

Project Name:	Cinders Nursery, Yapton
Document Reference:	125.5005/SVR
Document Name:	SuDS Verification Report
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1. INTRODUCTION

- 1.1 Paul Basham Associates have prepared this SuDS verification report on behalf of Crayfern Homes for the purpose of verifying if the site's sustainable urban drainage systems have been constructed in accordance with the agreed design. Paul Basham Associates attended the site while it was still active, as instructed.

2. THE SUDS COMPONENTS

'As built' drawings were obtained from Crayfern Homes (**Appendix A**) and indicated that the following SuDS components were installed:

- Infiltration Trench Soakaways
- Geocellular Infiltration Tanks
- Permeable Block Paving
- Geocellular Attenuation Tanks
- Hydrobrake Flow Control Device
- Surface Water Road Gullies and Aco Drain

3. VERIFICATION REPORT

Infiltration Trench Soakaways

'As built' drawings show that plots 1 – 11 were to have infiltration trench soakaways installed in their rear gardens. See **Figure 1**. As all of the infiltration trenches are in the rear gardens of dwellings which were occupied at the time of site visit, it was not possible for Paul Basham

Associates to gain access to the trenches. However, Crayfern homes have provided Paul Basham Associates with photographs which show the excavated trench prior to it being backfilled with material for the Trench Soakaway. They show that the trench was laid with a geomembrane prior to it being backfilled. See **Figure 2** and **Figure 3**.

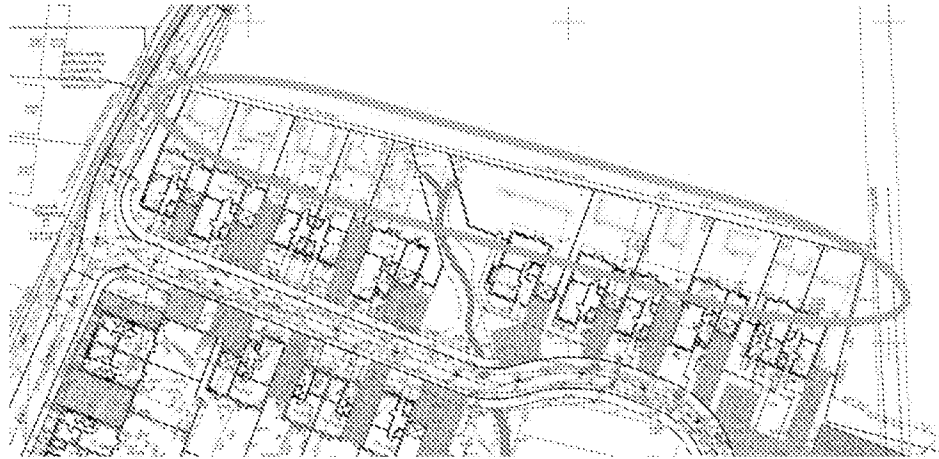


Figure 1: Snip of 'As Built' Drawing Showing the Proposed Position of the Infiltration Trench Soakaways.



Figure 2: Excavation for Trench Soakaway Lined with Geomembrane.



Figure 3: Excavation for Trench Soakaway Lined with Geomembrane.

- 3.1 As Paul Basham Associates were not present at the time of installation, this report cannot confirm if the trenches were constructed in accordance with the agreed design. However, the site was attended shortly after a rain event and showed no signs of flooding in or around dwellings drained by Infiltration Trench Soakaways. No trees were noted in or around areas that would be detrimental to the infiltration soakaways.

Geocellular Infiltration Crates

- 3.2 The 'as built' drawing indicates that a geocellular infiltration crate system is to be installed along Cinder's Lane. See **Figure 5** and **Figure 5**. Paul Basham Associates were not present during installation of the crates but were provided with photographs from Crayfern homes which show that the excavated trenches were laid with small stone aggregate, the crates were then laid and wrapped in a geomembrane. Pictures provided also show that the crates were then overlaid with small stone aggregate. See **Figure 6** and **Figure 7**.

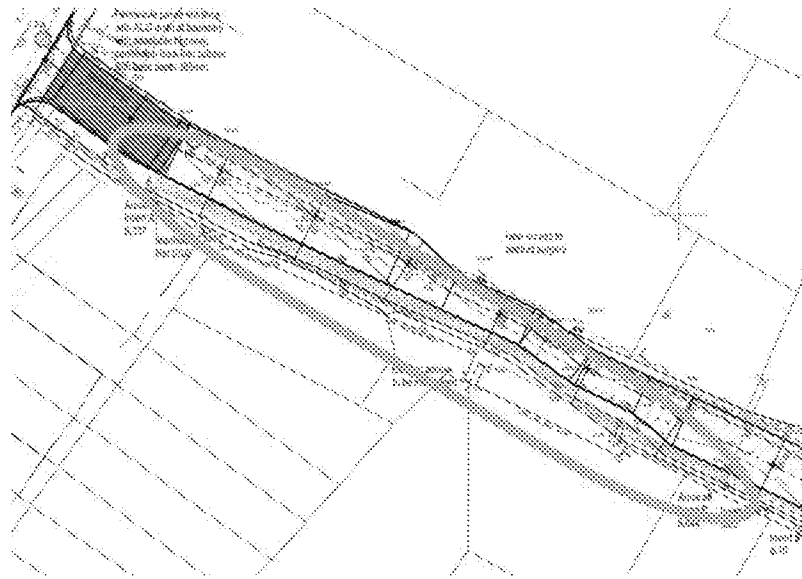


Figure 4: Snip of As Built Showing the Proposed Position of Infiltration Crates

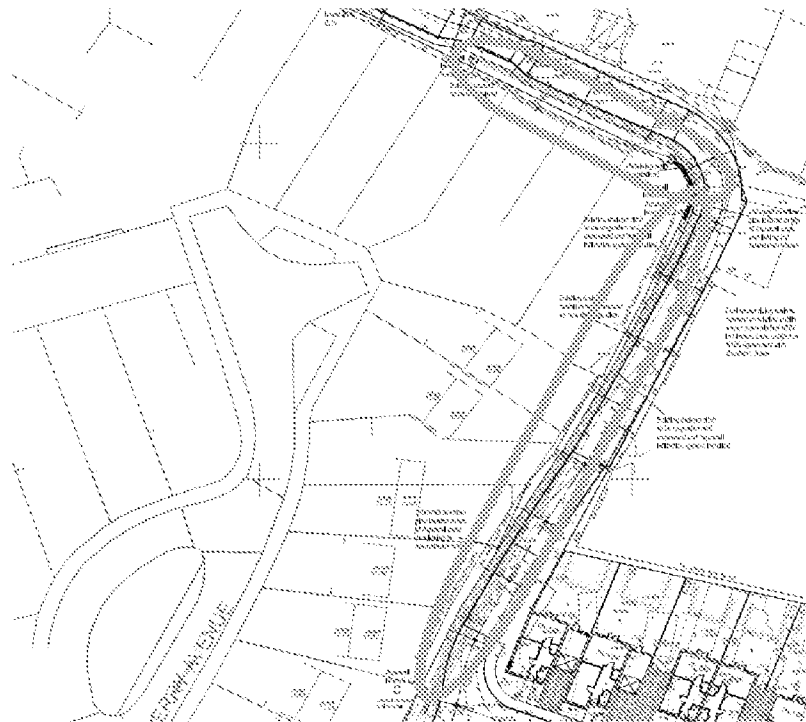


Figure 5: Snip of As Built Showing the Proposed Position of Infiltration Crates



Figure 6: Photograph Showing the Geocellular Crates Underlain by Small Stone Aggregate



Figure 7: Photograph Showing Geocellular Crates Overlain with Small Stone Aggregate

Permeable Block Paving

- 3.3 The 'As Built' drawing indicated that 20 sets of permeable block paving were installed. 17 of which were to be installed on private driveways, 1 on a shared driveway, 1 on a lay-by and 1 at the site access. This report can confirm that 19 out of 20 sets of permeable block paving sets were observed. **Appendix B** contains a picture of all sets of block paving installed on site. **Figure 8** shows

proposed position of the permeable block paving at the site access. **Figure 9** shows that upon site visit the permeable block paving has not been installed as per the As Built drawing.

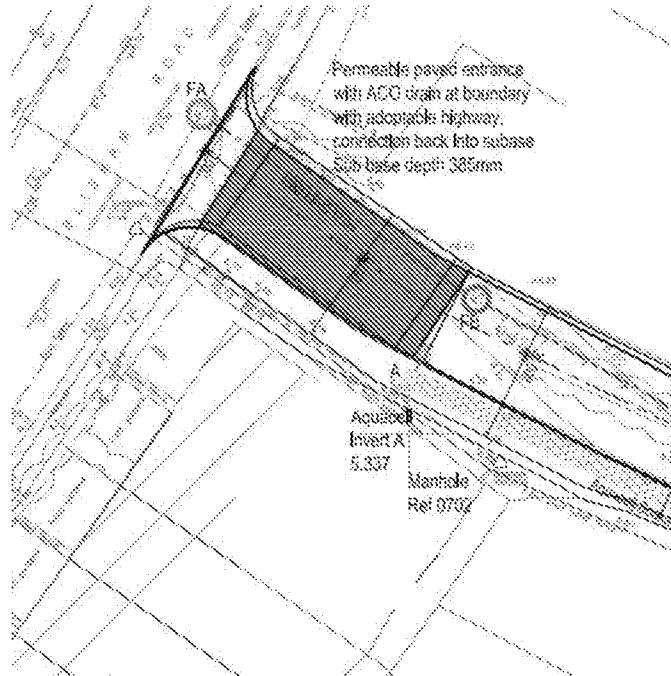


Figure 8: Snip of the As Built Drawing showing the Proposed Position of the Permeable Block Paving.



Figure 9: Image of the Proposed Position of the Permeable Block Paving at Site Access.

Geocellular Attenuation Tanks

- 3.4 The as built drawings show that there is a set of Geocellular Attenuation Crates installed in the southeast corner of the site. See **Figure 10**. Paul Basham Associates did not attend the site during the installation of the crates however photographs taken during construction provided to Paul Basham Associates by Crayfern Homes show that the crates were underlain by an impermeable geomembrane. They also show that after being laid, the crates were then covered with an impermeable geomembrane and then a small stone aggregate. See **Figure 11**, **Figure 12**, and **Figure 13**.

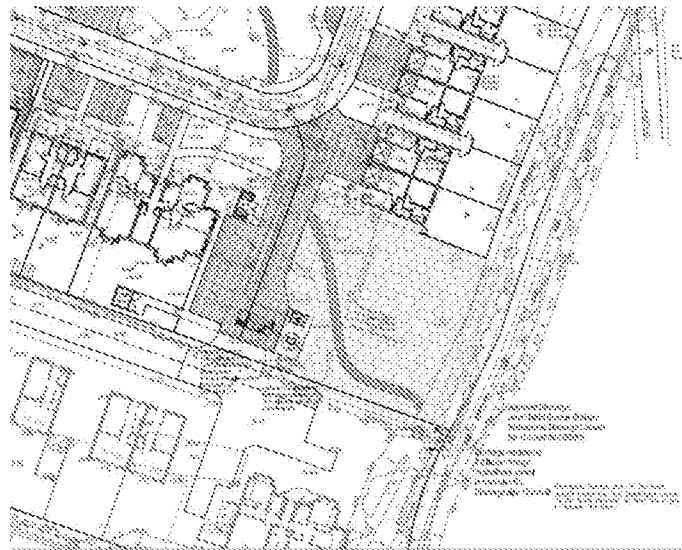


Figure 10: Snip of As Built Showing Proposed Position of the Geocellular Attenuation Crates



Figure 11: Photograph Showing the Geocellular Crates Underlain with Impermeable Geomembrane



Figure 12: Photograph Showing the Geocellular Crates Wrapped in Impermeable Geomembrane



Figure 13: Photograph Showing the Crates Overlaid with Small Stone Aggregate

- 3.5 It was not possible for Paul Basham Associates to confirm the size of the crates installed on site. No trees were observed in areas that would be detrimental to the geocellular crates.

Hydrobrake Flow Control Device

- 3.6 It was not possible to gain access to the Hydrobrake during the site visit. However, a photograph provided by Crayfern Homes (**Figure 14**) shows that a Hydrobrake was installed. A photocopy of the invoice for the device is contained in **Appendix C**.

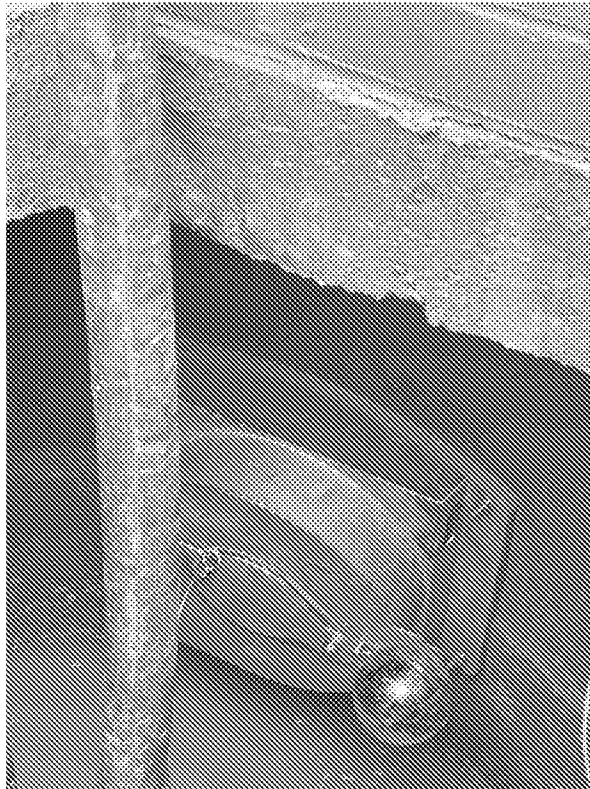


Figure 14: Photograph of Hydrobrake Flow Control Device

Surface Water Road Gullies and Aco Drains

- 3.7 Gullies and Aco Drains on site were checked against the as built drawings. At the time of site visit, several gullies were either missing or could not be found. They are outlined below. All other Gullies and Aco drains were found on site.

Missing Gullies

1. **Missing Gully A:** **Figure 15** shows the proposed position of the gully. **Figure 16** shows a photograph taken on site of the proposed position of the gully. It shows that no gully has been installed at the time of the site visit.

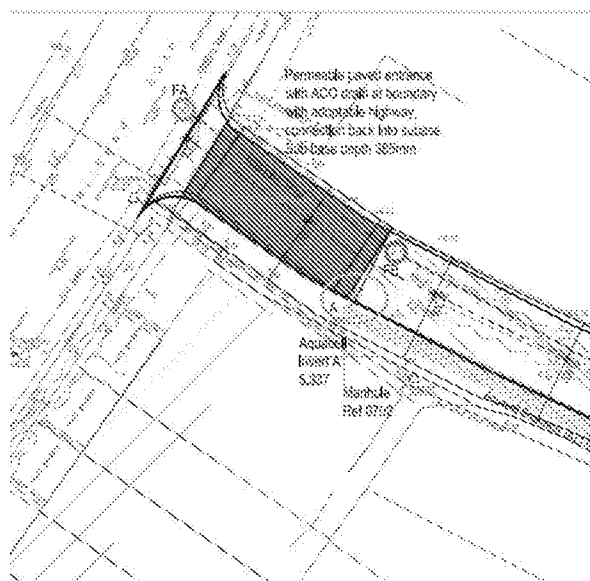


Figure 15: Snip of Missing Gully on As Built Drawing



Figure 16: Image of the Proposed Position of the Gully taken.

2. **Missing Gully B:** **Figure 17** shows the proposed position of the gully. **Figure 18** is a photograph of the proposed position of the gully. No gully could be observed at the time of site visit.

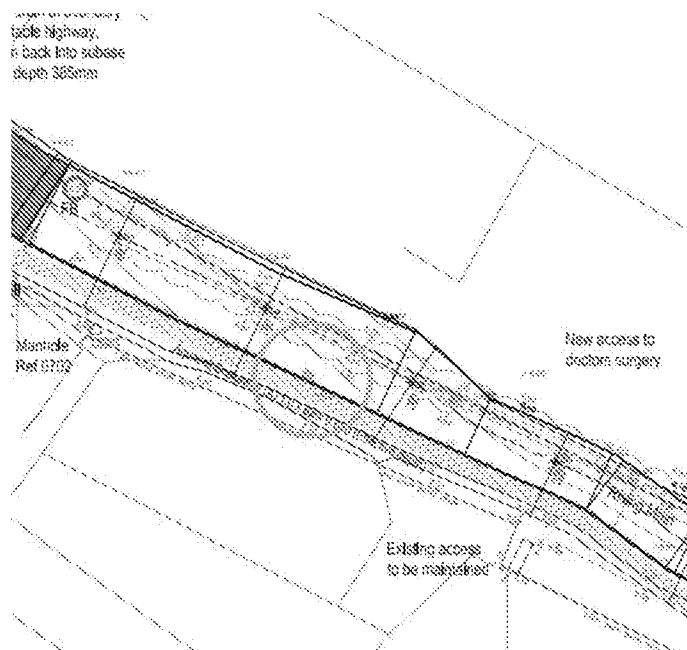


Figure 17: Snip of Missing Gully on As Built Drawing

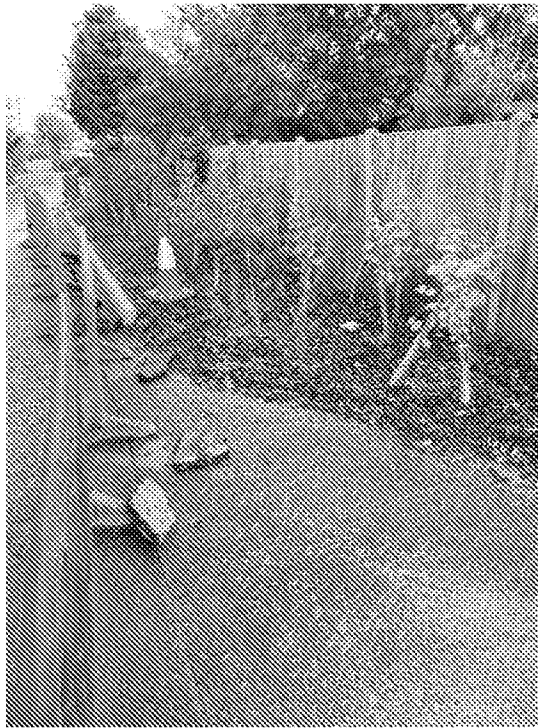


Figure 18: Image of the Proposed Position of Gully

3. **Missing Gully C:** **Figure 19** shows the proposed position of the gully. **Figure 20** is a photograph of the proposed position of the gully. No gully could be observed at the time of site visit.

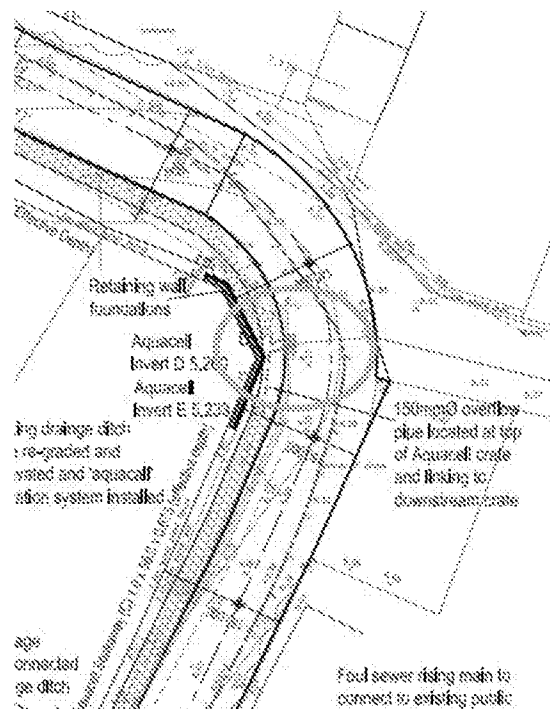


Figure 19: Snip of Missing Gullies on As Built Drawing



Figure 20: Photograph of the Proposed Position of Gully

4. **Missing Gully D:** **Figure 21** shows the proposed position of the gully. **Figure 22** is a photograph the proposed position of the gully. No gully could be observed at the time of site visit.

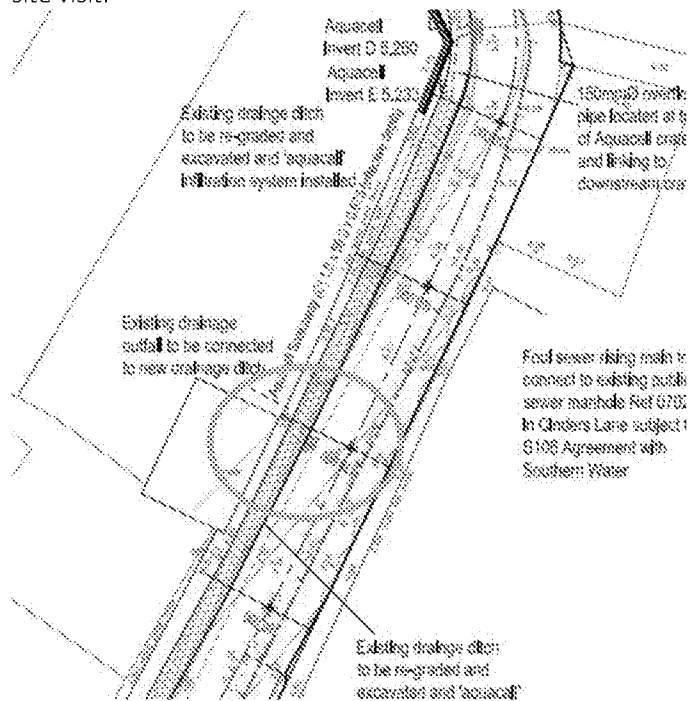


Figure 21: Snip of Missing Gully in As Built Drawing

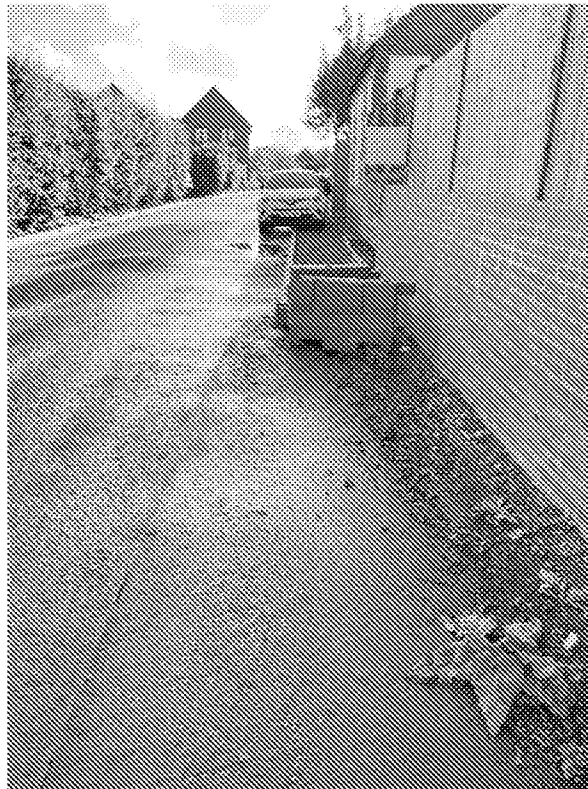


Figure 22: Photograph of the Proposed Position of the Gully

5. **Missing Gully E:** **Figure 23** shows that the proposed position of the gully. **Figure 24** is a photograph of the proposed position of the gully. No gully could be observed at the time of site visit.

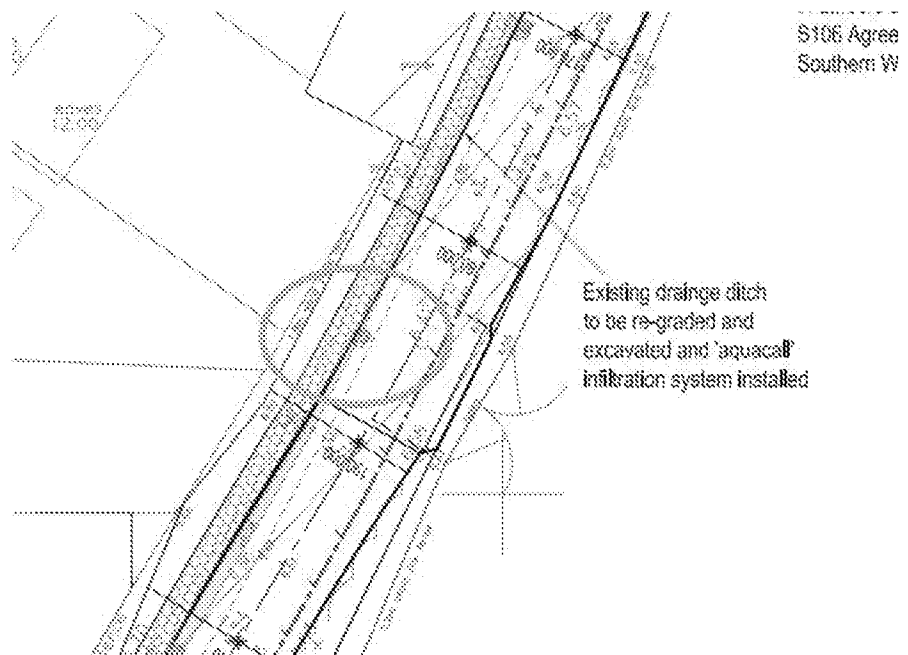


Figure 23: Snip of Missing Gully in As Built Drawing

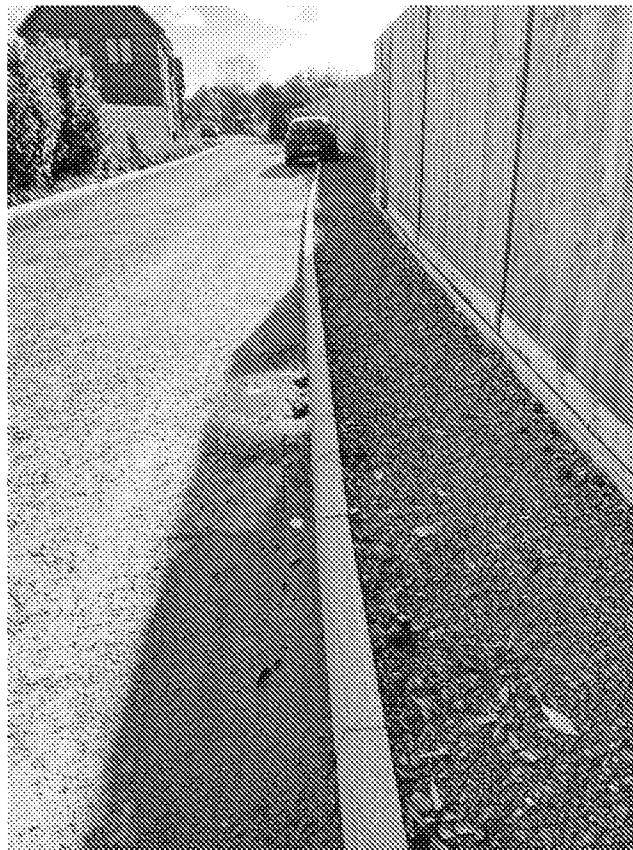


Figure 24: Photograph of the Proposed Position of the Gully

6. **Missing Gully F:** **Figure 25** shows the proposed position of the gully. **Figure 26** is a photograph of the proposed position of the gully. No gully could be observed at the time of site visit.

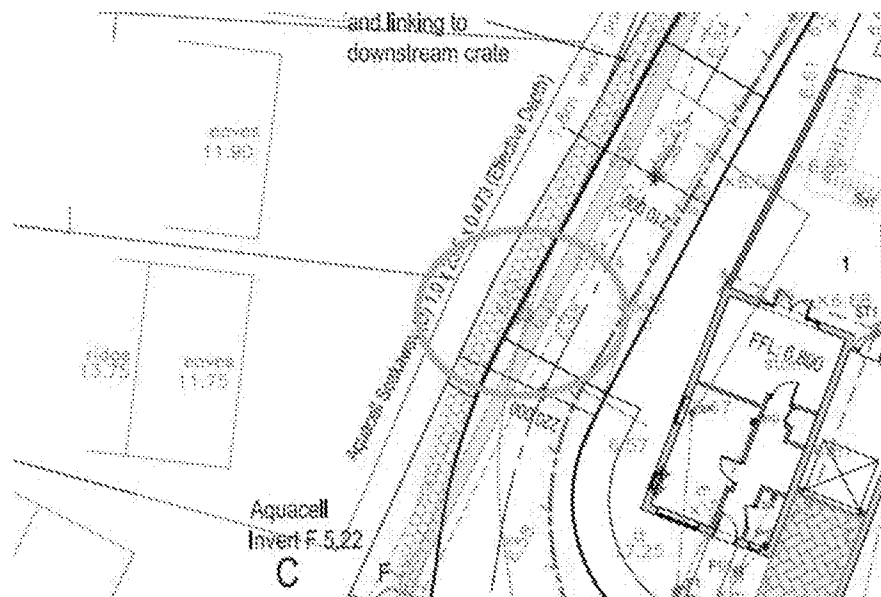


Figure 25: Snip of Missing Gully in As Built Drawing



Figure 26: Photograph of Proposed Position of Gully

4. REMEDIAL WORKS

Gullies

Several gullies were installed following consultation with Crayfern homes and are detailed below.

- 4.1 **Missing Gully A:** **Figure 27** below shows a stoned-up excavation for a gully in the proposed position of Missing gully A.



Figure 27

- 4.2 **Missing Gully B:** Figure 28 below shows a stoned-up excavation for a gully in the proposed position of Missing gully B.

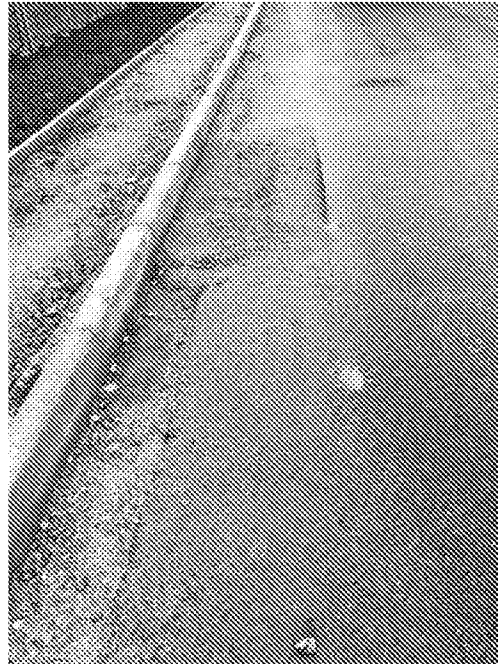


Figure 28

- 4.3 **Missing Gully C:** Figure 29 below shows a gully installed in the proposed position of Missing gully C.

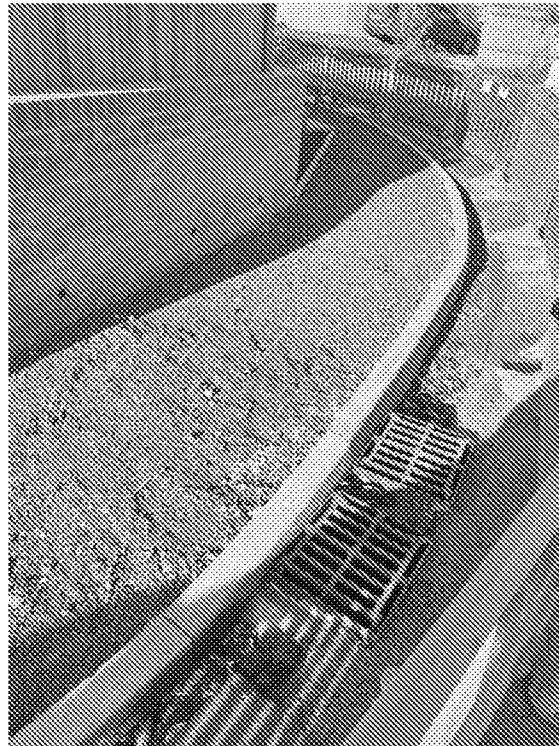


Figure 29

- 4.4 **Missing Gully E:** **Figure 30** below shows a stoned-up excavation for a gully in the proposed position of Missing gully E.



Figure 30

- 4.5 **Missing Gully F:** Figure 31 below shows a stoned-up excavation for a gully in the proposed position of Missing gully F.



Figure 31

5. SUMMARY AND CONCLUSION

- 5.1 The infiltration trenches shown in the rear gardens of plots 1-11 could not be accessed on site. Photographs provided by Crayfern homes show excavations laid with a permeable geomembrane. This report cannot confirm if the excavations were backfilled in accordance with design. However, Paul Basham Associates attended the site shortly after a rain event and observed no signs of flooding and/or excess surface water flow.
- 5.2 The as built drawings indicate that geocellular infiltration crates were installed along Cinders Lane. Pictures provided by Crayfern homes show that the excavations were laid with small stone aggregate before the crates were laid. They also show that the crates were then wrapped in permeable Geomembrane and the excavation was then filled with small stone aggregate.
- 5.3 All but one of the specified permeable block paving sets could be observed upon site visit. The missing block paving set was that at the site entrance.
- 5.4 Paul Basham Associates were not present during the installation of the Geocellular Attenuation Crates, however photographs provided to Paul Basham Associates by Crayfern homes show that

the crates were wrapped with an impermeable geomembrane before being covered with small stone aggregate.

- 5.5 The hydrobrake flow control device could not be verified on site visit due to access issues. However, Crayfern homes provided proof of installation in the form of photo evidence and an invoice for the purchase of the device.
- 5.6 7 gullies were missing upon site visit. Remedial works were carried out to install 6 of the missing 7. All other gullies not mentioned in this report were in sections of the site that were still under construction as the time of site visit.

Due to there being a missing gully, longitudinal drawings provided by Crayfern Homes (**Appendix D**) were used in conjunction with the as built drawings to assess whether the gully arrangement on site had adequate spacing to drain the site according to DMRB standards (CD 526, Table D.4). **Appendix E** shows that the current gully spacing between chainages 145 and 185 would not adequately drain the site.

- 5.7 No trees were observed in areas that would be detrimental to the site's drainage system.