Feasibility Study

HYDROROCK®
future of sustainable water management

Ref: HPSA001/26.6.21/RJI

[redacted] Central Reservation

1. Location: [redacted] - Central reservation

Postcode: Coordinates:

2. Brief:

Prevent highway flooding from a 30 year rain event by ensuring rapid surface water removal from carriageway into central reservation. Attenuate stormwater and ensure infiltration into chalk strata sub level within central reservation. Works must meet Highway / Environmental / Street Works objectives and regulations.

3. History:

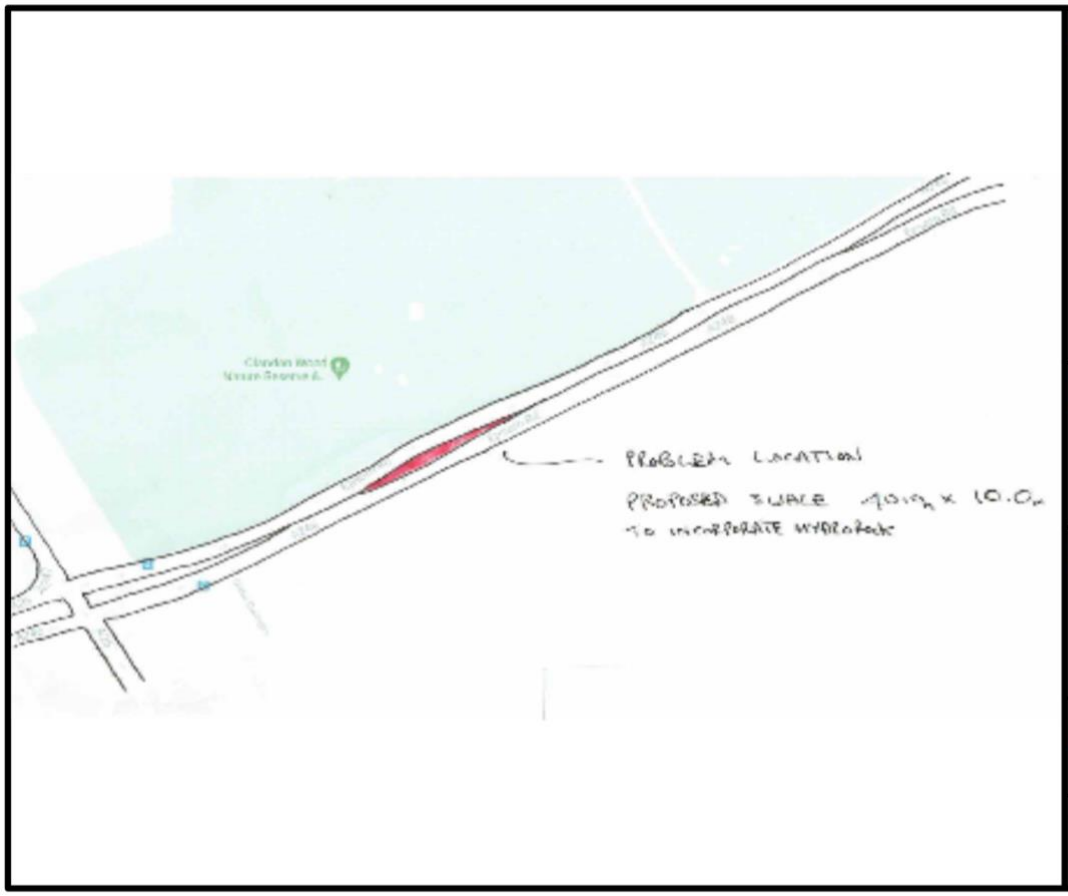
Carriageway subject to severe flooding in one location during heavy periods of rain which subsequently remains for long periods due to topographical characteristics. Consequent inability to drain successfully due to existing soakaways not performing to increasing water volume requirements. Overflow pipe is no longer permitted to outflow into adjacent field / cemetery.

4. Site Information:

- Topographical survey: Assumed less than 10% gradient in the absence of actual data
- Services report: Not Received
- Porosity test: Assumed infiltration rate 104/ L / hr in the absence of actual data (Infiltration rate same as for Caterham projects)
- Street works requirements: Assumed lane closure from 09.00 to 16.00
    - Other site requirements:

**NB. Key required site information for calculating system design & performance has been assumed in the absence of actual data*

5. Site plan:



Notes:

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6. Hydrorock Proposed Solution/System

Following study of all given information and discussions with [redacted] Highways Engineers, Hydrorock's proposed Solution is to create a swale 40m x 10m within the central reservation to a finished depth of 1.00 metre below adjacent carriageway level

And within this swale create a Hydrorock Infiltration System by excavating for layer 2 42.000m length x 1.400m width x 1.300m depth and a further for layer 1 21.600 length x 1.400 width x 1.00 depth to accommodate 76.32m3 of Standard Density Hydrorock Aquifer Blocks (ready-wrapped in geotextile) sat on a 100mm bed of 10mm pea shingle and backfilled surround of same. Reinstatement to comprise a geomembrane covering the top of the Hydrorock system with a geogrid over and 200mm of Type B 40mm Filter stone to the surface. The remainder of the swale to be reinstated with the set aside topsoil

Kerbs to be removed from adjacent carriageway edges and replaced with a rumble strip comprising three rows of granite setts laid in strong mortar, flush to surface with transition kerbs at each end

Traffic management to comprise closure of Lane 2 in both directions within the restricted hours (09.00 – 16.00)

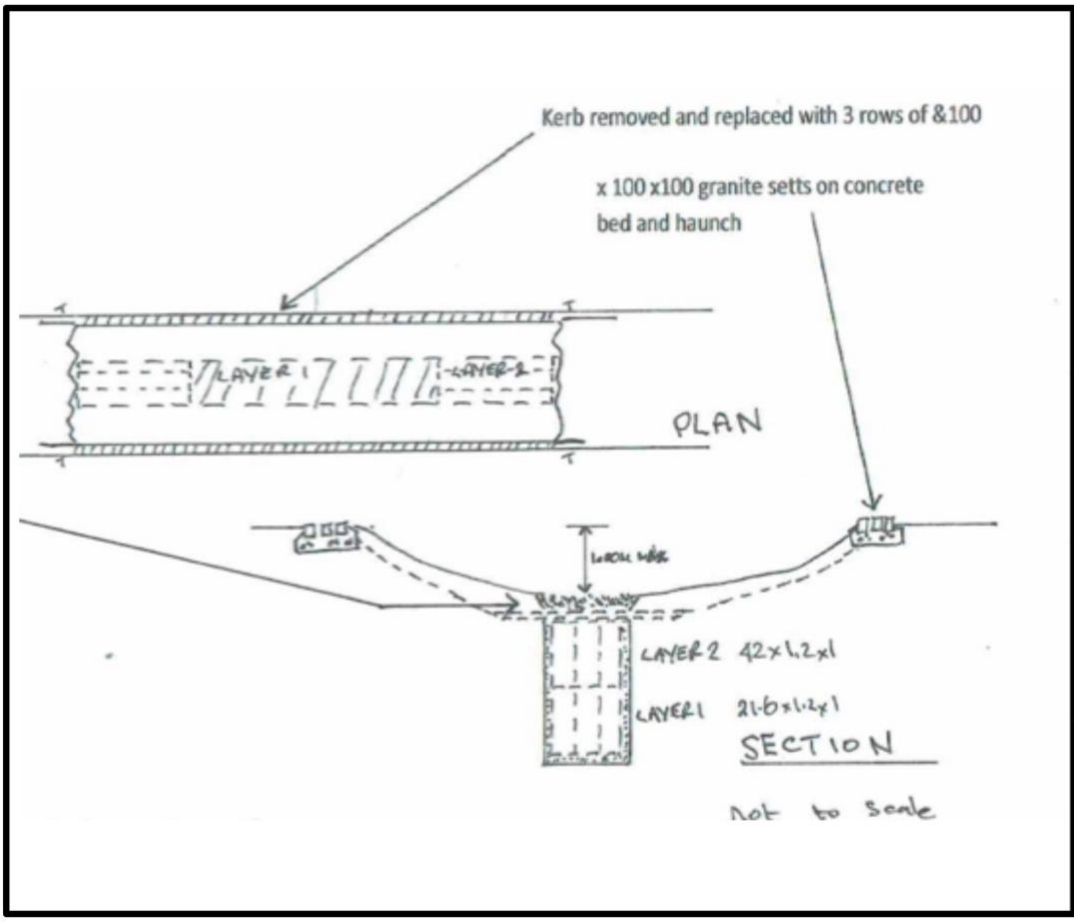
NB. Detailed breakdown of all project activities shown in Indicative Costed Activity Schedules

7. Hydrorock Outline Design:

HYDROROCK DETAIL – see attached data sheet for installation guide

- Strip and set aside 200mm of topsoil, reinstate on completion
- Swale to be maximum 1.00m deep below finished road level over 40m x 10m area
- 200mm of Type B Filter material placed on geogrid on geomembrane for maintenance and protection
- Hydrorock system comprises two layers as detailed to facilitate ready infiltration into permeate chalk layer to achieve required 80m3 attenuation capacity within 1 hr
- 10mm clean stone as bed and surround

[redacted] **– Swale as drainage attenuation**



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9. Performance Data - [redacted] Swale Flood Protection Dynamic System

Hydrorock System:

*Designed for static capacity buffering of 80m³ within 1 hour @ infiltration *permeability 104L / m² / hr*

- System Buffering capacity: 80.5m³ within 1 hour
- Ongoing infiltration rate: 7.4m³ / hr
- Under 10hrs to completely empty: 80.5m³ @ infiltration rate of 7.4m³ / hr
- Array Comprises: 159 D440 Blocks
- Top Layer: 105 Blocks 42m L x 1.2m W x 1m H
- Bottom Layer 54 Blocks 21.6m L x 1.2m W x 1m H
- Filling Rate: 90.7m³ / hr (105 blocks x 864 L / hr)
- Infiltration Surface Area: 71.5m² (43.2m² sides + 25.9² bottom + 2.4m² ends)
- Infiltration Rate: 7.4m³ / hr (71.5m² x 104L/hr/m²)
- Static Capacity: 73.1m³ (Storage Capacity of 159 Blocks x 460 L)
- Dynamic Capacity: 80.5 m³ (Static Capacity 73.1m³ + Infiltration Rate 7.4m³ in 1st hr

Total Swale System:

- 24hr buffering capacity is 451m³ (Hydrorock System 251m³ 1hr @ 80.5m³ + 23hrs @7.4m³ / hr plus Swale static capacity @ 200m³)
- Time to completely empty from full @ infiltration rate of 7.4m³ / hr is approx. 60hrs

9. Cost Data – including comparison of Hydrorock System with gravel system:

NB. Detailed breakdown of all project costs shown in Indicative Costed Activity Schedules

Product Cost:	Hydrorock	£ 30,448
	Gravel	£ 31,430
Fully Installed Cost:	Hydrorock	£ 65,313
	Gravel	£ 97,431
Whole of 30 year Life:	Hydrorock	£67,913
	Gravel	£182,231

10. Summary of Project benefits from using Hydrorock System:

Project -

- Using Hydrorock makes Project significantly simpler, easier, faster, cheaper and safer
- Reduced volumes to excavate, remove and install
- Simple plug and play installation / engineering
- Minimises Traffic Management – reduced traffic disruption
- Minimises ongoing maintenance

Cost -

- Hydrorock Fully Installed Cost is 33% cheaper than using gravel
- Hydrorock Whole of Life cost is 63% cheaper than using gravel
- Eliminates gravel system consultant design cost

Environment -

- Road surface runoff is kept onsite & filtered by Hydrorock
- Highly efficient infiltration system minimises installation footprint
- Hydrorock is a natural material – *No Plastic* in Aquifer
- Greatly reduced off-site vehicle movements

Project Risk -

- Flexibility to work around existing services ensure that project remains on time & on budget
- Installation of Hydrorock not weather dependent
- Hydrorock system Whole of Life performance remains at installation specification

Safety -

- Site safety is improved – no need for earthworks support or operatives within excavation
- Hazard exposure reduced by simplified work activities
- Greatly reduces on-site and off-site vehicle movements

Hydrorock has the flexibility of gravel and the void ratio of Crates