

Drainage Strategy

Change of Use of Land (Use Class E) to form container storage (Use Class B8).

Land at former Quarry Farm, Ainsworth Lane, Knowsley, Lancs, L34 9EU.



Prepared For:

Mr. John Groves
Unity Commercial Developments Ltd,
Unit 4A Heysham Point,
Heysham Road,
Liverpool,
L30 6UR.

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Revision 1 (June 2023) – Addition of Hydrogeological Assessment of potential impact on groundwater

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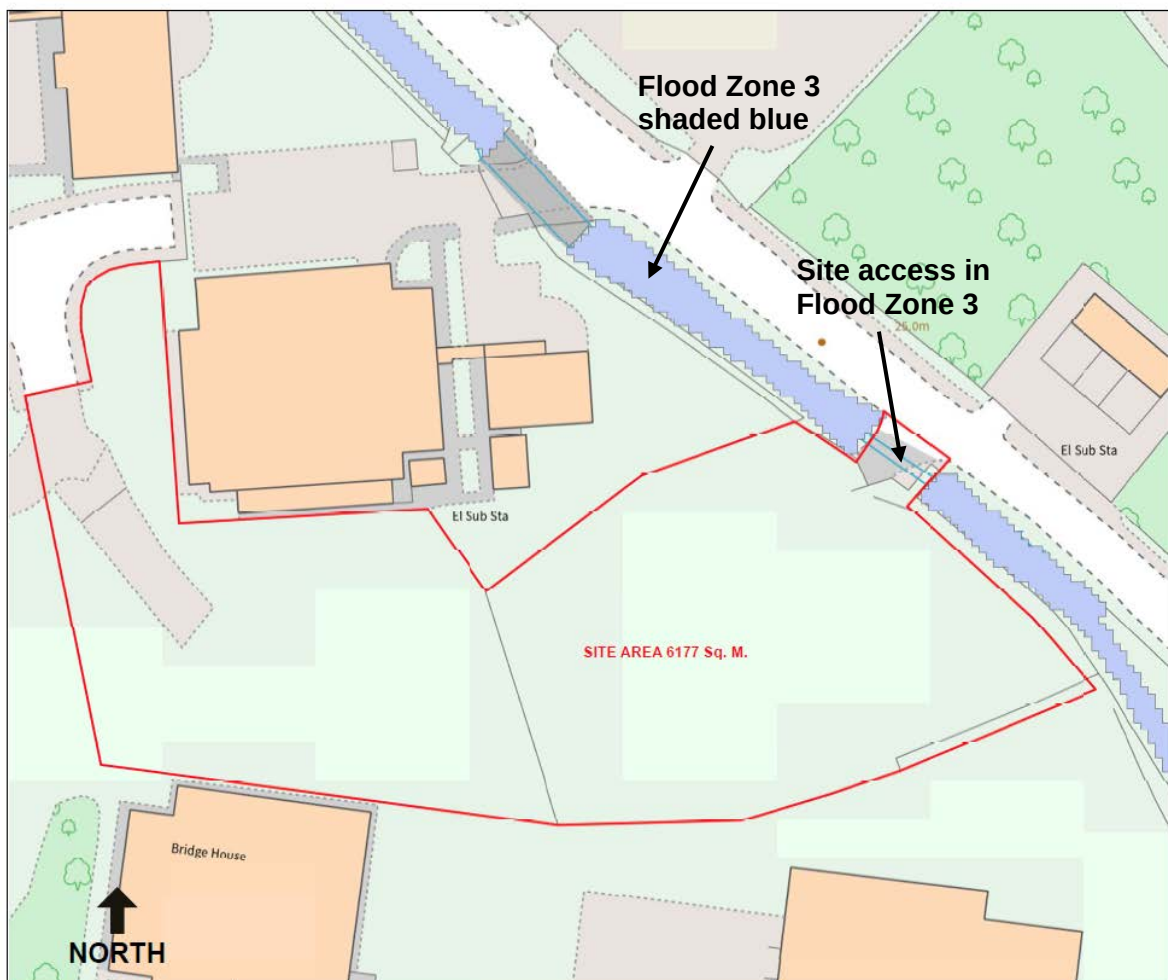
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Background and Introduction

This Drainage Strategy supports a planning application for change of use of land (Use Class E) to form container storage (Use Class B8) at former Quarry Farm, Ainsworth Lane, Knowsley, Lancashire, L34 9EU. The site area is 6,177 sq. m.

It has been requested by Knowsley Council because part of the application site has been identified as being within flood Zone 3.

According to the Environment Agency's Flood Map for Planning, the site is located within Flood Zone 1, but the Ainsworth Lane site access runs over a small, culverted section of Knowsley Brook measuring 25 sq. m. which is in Flood Zone 3a. This area represents 0.4% of the total 6,177 sq. m. site area. The remainder of the site is shown as "clear" and therefore classified as Zone 1, as shown on the plan below.



The planning application is solely for the change of use of the land to allow the temporary storage of shipping containers en-route to the Docks, together with the siting of two 'Portakabin' type units to provide mess, welfare, and toilet facilities.

There are no permanent structures proposed, nor are any engineering works proposed to create additional hard surfaces. The land is a cleared site and former farmyard following the demolition of former farm buildings in 2013 and consists of an existing crushed stone surface and existing concrete-paved accesses to Unity Grove and over the culvert to Ainsworth Lane. It must be emphasised that no engineering operations such as the formation of impermeable hard surfaces are proposed.

Summary of Flood Risk Assessment

A Flood Risk Assessment (forming a separate supporting document) has been undertaken using data supplied by the Environment Agency. This concluded that the site does not flood, there is no flood risk to this site from Knowsley Brook and there will be no increase in run-off to areas downstream. The site is not within the flood outline of the 0.1 % AEP + climate change flow modelled by the Knowsley Brook Study in 2017. The site does not form part of the watercourse floodplain and as demonstrated above, there can be no issue regarding loss of flood storage resulting from the change of use of the site.

Surface Water Drainage Strategy

The primary flood risk generated by any new development is the risk posed by an increase in surface water runoff. The Environment Agency state that in order to demonstrate that the development is of low risk, the applicant should show that it will be feasible to balance surface water run-off to the existing run-off rate in terms of a brownfield development for all events up to the 1 in 100 year storm (including a 30% allowance for climate change) and set out how this will be achieved.

As previously discussed, the development site comprises an existing crushed stone surface following the demolition of farm buildings in 2013. The proposed development will not increase the amount of hardstanding across the site, therefore larger surface water run-off rates / volumes will not need to be attenuated within the site boundary. Rainwater will continue to infiltrate into the ground through the crushed stone surface, as is already the case.

There will be no increase in run-off as a result of the change of use of the site because there are no permanent buildings or new areas of impermeable hardstanding proposed. The shipping containers are simply placed over the crushed stone surface and are only in partial contact with the ground (the only contact with the ground is at the edge beams). Rainwater can therefore percolate through the crushed surface and under the containers – see photo below.

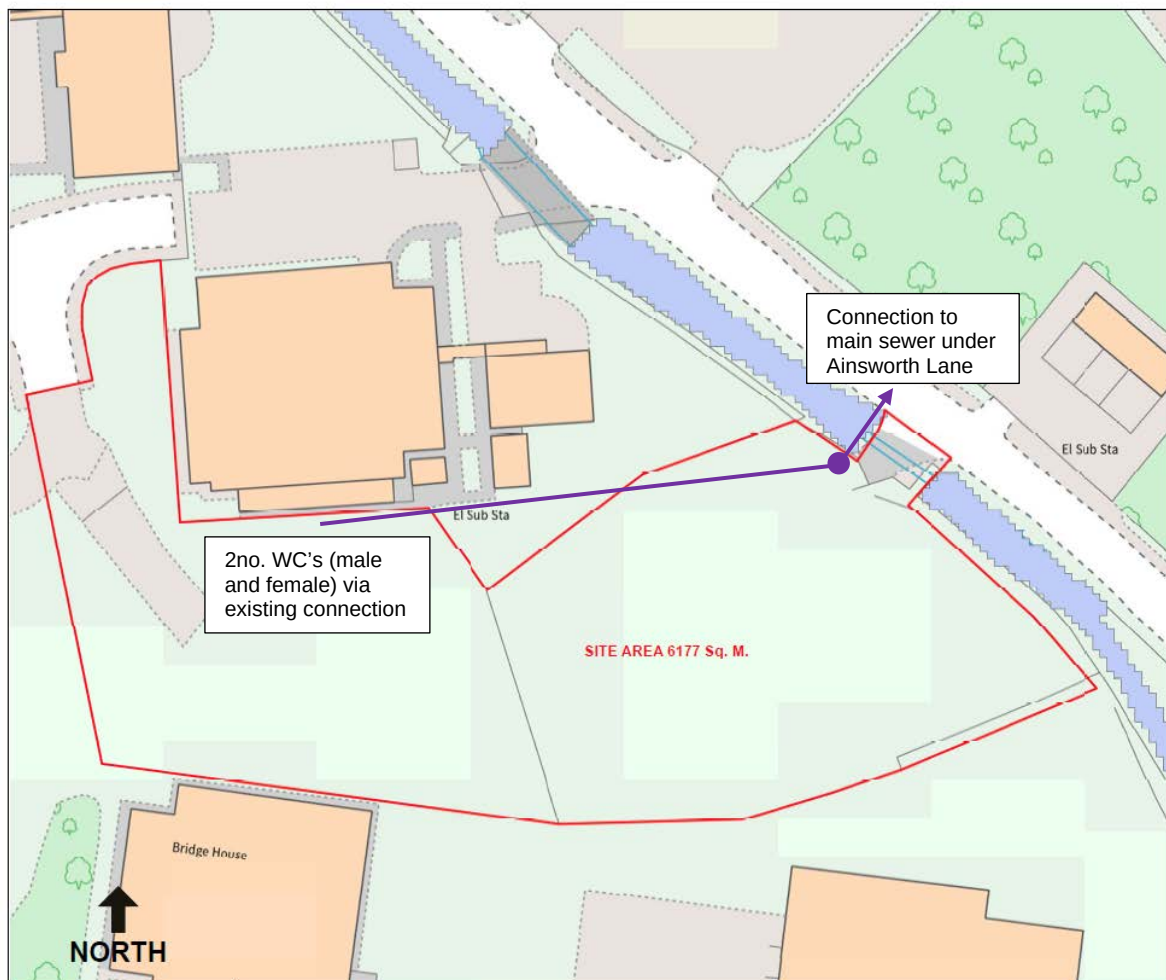


As there will be no change to existing surface water infiltration, nor any new paved areas, there is no need to install new attenuation such as soakaways or manage runoff into the watercourse

Foul Water Drainage Strategy

The existing foul sewer outfalls from the site via a 3m deep manhole adjacent to the access off Ainsworth Lane – shown in purple on the plan below. From here it is understood to connect into the main sewer. The site has a water services account with United Utilities.

There are presently 2 individual WC's connected to this foul drain, these are part of the mess and welfare facilities for the staff and are temporary 'Portakabin' buildings shown in the photograph overleaf.





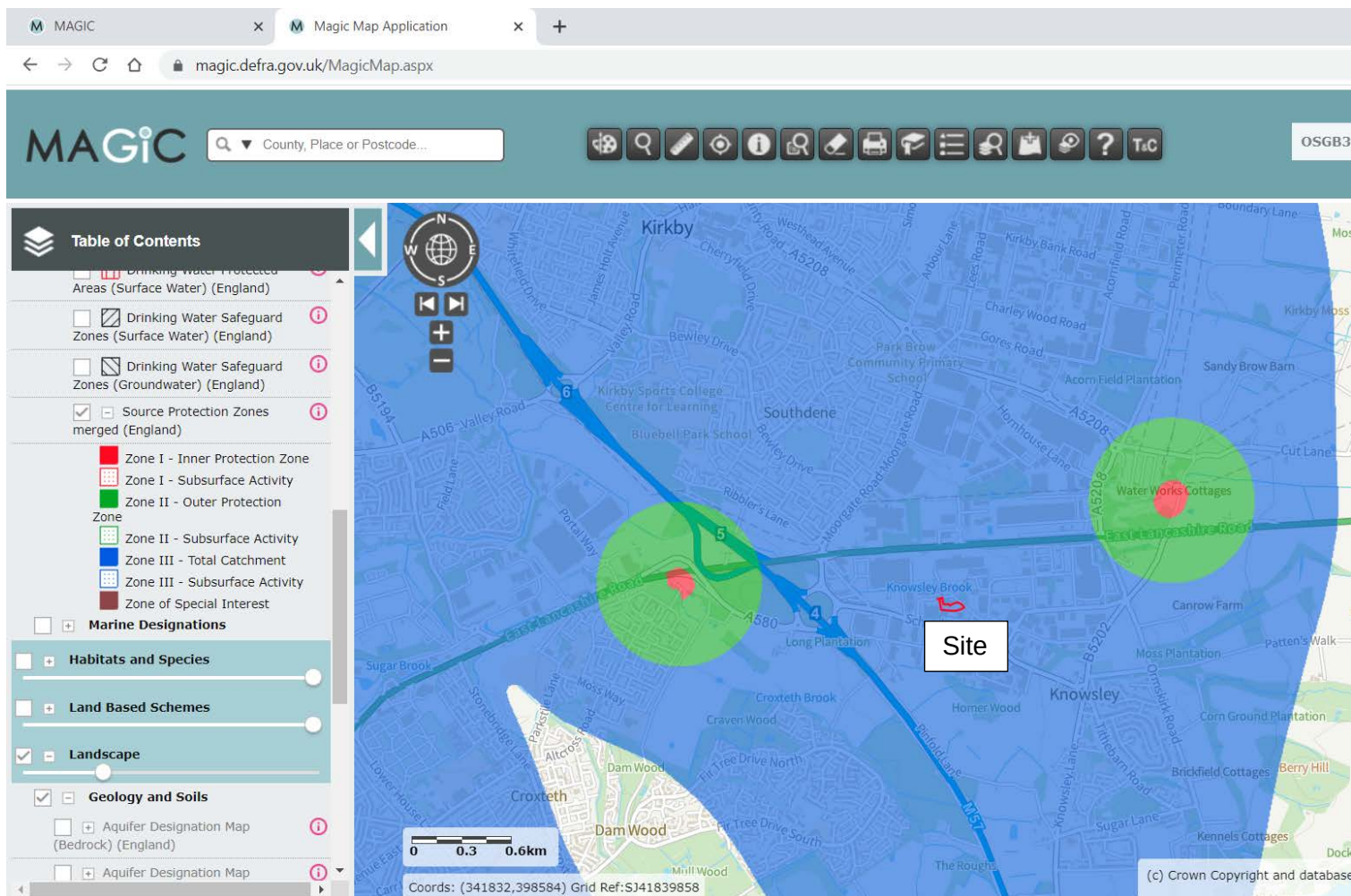
Impact on Groundwater

In response to the consultation response received from Knowsley Council's Lead Local Flood Authority dated 16th June 2023, a water quality assessment has been considered as part of the drainage strategy. We have undertaken a hydrogeological assessment in accordance with the Simplified Index Approach within Section 26 of the SuDS Manual (C753) to assess potential risks to groundwater and identify mitigation measures to ensure that contamination risks to groundwater from the surface water flows can be effectively managed.

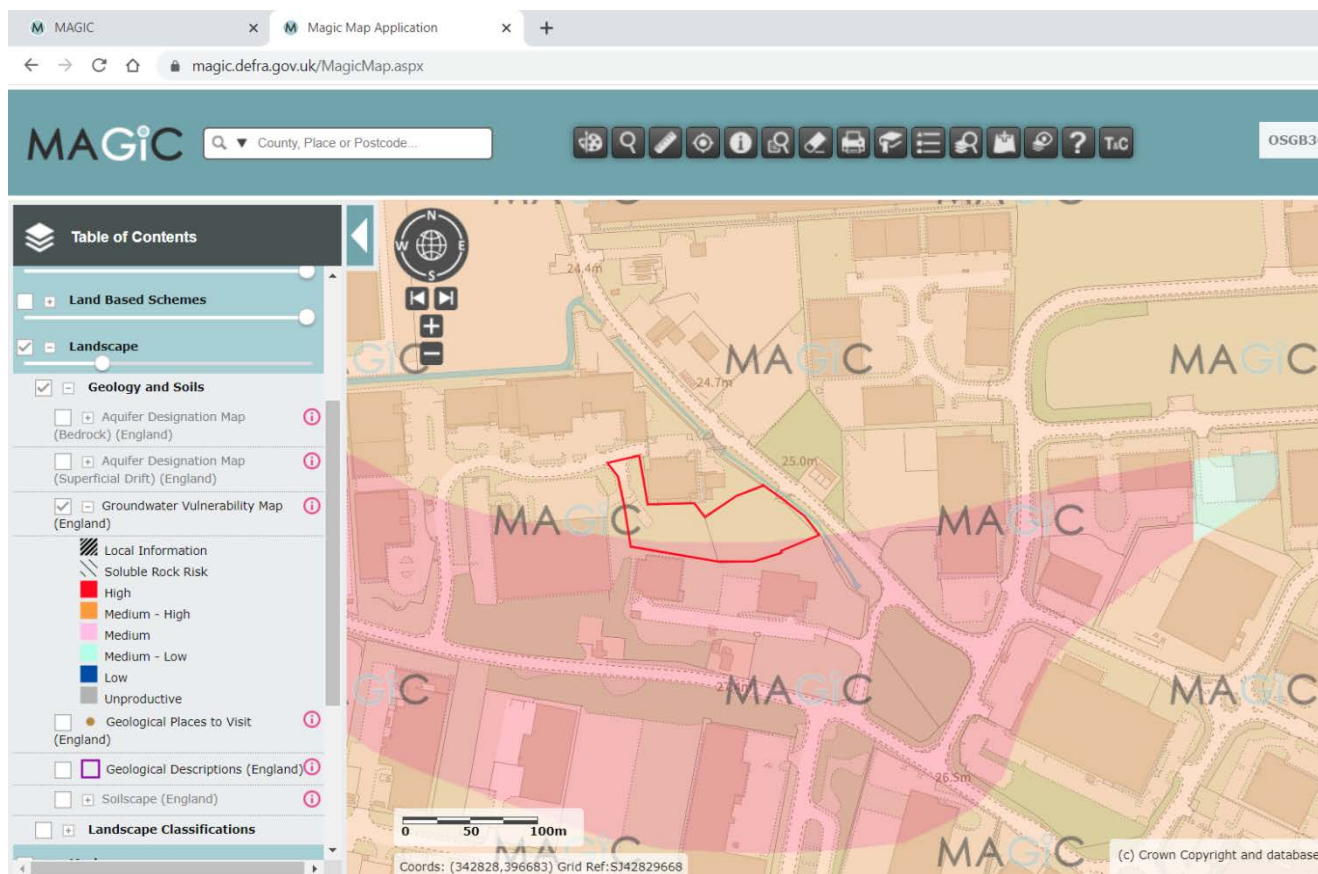
Source Protection Zone

The Environment Agency applies a general level of protection for all drinking water sources through the use of source protection zones (SPZs). SPZs are used to define areas close to drinking water sources where the risk associated with groundwater contamination is greatest. SPZs are not statutory but they do relate to distances and zones defined in legislation where certain activities are restricted.

The development site is within Source Protection Zone 3 (source catchment protection zone). Although not within the more critical inner or outer protection zones, Zone 3 is defined as the area around an abstraction source within which all groundwater can potentially feed into the abstraction source.



Above: Magic Map extract showing Source Protection Zone context



Above: Magic Map extract showing Groundwater Vulnerability

Groundwater Vulnerability

We have reviewed groundwater vulnerability maps created by the Environment Agency. The maps provide an assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. The groundwater vulnerability for each aquifer type is expressed from 'high' to 'unproductive'. The development site is within the 'medium high' and 'medium' categories:

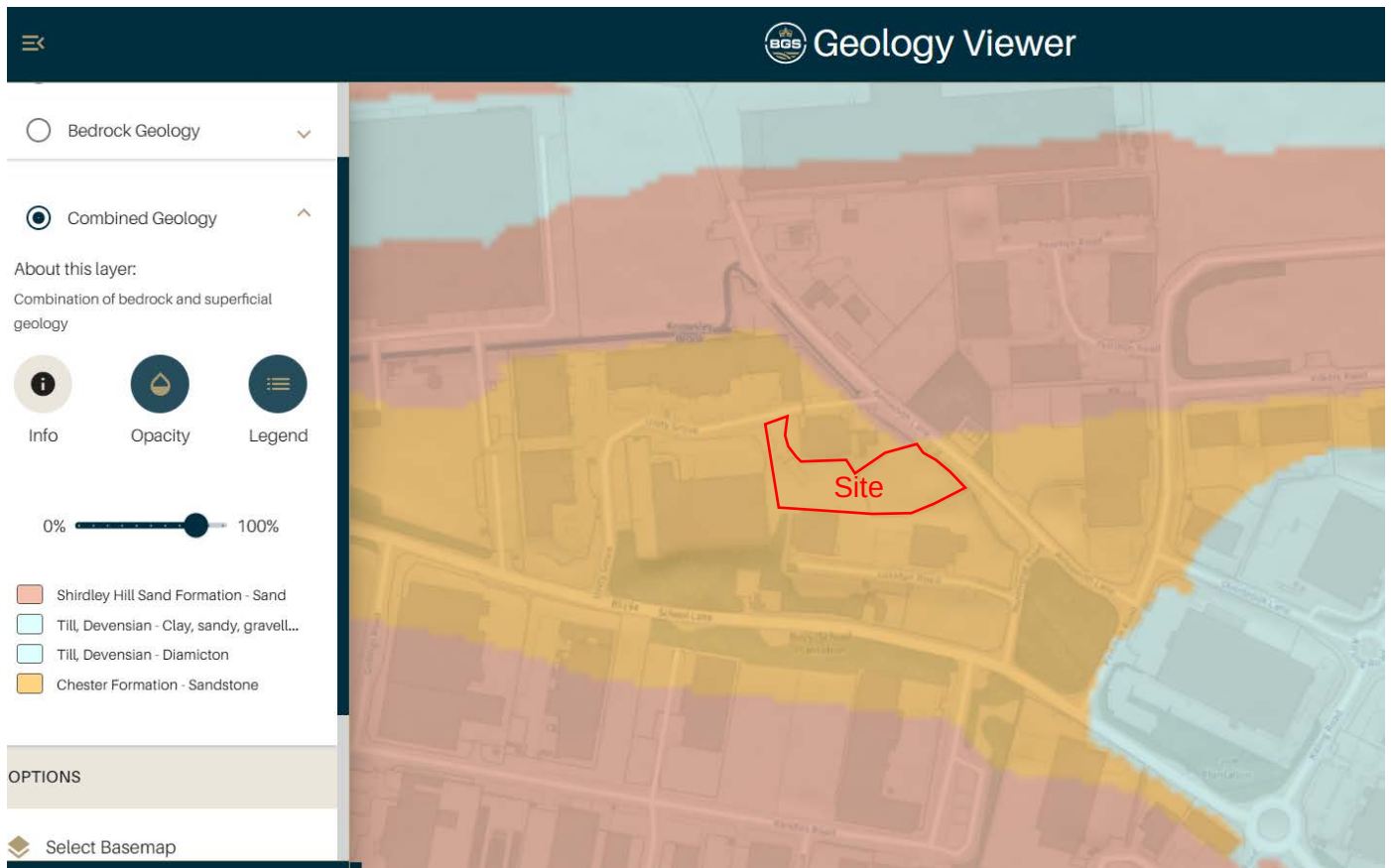
- *High: areas that can easily transmit pollution to groundwater. They are characterised by high-leaching soils and the absence of low-permeability superficial deposits.*
- *Medium: areas that offer some groundwater protection. Intermediate between high and low vulnerability.*
- *Low: areas that provide the greatest protection to groundwater from pollution. They are likely to be characterised by low-leaching soils and/or the presence of low-permeability superficial deposits.*
- *Unproductive: areas comprised of rocks that have negligible significance for water supply or baseflow to rivers, lakes and wetlands. They consist of bedrock or superficial deposits with a low permeability that naturally offer protection to any aquifers that may be present beneath.*

Geological Data

We have reviewed the British Geological Survey data to ascertain the superficial and bedrock geology of the development site to further understand the vulnerability to groundwater from infiltration. This has helped to inform the Source / Pathway / Receptor analysis in accordance with the SuDS Manual.

As is the case with most of south-west Lancashire, the geology is Shirdley Hill sand formation overlying sandstone bedrock. This comprises moderately to well-sorted, fine-grained sand with peat layers in the lower part. Sand grains are dominated by rounded to sub-rounded quartz grains. The formation is divisible into an upper "white" sand and a lower "brown" sand that is olive grey and brown. The sediments are interpreted as coastal blown sands, possibly a coastal facies of the Seacombe

Sand Formation. Normally sandy soils such as this allow rapid infiltration of groundwater, but there are also pockets of boulder clay (glacial till) which can reduce the permeability of the subsoil. There are areas of till located near to the development site, as shown on the BGS survey. Borehole records have therefore been examined.



Above: British Geological Survey extract

Borehole Records

A borehole from April 1969 (ref. SJ49NW139) is located 180m to the north of the development site. The record is shown overleaf. The site is topped by a layer of rich organic topsoil, as historically this was fertile farming land. Below this is a 3ft deep layer of sandy clay, with a high cohesive value. The borehole total depth was 12'- 6" and did not strike groundwater. It is of relevance that in this location the groundwater is deep and there is a thick topping of clay rich and organic material.

HOLST & CO. LTD. 42570, 96630
 SITE INVESTIGATION DEPT.
 5-7, NEW YORK ROAD SJ49NW 139
 LEEDS, 2

Contract No. M.1691/F.1217

Borehole No. 9

Location Knowsley

Ground Level

Client Liverpool City Engineer

Date 24th April 1969

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ϕ deg.	m.c. %	γ lb/cu. ft.	N
Topsoil		1'0"	1'0"						
Firm light brown sandy clay		3'0"	3'6"		1010	7	10.0	127	
		4'0"							
Compact light brown sand with traces of gravel			6'9"	8'6"					10
		10'9"		11'0"					
Hard Yellow Sandstone		12'6"	1'9"						50 for 3"

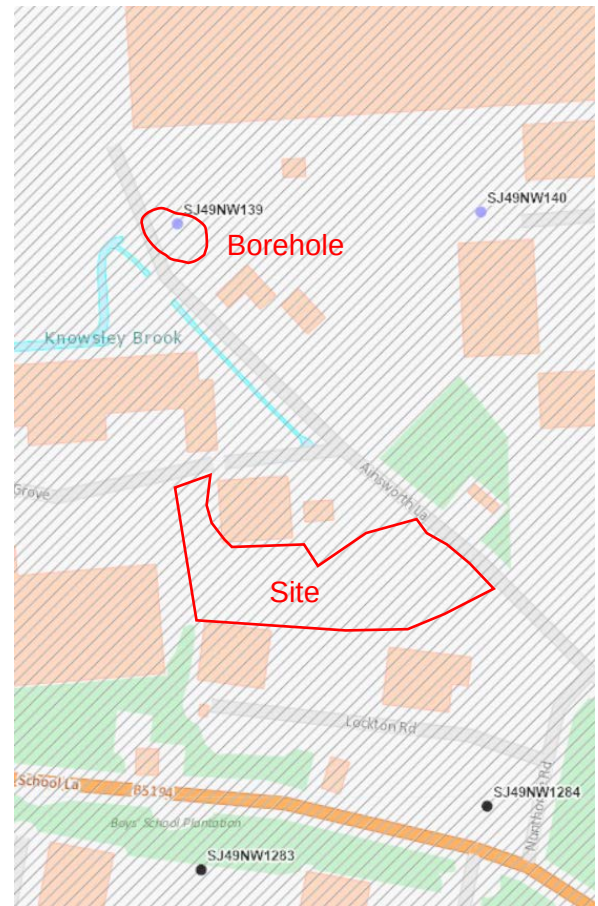
Water Struck at

Maximum Observed Water Level

Undisturbed Sample ☐
 Disturbed Sample ☐
 Water Sample
 Penetration Test

c = Cohesion
 ϕ = Angle of Internal Friction
 m.c. = Moisture Content
 γ = Bulk Density
 N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant



Source / Pathway / Receptor analysis

Table 26.5 of the SuDS Manual sets out a risk matrix to interpret the risk to groundwater by screening 8 weighted indices which are then scored. The development site was scored using the Table 26.5 matrix below:

TABLE 26.5 Risk matrix (from Highways Agency, 2009, after Scott Wilson, 2010)

Risk element (RE)		Risk score (RS)			Weighting factor (WF)
Element number	Element description	Low risk (score 1)	Medium risk (score 2)	High risk (score 3)	
1	Pollution hazard Traffic density	All standard urban land use types (excluding high hazard and trunk roads/motorways)			15
2	Standard Average Annual Rainfall depth	< 740 mm	740–1060 mm	> 1060 mm	15
3	Type of SuDS	Continuous unlined linear collection and conveyance components (eg filter strips, swales)	Shallow soakaway (eg infiltration basin/ trench, permeable pavement) draining < 5000 m2 runoff area		15
4	Unsaturated zone depth (ie depth of between infiltration surface and groundwater table)	> 15 m	5–15 m	1– 5 m	20
5	Predominant flow type through soils between infiltration surface and groundwater	Intergranular flow (occurs in unconsolidated or non-fractured consolidated deposits and fine or medium sands)	Mixed fracture and intergranular flow (occurs in fractured consolidated deposits and medium or coarse sands)	Fractured flow (occurs in heavily consolidated sedimentary deposits, igneous and metamorphic rocks and very coarse sands)	20
6	Unsaturated zone material: clay content	> 15% clay	1–15% clay	< 1% clay	5
7	Unsaturated zone organic carbon content: soil organic matter (SOM) content	> 15% SOM	1–15% SOM	< 1% SOM	5
8	Unsaturated zone material: soil pH	> 8	5–8	< 5	5

Total

15

15

30

40

40

10

10

10

170

The score of 170 identifies a low or medium risk to groundwater and the outcome is to use the ‘Simple Index Approach’ for hazard characterisation.

TABLE 26.6	How to interpret the groundwater risk screening results		
	Total risk score	Risks to groundwater	Interpretation
	< 180	Low or medium	Use simple index approach Note: For discharges to protected groundwater bodies, implement an upstream treatment component that will provide groundwater protection in the event of an unexpected pollution event or poor system performance
	180–250	High	Discharges may require an environmental licence or permit. Obtain pre-permitting advice first from the environmental regulator. Risk assessment likely to be required
	> 250	Very high	Unacceptable

The Simple Index Approach set out in the SuDS Manual has been used for hazard characterisation - simple pollution hazard indices are based on land use (Table 26.2). Risk mitigation to surface water and groundwater has been informed by Tables 26.3 and 26.4.

Table 26.2 states that sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites, trunk roads and motorways have a “high” pollution hazard level.

The site’s use as a container storage yard is not included in Table 26.2. We would argue that this use is not as intense as that of a highly frequented haulage yard or lorry park. No fuel is stored on the premises, no vehicle fuelling takes place and the containers are typical dry store shipping containers mostly for retailer clients. These are not Hazchem, waste transportation or tanked liquid units which the site does not have a licence to handle. We would argue that for the purposes of Table 26.2, the site use is akin to a ‘commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads / motorways’, which have a “medium” pollution hazard level. The mitigation indices given in the table are:

- Suspended solids 0.7
- Metals 0.6
- Hydrocarbons 0.7

Table 26.4 of the Manual shows indicative SuDS mitigation indices for discharges to groundwater. The development site surface comprises a constructed permeable pavement of crushed stone, underlain by a soil with good contaminant attenuation potential of at least 300 mm in depth. This has been demonstrated by the borehole sample. For this surface, the values shows are:

- Suspended solids 0.7
- Metals 0.6
- Hydrocarbons 0.7

This therefore mitigates the risk identified in Table 26.2.

It must be noted that the site's sub-surface includes clay-rich material and according to the nearby borehole, the groundwater is deeper than circa 4m, therefore this provides further protection to the aquifer.

The main contamination risk associated with the operation of the site as a container yard is small scale fuel / oil / grease spillages from defective vehicles – particularly drips from leaky fuel lines. As previously stated, there is no fuel stored on site, nor is any vehicle maintenance or re-fuelling undertaken on site. This significantly reduces the likelihood of a spillage. The containers stored on the site do not contain 'hazchem' products that require statutory labelling and separate site licences. The facility does not store Hazchem or bulk liquid tank units, only dry goods containers – mostly goods destined for high street retailers. Rainwater discharge onto the container units combining with any contamination (from the painted metal surface) has been considered and is not a risk as the containers are designed to be stored externally.

There are no specified Environmental Quality Standards (EQS) for oil and grease (SuDS Manual Page 584), but their presence is usually visible and unsightly, so maximum removal is appropriate. These are not considered to be as serious a

contamination risk to groundwater as heavy metals or industrial chemicals and the main mitigation is to prevent discharge in the first place by ensuring haulage vehicles are properly maintained and serviced and effective “eyes on the ground” – operatives trained to spot any problems. In the event of a small discharge of fuel / oil / grease, the most appropriate response would be to physically scrape up and remove the localised area of crushed stone by hand and bag up and take to an appropriate disposal site. Soil bacteria in the rich 300mm thick organic soil layer immediately underlying the crushed stone would naturally digest any remaining material. Given that there is a layer of clay rich material and groundwater level is at least 4m below the surface, it is very unlikely that such a small spillage of fuel / oil / grease would pose a significant risk to groundwater. The site is within Source Protection Zone 3, not the more vulnerable Zones 1 or 2.

Source	Pathway	Receptor	Mitigation
Fuel / oil / grease / chemical spillages	Direct infiltration through the ground exacerbated by rainfall	Groundwater as a resource in aquifers, including all current abstractions from groundwater and all feasible future uses. Discharges from groundwater, such as springs and base flow to rivers	Avoidance of contamination: Ensure vehicles are properly maintained, no leaks from the fuel systems, no leaks from oil sumps, brake lines etc. The haulage industry is highly regulated with strict MoT standards and it is unlikely that poorly maintained vehicles would remain in service. Operative training and skills development Site operatives to be given training about the need to work in an environmentally sustainable manner and the importance of protecting the natural environment by strict adherence to method statements and health and safety, especially concerning risks of contamination and how to minimise this. Operatives taught to be observant about risks from fuel / oil spillages and taught how to respond. Clean-up methods In the event of a small spillage, the area is to be secured and contamination removed as quickly as possible, crushed stone surface material to be scraped / bagged up and disposed of. Outcome: No likely significant effects.
Fuel / oil / grease / chemical spillages	Release via surface runoff.	Discharges from surface water into adjacent Knowsley Brook	Avoidance of contamination: Ensure vehicles are properly maintained, no leaks from the fuel systems, no leaks from oil sumps, brake lines etc. The haulage industry is highly regulated with strict MoT standards and it is unlikely that poorly maintained vehicles would remain in service. Operative training and skills development Site operatives to be given training about the need to work in an environmentally sustainable manner and the importance of protecting the natural environment by strict adherence to method statements and health and safety, especially concerning risks of contamination and how to minimise this. Operatives taught to be observant about risks from fuel / oil spillages and taught how to respond. Clean-up methods In the event of a small spillage, the area is to be secured and contamination removed as quickly as possible, crushed stone surface material to be scraped / bagged up and disposed of. Outcome: No likely significant effects.
Leaching of material from stored containers	Infiltration through the ground and surface water runoff	Groundwater and Knowsley Brook	Avoidance of contamination: No Hazchem units are stored on site. Containers are weatherproof and designed to be stored externally. Rainfall onto the containers will not have water quality implications. Outcome: No likely significant effects.

Conclusions

The use of the site for the short term storage of shipping containers en-route to and from the Docks will not increase surface water runoff as there is no net gain in impermeable surface.

A separate Flood Risk Assessment has concluded that the site does not flood, there is no flood risk to this site from Knowsley Brook and there will be no increase in runoff to areas downstream.

The containers are simply placed over the crushed stone surface and are only in partial contact with the ground (the only contact with the ground is at the edge beams). Rainwater can therefore infiltrate through the crushed surface and under the containers, as is already the case.

The risk of contamination to groundwater by direct infiltration, or contamination to Knowsley Brook from surface water runoff has been assessed and is considered to be low and mitigation measures can be adopted to ensure that the main risk (small scale fuel / oil / grease spillages) can be effectively managed.