



Havant Thicket Reservoir – Main Pipeline Works

Drainage Management Plan

HTR-WAB-PI-ZZ-PL-W-0011

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For Construction Approval

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Havant Thicket Reservoir – Main Pipeline Works

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1 Abbreviations and Definitions

CEMP	=	Construction Environmental Management Plan
DMP	=	Drainage Management Plan
EA	=	Environment Agency
HTR	=	Havant Thicket Reservoir
MPW	=	Main Pipeline Works
PMMP	=	Pollution Management and Mitigation Plan
POR	=	Portsmouth Water Limited
REAC	=	Register of Environmental Actions and Commitments
RMA	=	Reserved Matters Application
SAC	=	Special Area for Conservation
SPA	=	Special Protected Areas
SPZ	=	Source Protection Zone
SWS	=	Southern Water
WAB	=	Ward and Burke Construction Limited
HBC	=	Havant Borough Council

2 Introduction

- The objective of the Havant Thicket Reservoir Project is to provide a new resource to supply drinking water in the water-stressed Southeast of England, while maximising the community and environmental benefits of a new raw water reservoir.
- Ward and Burke (WAB) have been appointed by Portsmouth Water Limited (POR) to design, construct, and commission a new pipeline connecting Bedhampton Pumping Station to Havant Thicket Reservoir, including an emergency discharge structure at the Hermitage Stream, culvert upgrades and an Under Track Crossing.
- The pipeline corridor extends from the Portsmouth Water pumping station at the Bedhampton works, northwards to the proposed control house within the reservoir site. It passes through the Leigh Park Estate under local roads and open spaces. The corridor also runs north along the Hermitage Stream before turning north-east and broadly following the Riders Lane Stream towards the reservoir site. The southernmost point of the pipeline is located approximately 1 km north of Chichester Harbour and Langstone Harbour, which are Special Protected Areas (SPA) and Solent Maritime Special Area for Conservation (SAC).
- A combination of open cut and micro-tunnelling techniques will be used for the construction of the pipeline. Open cut techniques will take place in two locations: the council playing fields adjacent to Havant Rugby Club; and land in the southwest of Staunton Country Park. Micro-tunnelling will be used for the remainder of the pipeline construction facilitated by eight construction shafts and the emergency discharge chambers.

2.1 Project Drivers

Portsmouth Water have outlined seven strategic drivers for this project to ensure continued focus on meeting the Project's objectives. These project drivers are:

- **Quality:** Quality in procurement, design, and delivery to deliver an exemplar project to serve Customers in the short, medium, and long term,
- **Timeliness:** In service and operating by 2029 to support a major bulk transfer to Southern Water,
- **Innovation:** Develop best practice in the largest new reservoir project in the southeast for decades. Capture learning from companies working in partnership to deliver better value for Customers,
- **Flexibility:** Create a project that offers multiple uses and enables Portsmouth Water to be a strategic water supplier for the South over the medium and long term,
- **Responsibility:** Realise and build upon our health, safety, and well-being goals,
- **Connectivity:** Positive connection for all stakeholders – Customers, the local community, regulators, staff, contractors, shareholders, commercial partners, environmental groups, and individuals with a passion for the environment, and
- **Environment:** A positive contribution to local and internationally important habitats. Direct support for Government's objective to reduce the damaging abstraction of water from rivers.

2.2 Scope of Document

2.2.1 REAC Commitments

This Drainage Management Plan (DMP) is intended to outline the drainage strategies WAB will adapt throughout the construction of the Main Pipeline Works (MPW). As part of the Register of Environmental Actions and Commitments (REAC) included in Appendix A of the Construction Environmental Management Plan (CEMP)(HTR-WAB-PI-XX-HS-W-0006), several requirements are outlined which WAB will adapt in relation to drainage management which include:

- **Ref. Pipeline B10** - Discharges to surface water drainage or watercourses associated with shaft construction, and non-emergency washout valve testing will require environmental permitting. A management plan will be implemented to ensure appropriate treatment prior to discharge to any existing surface water drainage or watercourses.
- **Ref. Pipeline W1** - In context of a sensitive Secondary A and Principal Aquifer used for drinking water, construction and operational discharges to groundwater will be avoided. For access roads, road runoff drainage systems will be designed to minimise runoff soakaway drainage to ground, and pollution control measures will be installed on all access roads.
- **Ref. Pipeline VCC1** - Follow actions and commitments set out in FRA to avoid flooding brought about by extreme rain or during wetter winters (to be implemented by the drainage strategy plan, construction environment management plan and flood risk activity permits).
- **Ref. Pipeline W1** - Dewatering flows will need to comply with any associated permits or regulatory position statements and groundwater quality sampling may be required prior to discharge.
- **Ref. Pipeline W1** - Inclusion of specific sediment management measures to protect hydromorphology, the sediment plan will also consider movement of sediments from site to truck and truck to offsite.
- **Ref. Pipeline B6** - The PC will adopt best practice to avoid pollution of watercourses. This is to include but is not limited to adherence to Guidelines for Pollution Prevention (GPP), latest Environment Agency pollution guidance available from data.gov, and Construction Industry Research and Information Associated (CIRIA) guidance on the control of water pollution from construction sites.

Proposed temporary drainage will be carried out to current best practice guidance and based on the available information for the existing site/s. The objective of this document is to minimise the risk of surface water flooding during the construction phase, to prevent pollution of surface watercourses and to minimise the impact on local surface water features. Details for Shaft W1 drainage management can be found in the Shaft W1 DMP (HTR-WAB-PI-W1-PL-W-0004), with this document submitted and approved as part of a separate RMA planning application.

This document is required to discharge Condition 8 of permission reference HBC APP/24/00405. The requirements of this Condition and where within this document the requirements are addressed are set out in Table 2.1 below.

This drainage strategy will be regularly reviewed to ensure that the measures and commitments outlined within are being correctly implemented. Any required changes to the drainage at each works area will be updated within this plan.

Table 2.1 – Condition 8 of APP/24/00405

Condition 8 – Surface Water Drainage (SUDS) & Drainage Management	
<p>No development shall commence within a Phase until a detailed surface water drainage scheme for that Phase, has been submitted to and approved in writing by the Local Planning Authority. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.</p> <p>Reason: To ensure a sustainable drainage system is implemented to manage the increased risk of flooding, to improve and protect water quality and improve habitat and amenity.</p>	
Detail	Addressed
Surface Water Drainage Scheme	Section 4
Surface Water Drainage Details	App. A: Site Compound Layout/s

The relevant phase/s of the condition (listed in Table 2.1) this document revision seeks to address are specified in Table 2.2 below. Previously discharged phases of the condition, as well as those to be discharged in future submissions, are also listed.

Table 2.2 – Phase Submission Checklist

Phase Ref	Elements Covered	Discharge in this Submission
1	Pipeline Section P0 [FUW] (Bedhampton, associated infra.)	
2a	Pipeline Section P0 [WAB] Shaft W1 works (ex. Shaft)	
2b	Pipeline Sections P1/P2 Shafts W2/W3	✓
3	Pipeline Sections P3/P4 Shafts W3/W4/ED	✓
4	Pipeline Sections P5/P6 Shafts ED/W5/W6	P
5	Pipeline Sections P7/P8 Shafts W6/W7/W8	
6	Pipeline Section P9	
7	Pipeline Section P10 [FUW] (Reservoir, associated infra.)	
8	Purbrook Way Culvert	
9	Dunsbury Way Culvert	
10	Middle Park Way Culvert	
N/A	Shaft W1 (subject of separate Reserved Matters Application APP/24/00204 linked to original outline planning permission APP/20/00991)	✓ (Previously Discharged)

3 Works Overview

3.1 Working Areas

This document covers details of general measures for the 8Nr. separate compound work areas and 2Nr. open-cut pipeline installations across the scheme, as well as compound specific site layout plans for Shaft W2, Shaft W3 and Pipeline P2, and Shaft W4 and Shaft ED. Further updates/addendums to this document will provide specific details for the subsequent work phases and relevant areas listed below:

- **Shaft W2** (*off Hooks Farm Way*)
- **Shaft W3** (*off Hooks Farm Way*)
- **Shaft W4** (*off Stockheath Lane*)
- **Emergency Discharge (ED) Shaft and associated works** (*off Purbrook Way*)
- Shaft W5 (*off Purbrook Way and Riders Lane*)
- Shaft W6 (*off Dunsbury Way*)
- Shaft W7 (*off High Lawn Way*)
- Shaft W8 (*off Middle Park Way*)
- **Pipeline P2** (*off Hooks Farm Way, Hooks Lane Playing Fields, between W2 and W3*)
- Pipeline P9 (*off Middle Park Way, Staunton Country Park, between W8 and Reservoir Interface*)

3.2 Construction Methodology

The scheme comprises of the following main activities, typically completed in sequence. Pipework installation along the route is completed by: micro-tunnelling and subsequent tunnel pipework installation *or* open-cut pipework installation.

- Working area setup
- Shaft construction
- Micro tunnelling
- Tunnel pipework installation
- Open cut pipework installation
- Shaft pipework installation
- Pipework testing

3.3 Assumptions

The following assumptions have been made in the development of the drainage strategy:

- Where drainage surveys are incomplete, connectivity has been assumed based on engineering judgement as appropriate.
- Some shafts will be constructed underwater, until fully sealed against groundwater ingress. The water level inside these shafts will be maintained to balance the surrounding ground water table pressures and to avoid ground heave during excavation. This measure eliminates the need for constant de-watering of the surrounding areas during construction.
- Appropriate existing drainage infrastructure at shaft compounds will be utilised for water discharge where feasible, pending prior consent from utility asset owners.
- Water discharge consents will be obtained from the EA prior to any discharge relating to dewatering activities on site.
- Where discharge to existing drainage/sewers is not possible/practicable, discharge from dewatering activities will be via the Hermitage Stream or Riders Lane (pending the appropriate consent/s and environmental permits).
- Prior to works commencing at any site areas, existing gullies and other drainage features are to be assessed and confirmed to work sufficiently to provide suitable drainage to the existing surrounding areas. If maintenance measures are required, the asset owners are to be contacted, with issues recorded and appropriate action taken where practicable.

3.4 Route Overview

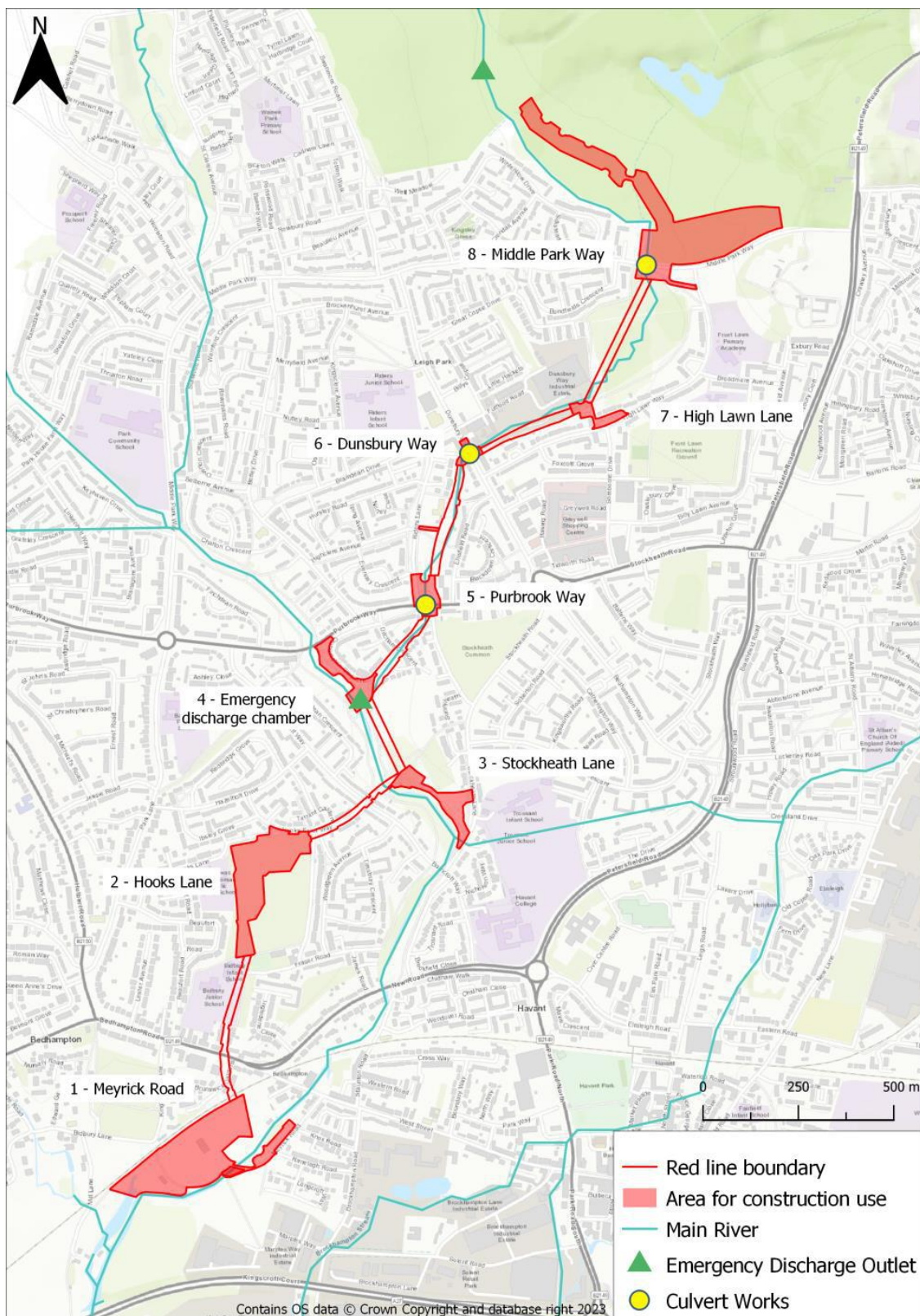


Figure 3.1 - Scheme Overview

The separate work areas along the scheme are identified in Figure 3.2 below. Pipeline sections P1, and sections P3-P8 are all constructed using micro-tunnelling methods and will have no impact on surface water drainage.

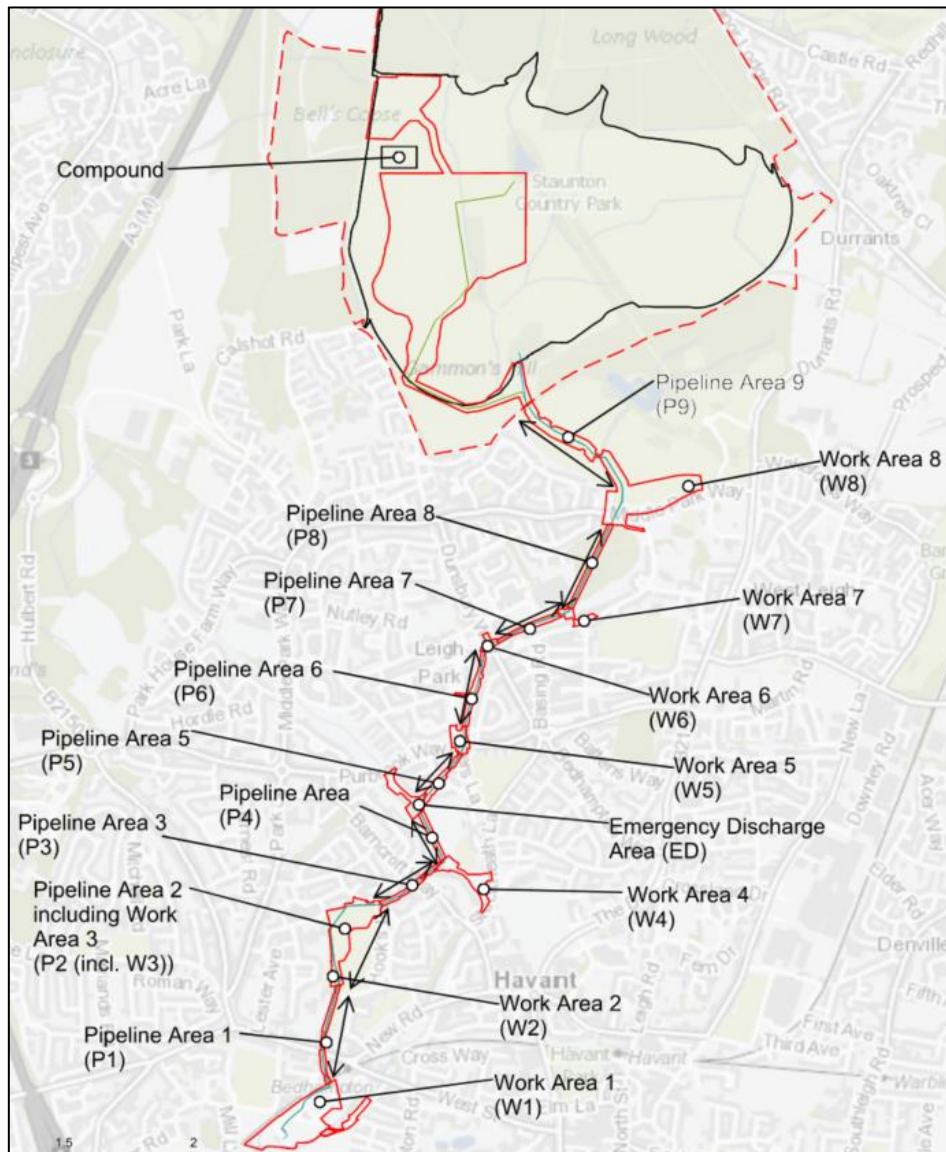


Figure 3.2 – Separate Work Areas and Pipeline Sections

3.5 Scheme Rivers / Catchments

Within the pipeline route there are two EA defined rivers, the Hermitage Stream and the Riders Lane Stream. The Hermitage Stream has an approximate catchment size of 20km², however 4.5km² of that area is attributed to the Riders Lane Stream catchment. The upper catchment of the Riders Lane Stream includes five Headwater Streams which are all Ordinary Watercourses along with the uppermost section of the Riders Lane Stream.

3.6 Flood Risk



Figure 3.3 - Flood zones across the pipeline route

Figure 3.3 above highlights the flood zones across the pipeline route in accordance with the Environment Agency Flood Map. Flood Zones are defined in Table 3.1 below:

Table 3.1 - Environment Agency Flood Zones

Flood Zone	Definition
Flood Zone 1: Low Probability	Land where the annual chance of flooding is lower than 0.1% for either fluvial or sea flooding.

Flood Zone 2: Medium Probability	Land where the annual chance of flooding is between 0.1 and 1.0% for fluvial flooding. Or, land where the annual chance of flooding is between 0.1 and 0.5% for flooding from the sea.
Flood Zone 3a: High Probability	Land where the annual chance of flooding is 1.0% or greater for fluvial flooding. Or, land where the annual chance of flooding is 0.5% or greater for flooding from the sea.
Flood Zone 3b: Functional Floodplain	Land where water has to flow or be stored in times of flooding. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Local planning authorities identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. Functional floodplain will normally comprise: Land where the annual chance of flooding is 3.3% or greater for fluvial. Or, land that is designed to flood, even if it would only flood in more extreme events

A total of six of the eight construction compounds across the scheme have some areas that fall within the predicted 1% Annual Exceedance Probability (AEP) for flooding, which indicates that these compounds are within the Flood Zone 3 threshold. Table 3.2 outlines the percentage area of each construction compound that falls within the Flood Zone 3 threshold. Only construction compound W4 features an area of the compound in Zone 3 greater than 10%.

Table 3.2 - Construction Compounds

Construction compound number	Compound Area (m²)	% of Compound in 1% AEP (Zone 3)
W1	48,000	1.6
W2	30,000	0
W3	10,000	1.0
W4	8,000	12.5
ED	7,500	9.0
W5	6,000	3.8
W6	2,300	4.8
W7	4,000	0
W8	60,000	0.2

4 Drainage Scheme

The site compounds across the scheme generally feature below ground infrastructure that is to be covered over and left with minimal permanent above ground features. Such areas are to be reinstated back to their existing conditions.

Sites such as the Emergency Discharge (ED) area will feature permanent above ground structures, and as such will require appropriate drainage measures to suit.

Calculations for Greenfield or Brownfield runoff rates for each relevant site are to be provided in Appendix B to showcase existing site conditions, with the 1 in 10-year storm data taken as appropriate for the temporary construction period. The development does not permanently materially increase the area of impermeable surfaces across the scheme, with typically only the shaft areas being permanent near-surface level features. Following reinstatement, generally only permanent manhole covers reduce the existing surface area contributing to surface water infiltration, with negligible effects to runoff expected.

During the temporary construction period, haul roads and compound areas are to be constructed of unbound permeable material and will not negatively contribute to increased levels of surface water run-off. Surface water is to be allowed to drain freely and via existing drainage measures.

4.1 Best Practice Guidance

Temporary site drainage will be undertaken in accordance with the following guidance:

- EA Pollution Prevention Guidance (withdrawn, but useful best practice guidance):
 - EA (2014a) Pollution Prevention Guidance Note 6: Pollution Prevention Guidelines – Working at Construction and Demolition Sites;
 - EA (2014b) Pollution Prevention Guidance Note 5: – Working in, near or liable to affect watercourses;
- CIRIA (2001) Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors.
- CIRIA (2015a) SuDS Manual, including the following measures:
 - Prevent surface water being affected during earthwork operations. No discharge to surface watercourses will occur without permission from the EA;
 - Wheel washers and dust suppression measures to be used as appropriate to prevent the migration of pollutants;
 - Regular cleaning of roads of any construction waste and dirt to be carried out;
 - A construction method statement to be submitted for approval by the responsible authority.
- CIRIA (2015b) Environmental good practice on site guide.

4.2 Temporary Drainage

General surface water management measures common to each work area are detailed in the sections below. Details specific to individual sites can be found within the relevant headings where required and within the site compound layout drawings in Appendix A. These drawings detail the following typical details:

- Temporary site compound/haul road hardstanding makeup (inc. direction of falls)
- Indicative locations of bunded areas (e.g for generators, fuel storage etc.)

- Proposed site drainage detail/location

4.2.1 Temporary Access Haul Roads

For access to some compound work areas, temporary haul roads are required.

- Temporary on-site haul roads will be designed so that the overall length is minimised where possible. Stakeholder requirements (e.g avoiding the rugby pitch boundaries at P2) may increase these lengths where unavoidable.
- Temporary haul roads will be constructed using permeable aggregate material underlain by a permeable geotextile membrane. The permeable unbound material will allow water to percolate through the road surface into the ground below. This will therefore generate similar runoff volumes to the naturally occurring clay subgrade typically found across the scheme. Any surface water runoff from these areas will drain as existing.
 - Haul roads are required at the W2, W3, W4, ED and W8 compound areas, and will be constructed through the removal of existing topsoil and subsoil to the existing clay subgrade.
- Works for haul road construction are to take place during dry weather periods to reduce the risk of site runoff or pollution due to heavy rainfall or flooding.

Any areas found to have prevalent run-off following installation will be identified through weekly inspections by the Site Manager, with this actively managed through bunding and / or temporary drainage.

Haul roads are for travel only, with no vehicles left stationary on these sections of the site – the risk of pollutants in surface water run-off is therefore low, with a permeable geotextile membrane suitable for this specific area to be installed throughout.

Silt fencing will be installed at the low side/s of any proposed haul roads to prevent significant quantities of suspended solids within run-off from entering existing watercourses or drainage systems.

4.2.2 Temporary Compound Work Areas

Where compound areas are required to be stoned up to provide a suitable clean working space (where existing hardstanding is non-existent or unsuitable for the proposed purpose), a layer of permeable geotextile membrane will be laid out at formation level within the compound footprint/s, with a minimum 300m overlap between layers to be maintained throughout. Similar to the temporary access haul roads, a suitably thick layer of permeable aggregate material is to be spread out across the area which will also allow for free drainage, allowing water to percolate through the surface and into the ground. Areas that require working platforms for specific items of plant are to be constructed as per any approved Temporary Works design, and may require an increased depth of stone build-up or additional layers of geotextile or geogrid. Any drainage implications for these working platforms are to be considered by the designer, with any identified issues during inspection reported back and managed appropriately.

Works for compound area construction are to take place during dry weather periods where possible to reduce the risk of site runoff or pollution due to heavy rainfall or flooding during construction. Any areas found to have prevalent run-off will be identified through weekly inspections by the Site Manager, with this actively managed through bunding and / or temporary drainage.

4.2.3 Compound Storage Areas

Temporary concrete bunded areas will be constructed within compound work areas for the storage of diesel and any COSHH materials, with an impermeable base capable of handling a spill during delivery. This will limit the potential for migration of contaminants into groundwater in the event of a leak or spillage. A designated area will be used for

any refuelling activities, as far away from any watercourses as possible. Absorbent sheets and granules will be stored at this location and clearly signed. All mobile plant is to be refuelled at least 20m away from any adjacent watercourses – large plant is to be tracked to the edge of their platform farthest from a watercourse prior to refuelling.

- Any bunds are to have a capacity of the stored volume plus 10 per cent as a minimum.
- Absorbent sheets and granules will be stored at all COSHH storage locations and clearly signed.
- Plant nappies will be used during refuelling.
- All mobile plant is to be refuelled at least 20m away from any adjacent watercourses or drainage systems or as far as reasonably practicable.

Any wet excavated material from shaft construction at each work areas will be stored within bunded concrete areas and dried prior to removal from site. A sump will be installed within bunds to allow for the collection of water. This water is to be removed from the bund and treated to remove suspended solids or other contaminants as appropriate, and only when meeting the requirements of any EA discharge permit is this water to be discharged to either Hermitage or Riders Lane stream, and is to be disposed of off-site (via a tanker or otherwise) if these conditions are not able to be met.

Storage areas within compounds are to be located outside of the Zone 3 areas identified (high flood risk, >1% AEP) where reasonably practicable. This is to avoid the temporary loss of floodplain storage within the construction compounds, as well as reducing the likelihood of water pollution in the unlikely event that a compound becomes flooded. Figure 3.3 highlights the areas within the red line boundary that are within the 1% AEP (Flood Zone 3), and Table 3.2 lists the percentage areas of Zone 3 within each compound area.

4.2.4 Open-cut Pipeline Installation

Open cut pipeline works are to be carried out during dry weather periods, to reduce the risk of site run-off or pollution due to heavy rainfall or flooding. For pipeline section P2, sections adjacent to school buildings are limited to only take place during the school summer holidays.

The open-cut pipeline works are to take place linearly, with only a small trench section (typically a standard pipe length, ~8m) excavated and open at any one time, with a negligible effect on existing infiltration over the full greenfield surface areas (at both P2 and P9).

Small amounts of dewatering may be required within the trenched excavation during pipework installation; however concurrent shaft works (P2 pipework falling towards Shaft Area W2) and dewatering at these shaft locations may reduce the volumes required to be removed or deem it unnecessary. Any water removed from the excavation is to be pumped to the nearest appropriate treatment arrangement prior to discharge (at either Shaft Area W2 or W3 depending on pipework chainage), and appropriate storage, treatment and discharge constraints at the shaft locations are to apply, with the relevant permits and water quality requirements in place prior to discharge to either the surface water sewer or to a watercourse.

4.3 Sediment Control,

The management of suspended sediment in any application can be broadly broken down into the following three components:

- Mitigation at source;
- Mitigation during the drainage transportation phase;
- Mitigation subsequent to the transportation phase and prior to site discharge.

Following this approach, WAB are committed to implementing the following general measures as a minimum at each of the site areas:

- Silt collection fencing at the low point of haul roads (where required).
- Flooded excavation of shafts where possible (i.e. where Artesian groundwater is not present) in order to reduce ground dewatering requirements and potential silt transport to rivers.
- Geofilters on dewatering well boreholes to control the ingress of fines.
- Appropriate solids removal treatment (e.g lamella clarifiers, chemical dosing where required depending on flowrates and solids load) at each discharge location prior to discharge, either to the sewer network or directly to a main river.
- Appropriate soakaways on sites without connection to surface / foul water drainage.
- Sealed concrete bunded muck bays for shaft and tunnel construction to allow material to dry out prior to removal. Excess water can be removed from site as waste by a licensed carrier or where possible treated prior to discharge to the environment. Contaminated water is to be disposed of off site at a licenced facility.
- EA Flood risk activity permits (FRAPs) in place for works in-channel, or within the flood zone, or otherwise where required.
 - Works carried out on behalf of a statutory undertaker (Portsmouth Water) benefit from protected undertakings. FRAPs will generally only be required when working directly in the watercourse.
- Protection of existing surface water sewer systems adjacent to or within site areas through the use of geotextile filters or similar products.
- Stockpiles produced during excavation works are to be covered and protected to prevent run-off during weather events.

In addition to the above, specific measures may be detailed in RAMS documents for specific silt producing tasks to reduce the likelihood of silt entering watercourses or drainage systems.

4.4 Welfare Drainage

Where temporary foul connections to sewer for compound welfare units are not possible, wastewater from welfare units will be collected either within integrated waste tanks or separate standalone concrete bunded septic/waste tanks. This is to be removed from site via licensed waste hauliers in waste tankers on a regular basis as appropriate for the staff numbers present at each site.

4.5 Permanent Drainage

The scheme will result in the creation of new permanent hardstanding areas required for access to the new pipeline infrastructure. These will be in the form of a permanent access road to the Emergency Discharge Chamber. This represents a new permanent hard standing which has the potential to increase surface water run-off. Drainage techniques to intercept surface water run-off will need to be implemented following best practice guidance outlined in 4.1 Best Practice Guidance. Existing service drawings of the area will be consulted prior to any detailed drainage design to incorporate new drainage with pre-existing drainage on site where feasible.

4.5.1 Solutions

- **Swale Drains** – Swales are a useful method for draining sections of road where the new road is constructed

close to the existing ground level and there are few buried services alongside or crossing the new road. Swales are usually not suitable where roads are located on embankments or where space is limited so this needs to be considered when considering the use of swales for any new permanent access roads. Figure 4.1 below outlines the typical design of a swale drainage system. Swale Drain design will be carried out following best practice guidance from the Ciria 2015 SuDS manual¹ (Chapter 17).

- **Pervious Pavements** – Pervious pavements provide a suitable surface for both pedestrian and vehicle movement. This type of pavement allows rainwater to infiltrate through the surface and into the underlying layers. A typical system can be seen in Figure 4.2.
- **Proprietary treatment systems** - Proprietary treatment systems are manufactured products that remove specified pollutants from surface water runoff. They are especially useful where site constraints preclude the use of other methods or where they offer specific benefits in facilitating the delivery of SuDS design criteria for a site. A typical system can be seen in Figure 4.3.
- **Attenuation storage** – Attenuation storage tanks are used to create a below-ground void space for the temporary storage of surface water beyond infiltration and may be combined with solutions such as swales.

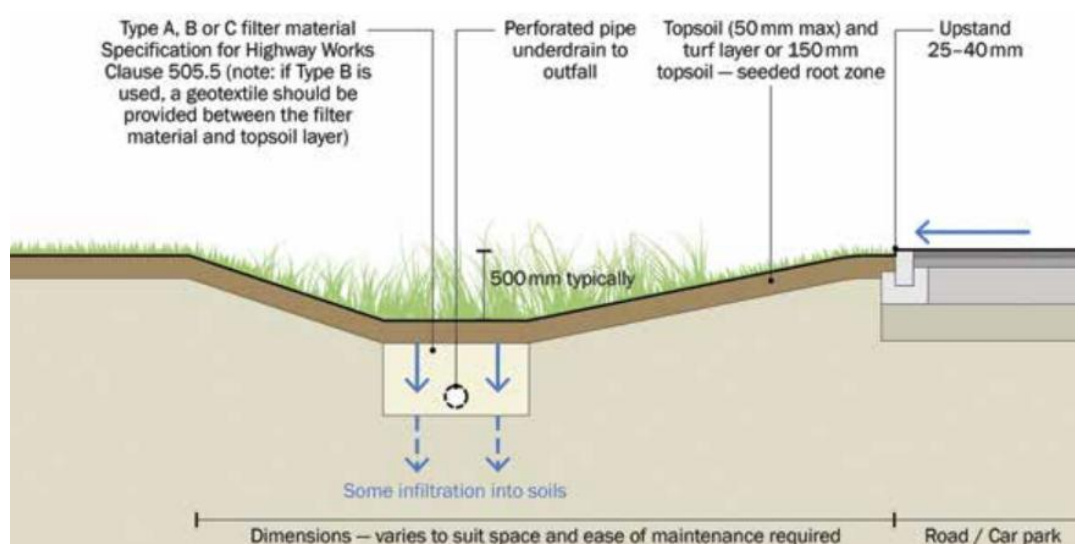


Figure 4.1 - Swale Drainage detail

¹ The suds manual (2016). London: CIRIA.

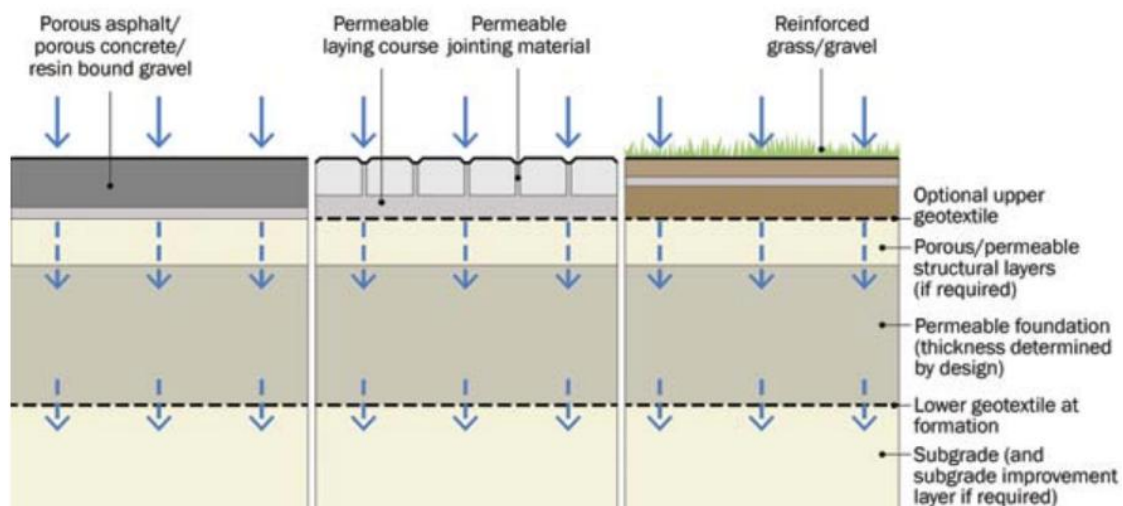


Figure 4.2 - Pervious Pavement system total infiltration

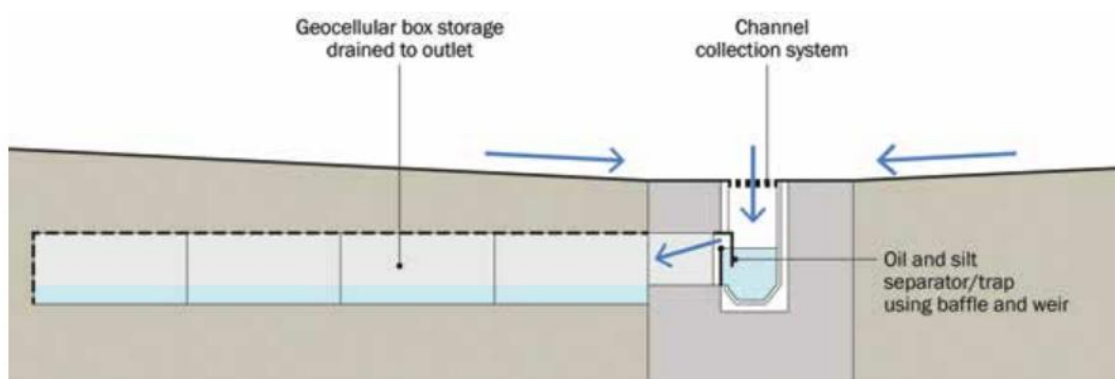


Figure 4.3 - Common example of proprietary treatment system

4.6 Pollution Mitigation

A Construction Environmental Management Plan (CEMP) has been produced for both the Shaft W1 works (HTR-WAB-PI-W1-HS-W-0001) and the Main Pipeline Works (HTR-WAB-PI-XX-HS-W-0006) which outlines a number of measures to mitigate the risk of pollution. A Pollution Mitigation and Management Plan (PMMP) (HTR-WAB-PI-XX-HS-W-0007) has also been produced for the Main Pipeline Works which outlines mitigation measures for the protection of watercourses during scheme construction.

All relevant construction drainage mitigation details in the above documents are included within this document, however further details regarding specific scenarios can be found in those documents referenced above.

5 Monitoring

All temporary haul roads and construction compounds will be monitored weekly as part of the Site Managers weekly inspection record. Roads and work areas will be assessed for integrity and to ensure that no water is accumulating on the surface. Checks will be made to determine if surface water is effectively percolating through the permeable layers of stone and geotextile.

Bunded areas for excavated material storage will also be monitored as part of a weekly Temporary Works inspection. Bunds will be checked to ensure they are properly sealed and that wet material and silt is being effectively retained within the constructed bund area.

The performance of any in-situ water treatment systems that discharge water to the Heritage or Riders Lane streams will be monitored and inspected by the site management team on a weekly basis, with an appropriate sampling regime, to ensure effective processing of the treated water at each discharge location.

5.1 Maintenance

Haul roads and work areas will be regularly inspected and maintained to ensure water is adequately free draining through the stone surfaces. Maintenance activities are to be recorded by the Site Manager. These maintenance measures include:

- Clearance and removing of any excess dirt/dust or material accumulating on the road surface
- Repairing any damage caused by operational activities as soon as is reasonably practicable.
- Removal of any excess accumulations of sediment.
- Maintenance of bunded areas (for excavated material) will involve clearing of the sump area periodically, to remove excess accumulations of silt or debris (to ensure water can pool and be pumped effectively if required).
- Water treatment systems will be maintained as per supplier/manufacturers guidance and may require routine cleaning to remove any accumulated material.
- All plant and equipment will be regularly checked for wear and tear and undergo regular routine maintenance checks to prevent any oils accidentally entering the watercourse as a result of leaks or bursts when operating nearby.
- Any existing highway gullies or drainage systems located within or close to site areas will be inspected bi-annually, monitoring for blockages, and with maintenance including emptying/clearing of silt traps and gullies if required.

6 Site Work Areas

Site layouts are provided within Appendix A detailing the measures common to most shaft sites proposed across the pipeline scheme, including bunded areas, designated refuelling sites and measures, and temporary drainage features including cut-off drains.

In the event of a pollution incident within a site compound area, prevention of contaminants reaching existing surface water networks or watercourses is paramount. Cut-off drains are to feature within most site compounds where practicable, ensuring that site run-off can be captured and treated, and also isolated when required (e.g. in case of a larger spill that cannot be easily or quickly contained).

6.1 Shaft W2/W3/P2

The Shaft W2 and W3 site areas are temporary compounds that will be reinstated as per the approved landscape reinstatement plans upon completion of the works.

The sites sit within playing fields used predominantly by Havant Rugby Club. The pitches have been assessed as not featuring an existing drainage arrangement, with water draining naturally.

A topographical LiDAR survey was carried out on the full playing fields area, as can be seen in Figure 6.1. The ground typically falls from north to south, with Shaft W2 at the southern boundary significantly lower than Shaft W3 in the northeastern corner.

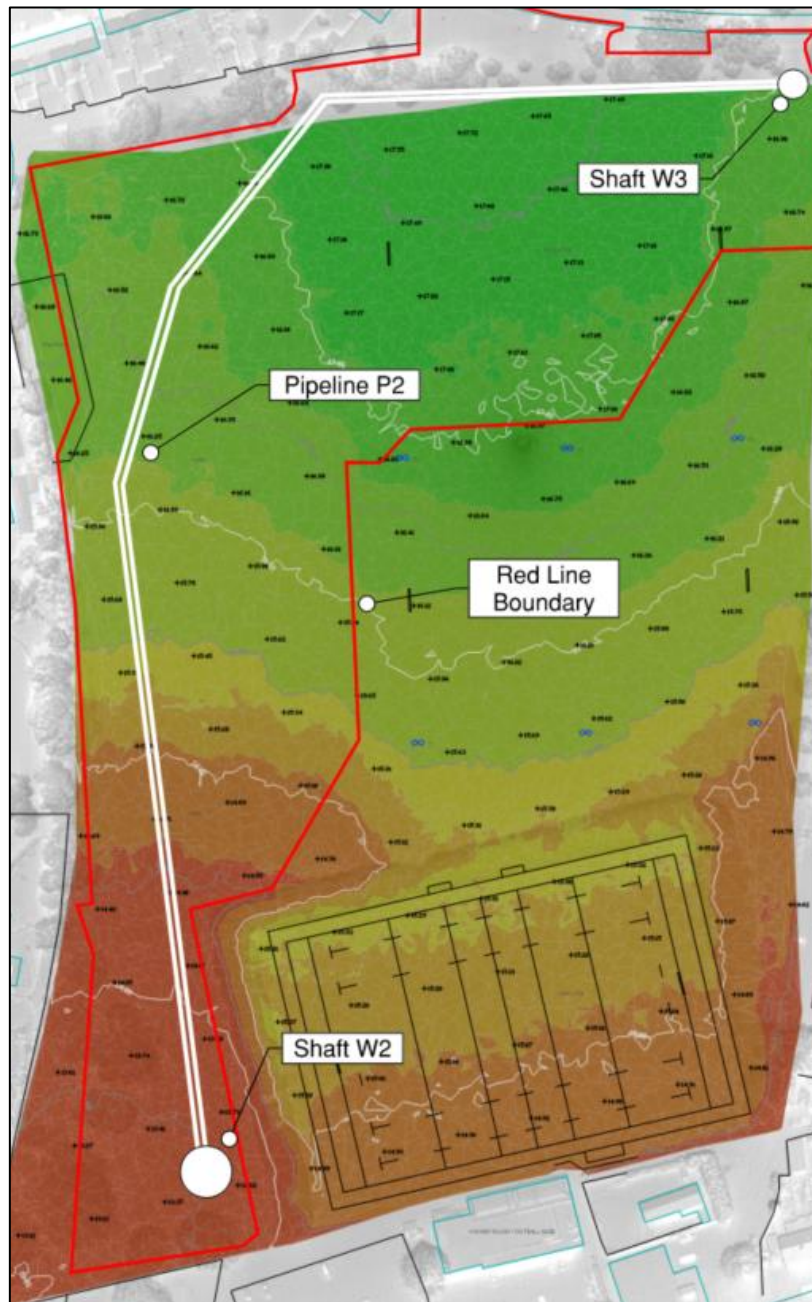


Figure 6.1 Topographical LiDAR Survey (Hooks Lane Playing Fields)

Existing surface water sewer drainage infrastructure can be found at the southwestern corner of the playing fields. With the appropriate permissions from the asset owner and pending successful granting of discharge licenses from the EA, this infrastructure will be utilised for surface water discharges when it cannot be avoided or minimised.

To date there is no record of existing drainage measures to aid in draining the Hooks Lane playing field area itself. During construction, the use of permeable surfacing will have a negligible effect on existing surface water infiltration and run-off. The permanent development results in a negligible loss of greenfield area following reinstatement, with only small manhole access covers remaining visible at ground level.

Temporary compound connections into existing surface water assets (following appropriate permissions and approvals) will potentially alleviate the risk of localised surface water flooding by allowing controlled inflows into the surface water sewer network where infiltration rates are poor in the existing clay subgrade.

6.2 Shaft W4

The Shaft W4 site area is a temporary compound that will be reinstated as per the approved landscape reinstatement plans upon completion of the works. 12.5% of the total W4 area shown in the red line boundary is in 1% AEP (Zone 3), however the majority of this area in Zone 3 is to the southwest of the proposed compound area, closest to Hermitage Stream. The majority of this area has been discounted as usable, and will not be fully utilised to reduce the risk of flooding of site compound and/or haul road areas.

The site sits within green open space colloquially referred to as Stockheath Meadow. The existing public footpaths to the northwest are known to become waterlogged during the winter months, with the central path found in a natural bowl running west to east. An existing deep foul sewer runs through the site footprint, with a raised manhole above ground located near a section of the site access haul road.

Existing surface water drainage infrastructure is located within the green space, to the southeast of the main compound, where surface water naturally falls towards, potentially fed by unmarked land drains throughout the area. This existing ground profile is to be maintained to minimise the impact to the existing drainage arrangements. With the appropriate permissions from the asset owner and pending successful granting of discharge licenses from the EA, this infrastructure will be utilised for surface water discharges when it cannot be avoided or minimised.

During construction, the use of permeable surfacing will have a negligible effect on existing surface water infiltration and run-off. The permanent development results in a negligible loss of greenfield area following reinstatement, with only small manhole access covers remaining visible at ground level.

Temporary compound connections into existing surface water assets (following appropriate permissions and approvals) will potentially alleviate the risk of localised surface water flooding by allowing controlled inflows into the surface water sewer network where infiltration rates are poor in the existing clay subgrade. Appropriately sized interceptors/isolations will be in place upstream of any new connections to ensure the compound area can be isolated where necessary in the event of a spill or where otherwise needed.

6.3 Shaft ED

The Shaft ED site area is initially a temporary construction compound. Following completion of the works the area is to be reinstated as per the approved landscape reinstatement plans, with an above ground kiosk and infrastructure as well as a new emergency discharge spillway into Hermitage Stream, upstream of the confluence of Hermitage Stream and Riders Lane Stream.

This iteration of the drainage management plan will cover solely the shaft and tunnelling works due to take place, with the subsequent spillway and permanent above ground infrastructure works to be covered in a later update.

The site sits within open green space to the south of Corhampton Crescent, and at the northern end of Stockheath Meadow.

9% of the total ED area shown in the red line boundary is in 1% AEP (Zone 3), however the majority of this area in Zone 3 is to the south of the proposed compound area, immediately adjacent to Hermitage Stream. The majority of this area has will not be fully utilised until the spillway installation works are to take place, with this work to be managed alongside acquisition of a FRAP.

A number of existing surface water sewers as well as a foul sewer run through the site footprint, with a number of manholes located within the compound footprint.

Evidence of existing surface water drainage infrastructure is located within the low spots of the green space, where surface water naturally falls towards, potentially fed by unmarked land drains throughout the area. This existing ground profile is to be maintained to minimise the impact to the existing drainage arrangements. With the

appropriate permissions from the asset owner and pending successful granting of discharge licenses from the EA, this infrastructure will be utilised for surface water discharges when it cannot be avoided or minimised.

During construction, the use of permeable surfacing will have a negligible effect on existing surface water infiltration and run-off. The permanent development results in a loss of greenfield area following reinstatement, however this permanent case is to be covered separately to the main civil construction works.

Temporary compound connections into existing surface water assets (following appropriate permissions and approvals) will potentially alleviate the risk of localised surface water flooding by allowing controlled inflows into the surface water sewer network where infiltration rates are poor in the existing clay subgrade. Appropriately sized interceptors/isolations will be in place upstream of any new connections to ensure the compound area can be isolated where necessary in the event of a spill or where otherwise needed.