.1	86
120 min Winter	36.216	0.0	1220.8	146
180 min Winter	26.756	0.0	1313.6	204
240 min Winter	21.503	0.0	1386.3	262
360 min Winter	15.799	0.0	1501.0	378
480 min Winter	12.674	0.0	1582.9	494
600 min Winter	10.672	0.0	1641.6	608
720 min Winter	9.269	0.0	1672.5	724
960 min Winter	7.414	0.0	1654.2	952
1440 min Winter	5.401	0.0	1597.8	1400
2160 min Winter	3.927	0.0	2539.0	1960
2880 min Winter	3.128	0.0	2629.0	2268
4320 min Winter	2.265	0.0	2725.0	3200
5760 min Winter	1.800	0.0	3447.3	3880

Cascade Summary of Results for 37212 - Pond.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
7200 min Winter	44.981	0.381	10.9	229.9	O K
8640 min Winter	44.863	0.263	10.8	153.5	O K
10080 min Winter	44.792	0.192	10.5	109.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.508	0.0	3599.8	4496
8640 min Winter	1.305	0.0	3715.7	5096
10080 min Winter	1.155	0.0	3724.8	5568

Cascade Rainfall Details for 37212 - Pond.SRCX

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.677

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.100	8	12	0.100	16	20	0.100	24	28	0.077
4	8	0.100	12	16	0.100	20	24	0.100			

Cascade Model Details for 37212 - Pond.SRCX

Storage is Online Cover Level (m) 46.000

Tank or Pond Structure

Invert Level (m) 44.600

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	540.0	0.400	675.0	0.800	820.0	1.200	975.0
0.200	605.0	0.600	745.0	1.000	900.0	1.400	1055.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0152-1090-1000-1090
Design Head (m)	1.000
Design Flow (l/s)	10.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	152
Invert Level (m)	44.600
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	10.9
Flush-Flo™	0.306	10.9
Kick-Flo®	0.680	9.1
Mean Flow over Head Range	-	9.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.5	1.200	11.9	3.000	18.3	7.000	27.6
0.200	10.6	1.400	12.8	3.500	19.7	7.500	28.5
0.300	10.9	1.600	13.6	4.000	21.1	8.000	29.4
0.400	10.8	1.800	14.4	4.500	22.3	8.500	30.3
0.500	10.5	2.000	15.1	5.000	23.4	9.000	31.1
0.600	10.0	2.200	15.8	5.500	24.5	9.500	31.9
0.800	9.8	2.400	16.5	6.000	25.6		
1.000	10.9	2.600	17.1	6.500	26.6		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 804 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.659	0.159	0.0	0.6	0.6	33.2	O K
30 min Summer	49.711	0.211	0.0	0.7	0.7	44.1	O K
60 min Summer	49.765	0.265	0.0	0.8	0.8	55.4	O K
120 min Summer	49.817	0.317	0.0	0.9	0.9	66.3	O K
180 min Summer	49.843	0.343	0.0	0.9	0.9	71.7	O K
240 min Summer	49.859	0.359	0.0	1.0	1.0	75.0	O K
360 min Summer	49.877	0.377	0.0	1.0	1.0	78.9	O K
480 min Summer	49.885	0.385	0.0	1.0	1.0	80.6	O K
600 min Summer	49.888	0.388	0.0	1.0	1.0	81.1	O K
720 min Summer	49.889	0.389	0.0	1.0	1.0	81.3	O K
960 min Summer	49.889	0.389	0.0	1.0	1.0	81.3	O K
1440 min Summer	49.884	0.384	0.0	1.0	1.0	80.2	O K
2160 min Summer	49.868	0.368	0.0	1.0	1.0	77.0	O K
2880 min Summer	49.850	0.350	0.0	0.9	0.9	73.1	O K
4320 min Summer	49.813	0.313	0.0	0.9	0.9	65.5	O K
5760 min Summer	49.781	0.281	0.0	0.8	0.8	58.8	O K
7200 min Summer	49.754	0.254	0.0	0.8	0.8	53.2	O K
8640 min Summer	49.732	0.232	0.0	0.8	0.8	48.4	O K
10080 min Summer	49.712	0.212	0.0	0.7	0.7	44.3	O K
15 min Winter	49.659	0.159	0.0	0.6	0.6	33.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.329	0.0	29.6	19
30 min Summer	92.613	0.0	39.1	34
60 min Summer	59.033	0.0	55.5	64
120 min Summer	36.216	0.0	68.1	122
180 min Summer	26.756	0.0	75.4	182
240 min Summer	21.503	0.0	80.7	242
360 min Summer	15.799	0.0	88.7	362
480 min Summer	12.674	0.0	94.4	480
600 min Summer	10.672	0.0	98.9	570
720 min Summer	9.269	0.0	102.4	616
960 min Summer	7.414	0.0	107.4	740
1440 min Summer	5.401	0.0	111.4	998
2160 min Summer	3.927	0.0	135.9	1408
2880 min Summer	3.128	0.0	144.1	1820
4320 min Summer	2.265	0.0	155.3	2636
5760 min Summer	1.800	0.0	167.1	3408
7200 min Summer	1.508	0.0	174.9	4184
8640 min Summer	1.305	0.0	181.4	4928
10080 min Summer	1.155	0.0	186.8	5656
15 min Winter	138.329	0.0	29.6	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.711	0.211	0.0	0.7	0.7	44.1	O K
60 min Winter	49.765	0.265	0.0	0.8	0.8	55.5	O K
120 min Winter	49.818	0.318	0.0	0.9	0.9	66.4	O K
180 min Winter	49.844	0.344	0.0	0.9	0.9	71.8	O K
240 min Winter	49.860	0.360	0.0	1.0	1.0	75.2	O K
360 min Winter	49.879	0.379	0.0	1.0	1.0	79.1	O K
480 min Winter	49.888	0.388	0.0	1.0	1.0	81.0	O K
600 min Winter	49.891	0.391	0.0	1.0	1.0	81.7	O K
720 min Winter	49.891	0.391	0.0	1.0	1.0	81.7	O K
960 min Winter	49.888	0.388	0.0	1.0	1.0	81.2	O K
1440 min Winter	49.879	0.379	0.0	1.0	1.0	79.2	O K
2160 min Winter	49.855	0.355	0.0	1.0	1.0	74.3	O K
2880 min Winter	49.829	0.329	0.0	0.9	0.9	68.9	O K
4320 min Winter	49.781	0.281	0.0	0.8	0.8	58.7	O K
5760 min Winter	49.741	0.241	0.0	0.8	0.8	50.3	O K
7200 min Winter	49.709	0.209	0.0	0.7	0.7	43.6	O K
8640 min Winter	49.683	0.183	0.0	0.7	0.7	38.1	O K
10080 min Winter	49.661	0.161	0.0	0.6	0.6	33.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	92.613	0.0	39.1	33
60 min Winter	59.033	0.0	55.5	62
120 min Winter	36.216	0.0	68.1	120
180 min Winter	26.756	0.0	75.4	180
240 min Winter	21.503	0.0	80.7	238
360 min Winter	15.799	0.0	88.7	352
480 min Winter	12.674	0.0	94.4	464
600 min Winter	10.672	0.0	98.9	572
720 min Winter	9.269	0.0	102.5	672
960 min Winter	7.414	0.0	107.4	760
1440 min Winter	5.401	0.0	111.5	1068
2160 min Winter	3.927	0.0	135.9	1516
2880 min Winter	3.128	0.0	144.1	1960
4320 min Winter	2.265	0.0	155.3	2772
5760 min Winter	1.800	0.0	167.1	3576
7200 min Winter	1.508	0.0	175.0	4392
8640 min Winter	1.305	0.0	181.5	5104
10080 min Winter	1.155	0.0	186.9	5848

Rainfall Details

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)	20.800	Shortest Storm (mins)	15
Ratio R	0.355	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.097

Time (mins) From:	To:	Area (ha)
0	4	0.097

Model Details

Storage is Online Cover Level (m) 51.000

Cellular Storage Structure

Invert Level (m) 49.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	220.0	0.400	220.0	243.7

Orifice Outflow Control

Diameter (m) 0.028 Discharge Coefficient 0.600 Invert Level (m) 49.500

Stantec

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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