

TECHNICAL NOTE – DRAINAGE COMPLETION REPORT (38 UNITS)

Project Name : Land at Stakers Farm, North End Road, Yapton

Job No : 19-156

Report Reference : 19-156-08C

Note Title : Drainage Completion Report (38 Units)

Checked : RS

Approved : RS

Date : April 2024

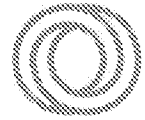
1.0 INTRODUCTION

1.1.1 Odyssey (Basingstoke) has been instructed by Dandara Ltd to prepare this Sustainable Drainage (SuDS) Verification Report to address Planning Condition No.17 (reproduced below) of the Planning Permission No. Y/88/18/OUT for the above site.

Condition (17)

Immediately following implementation of the approved surface water drainage system and prior to occupation of any part of the development, the developer/applicant shall provide the local planning authority with as-built drawings of the implemented scheme together with a completion report prepared by an independent engineer that confirms that the scheme was built in accordance with the approved drawing/s and is fit for purpose. The scheme shall thereafter be maintained in perpetuity.

Reason: To ensure that the proposed development is satisfactorily drained in accordance with policies W DM2 and W DM3 of the Arun Local Plan.



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1.1.2 This report follows further as-built information provided from the client / contractor and detailed modelling of the as-built permeable paving roads and infiltration blanket.

1.1.3 It is understood that the type, principle and main function of the agreed SuDS features must be implemented on site as per the approved drainage scheme whilst minor adjustments i.e. pipe layout, local invert levels, chamber size and its location are allowed on site to suit specific site conditions and / or buildability. Such adjustments are outside of the scope of this report as these do not relate directly to the functionality of the SuDS implemented.

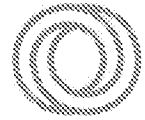
1.1.4 The approved list of drawings is presented below:

YAP-130-028-C1 "Pervious System Network (38 Units)";
YAP-130-081-C5 Drainage Layout "Plots 1-23 & 33-38 38 Unit Site Sheet 1 of 6";
YAP-130-082-C5 Drainage Layout "Plots 24-32 38 Unit Site Sheet 2 of 6";
YAP-140-001-C1 "Private Drainage Manhole Schedules";
YAP-150-071-C2 "External Works Layout 38 Unit Site Sheet 1 of 3";
YAP-180-030-C2 "Drainage Construction Details (Sheet 1 of 2)";
YAP-180-031-C3 "Drainage Construction Details (Sheet 2 of 2)";
YAP-180-035-C2 "Highway Construction Details (Sheet 1 of 2)"; and
YAP-180-036-C1 "Highway Construction Details (Sheet 2 of 2)".

1.1.5 The list of drawings used by the contractor for the construction of the scheme is provided in **Appendix A**. Drawings having a later revision to the ones approved at drainage condition discharge have been amended to suit minor site alterations and address client's comments, however the principle of the approved drainage scheme was not materially altered.

2.0 PERSONAL STATEMENT

2.1.1 My name is Ryan Saul and I am a Partner at Odyssey Consult LLP. I hold a first class bachelor's degree with honours in civil engineering and I have gained over 20 years experience in civil engineering consulting for both the public and private sectors. I am registered as an Incorporated Engineer with the Engineering Council. I am a Full Member of the Institution of Civil Engineers.



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2.1.2 I am responsible for the delivery of Flood Risk Assessments, Drainage Strategies, Services Appraisals, Feasibility Studies and detailed civil engineering design for construction on behalf of Odyssey Consult LLP's clients. I previously worked for a large international and multi-discipline UK based consultancy prior to joining Odyssey. I have experience in a wide range of projects from small bespoke residential developments to large strategic mixed use schemes.

3.0 AS-BUILT INFORMATION

3.1.1 The as-built information used in preparation of this report has been supplied by NRS Surveying Limited via a drainage survey, as presented in **Appendix B**. In addition, emails, documents and site photographs were sent by the client or their contractor. Odyssey assumes no responsibility for the correctness of such information, however trust it to be true and accurate.

3.1.2 Odyssey visited the site on 9th March 2022 and gathered photographic evidence of some structures and such photographs are presented in **Appendix C**.

3.1.3 Below is a summary of main drainage and SuDS components that were approved and should be installed;

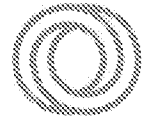
- Pervious pavement;
- Pervious pavement weirs (check dams);
- Pervious pavement geocellular storage;
- Infiltration blankets;
- Drainage runs; and
- Silt traps (catchpits).

3.2 *Pervious Pavement*

3.2.1 During the site visit Odyssey was shown the asphalt concrete base course of the permeable paving to be core drilled for certain areas. Other areas had permeable paving blocks already installed but the contractor and client confirmed that similar core drilling took place for these areas.

3.2.2 The as-built sub-base material complies with the design requirement to provide sufficient void ratio for water storage purposes. Please refer to an example of delivery ticket in **Appendix C**.

3.2.3 The sub-grade levels of the installed permeable paving are presented on the drawing YAP-130-SK008 in **Appendix D**. Most of the as-built sub-grade levels are constructed to within a +/- 50



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millimetre (mm) tolerance (green clouded areas) with two areas where the tolerance exceeds +/- 50mm (red clouded areas).

3.2.4 The permeable paving areas were re-calculated to check their performance for the design storm of 1 in 100 year (+40% climate change). Calculations are presented in **Appendix D** together with the supporting drawing YAP-130-SK009.

3.2.5 The hydraulic calculations show that the as-built pervious systems will perform satisfactorily during the design storm and will not flood off-site. Odyssey confirms therefore that pervious pavements should function as per approved designs.

3.2.6 As-built documents and photographs of the as-built pervious pavements are presented in **Appendix C**.

3.3 Pervious Pavement Weirs (check dams)

3.3.1 The site installed weirs (check dams). As-built documents and photographs of these are presented in **Appendix E**.

3.3.2 The available as-built information indicates that weirs were generally constructed to within a +/- 50mm height tolerance of the design height, with a single weir (No. 2) height being 100mm lower than the design height.

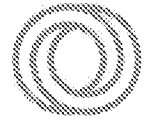
3.3.3 Calculations of pervious pavement incorporating weirs are presented in **Appendix E** together with the supporting drawing YAP-130-SK009.

3.3.4 Odyssey confirms that weirs should function as per approved designs.

3.4 Pervious Pavement Geocellular Storage (Roads 2 and 3)

3.4.1 The design was based on the use of Permavoid product, however other products could be used if these would offer the same characteristics (i.e. volumes and structural strength).

3.4.2 The site used a product called GEOLight from SDS company. The thickness of this product is 250 mm as per the confirmation e-mail in **Appendix F**.



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3.4.3 The letter from SDS in **Appendix F** states that units should be structurally capable for the given application and that total combined storage equals to 148.67m³. (Note: the total combined design storage within the geocellular units of the sub-base of roads 2 and 3 was 142.3m³).

3.4.4 Odyssey confirms that pervious pavement geocellular storage should function as per approved designs.

3.5 Infiltration Blankets

3.5.1 Infiltration blankets installation pictures and as-built levels are presented in **Appendix G**.

3.5.2 The as-built information indicates that infiltration blankets were generally constructed to within a +/- 15mm level tolerance of the design invert / soffit levels.

3.5.3 Inspection chambers are included along the edge of the units to enable maintenance in accordance with operation and maintenance requirements set out in The SuDS Manual (CIRIA C753). Maintenance would be carried out annually or as required based on inspections.

3.5.4 Odyssey confirms therefore that infiltration blankets are therefore installed and will function as per approved designs.

3.6 Drainage Runs

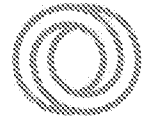
3.6.1 The letter from the contractor confirms that all drainage runs were installed as per approved design drawings. Please refer to **Appendix A** for the letter.

3.7 Silt Traps

3.7.1 The contractor provided photographic evidence of the installed silt traps. Please refer to **Appendix H** for photographs.

4.0 VERIFICATION

4.1.1 Odyssey did not have a site presence during construction to be able to verify that the SuDS elements of the drainage scheme were installed as per the approved design. However, the contractor has certified that they built the drainage system in accordance with the approved design provided by Odyssey, and with no material deviation to the design. The letter is included in **Appendix A**. Furthermore, Odyssey has revised the drainage calculations following receipt of the as-built survey



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and the modelled results demonstrate there is no flooding for the 1 in 30 year storm. There is minimal flooding within the west of the site for the 1 in 100 year plus 40% climate change storm, however this very small volume is no greater than that presented within the previously approved calculations, and would be routed within the site layout to ensure there would be no flooding offsite.

4.1.2 Based on the information / evidence supplied and undertaken calculations it is verified and concluded that the SuDS elements of the drainage system have been generally constructed as per the approved designs and therefore should function as per the approved scheme.

APPENDIX A

As-Built Contractor Letter

Dear Dandara et al,

This letter is to confirm that Parchow Groundworks have constructed all SUDS related aspects at Stakers farm on behalf of Dandara to the Odyssey drawings referenced below;

YAP-180-030 Drainage Construction Details (rev C2)
YAP-180-031 Drainage Construction Details (rev C4)
YAP-180-035 Highway Construction Details (rev C3)
YAP-130-026 Drainage Layout (rev F)
YAP-130-028 Drainage Layout (rev C1)
YAP-130-081 Drainage Layout (rev C8)
YAP-130-082 Drainage Layout (rev C9)
YAP-130-083 Drainage Layout (rev C6)
YAP-130-084 Drainage Layout (rev C6)
YAP-130-085 Drainage Layout (rev C5)
YAP-130-086 Drainage Layout (rev C5)

All details have been followed along with stated pipe sizes.

Andy Howe
Operations Director

APPENDIX B

As-Built Survey

[illegible]

This Drawing is for As Built / Technical Query reasons only and is not to be used for setting out unless drawing is approved and signed off and copies emailed to NRS Surveying Ltd.

No Original Control or Topographical Stations located on site. No Control issued by Parchow Groundworks prior to survey.

New control points installed using GPS and relate to OSGB36(15). 200 RTK positions taken on each ground control point;

Survey completed using EDM. The grid is related to OS using Industry Standard Network RTK GPS. All levels are related to OS Grid using Industry Standard Network RTK GPS.

STN GPS Nail 01: 497727.471E, 103792.136N, 6.890Z.
STN GPS Nail 02: 497783.571E, 103771.831N, 7.676Z.

From this Set Up New Control Stations Installed.

Drawing completed on behalf of Dandara.

Survey completed: 05/06/2023 - N Rogers - NRS Surveying Ltd.

Rev C Drawing Issued 11/12/2023 - Rodding Eyes added to end of Storm Tank - N.Rogers - NRS Surveying Ltd.

Rev D Drawing Issued 11/01/2024 - S72 Sump Levels Amended - N.Rogers - NRS Surveying Ltd.

NRS Surveying Limited,
6 Purbrook Way,
Havant,
Hampshire
PO9 3RY
Mobile:
07564 602518.
Email:
nrsurveying@gmail.com

Project: Paddock View,
Yapton, West Sussex.

Scale @ A1: xxxxx	Drawn Date: 08/06/2023.	Project Number: Dandara -Paddock View-001 Rev D.
Drawn By: Nick Rogers		Checked By: Nick Rogers.

APPENDIX C

Pervious Pavement Evidence

Contractor / Client's evidence

DAY ■ AGGREGATES

BULK MATERIALS CONVEYANCE NOTE

DATE	TIME	PROJECT CODE	ORDER CODE	TICKET NUMBER
18/05/21		DQ00013842	641	4230717

VEHICLE REG.	HAULIER'S CODE/NAME	DRIVER'S NAME
GF68VRE 1	DAY RIGID LOOSE AGGREGATE	DAVID SIMPSON

CUSTOMER NAME: 203006 MACKOY LTD SIC CODE:

SITE ADDRESS:
DANDARA HOMES SITE
YAPTON, NORTH END ROAD NO ACCESS OFF FORD ROAD
BN18 0DU

NUTS CODE: ZONE CODE: BN18

INSTRUCTIONS: ANDY 07922 260 982 - COLLECTION REF - 28107038
DO NOT ENTER SITE OFF FORD ROAD

CUSTOMER ORDER No.: YAP096 ORDER QTY: 100

MATERIAL DESCRIPTION: 4/20 GRADED GRANITE AGGREGATE



SOURCE/W.D.P.	U.O.M.	GROSS WEIGHT	TARE WEIGHT	NETT QUANTITY
395 AGGSH0	tonnes			18 to 57
CASH SALE DETAILS		RATE	NETT	VAT
				TOTAL

THIS BLOCK TO BE USED FOR WAITING TIME OR DAY WORK ONLY	TIME ON SITE	TIME OFF SITE	HOURS	MINUTES
	REASON FOR WAITING			
	SIGNED BY		PRINT NAME	

CUSTOMERS ORDERING VEHICLES OFF THE HIGHWAY DO SO ENTIRELY ON THEIR OWN RESPONSIBILITY

GOODS RECEIVED	SIGNED BY	PRINT NAME
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THIS LOAD IS SOLD SUBJECT TO OUR CONDITIONS OF BUSINESS (AVAILABLE ON REQUEST). DAY AGGREGATES IS A DIVISION OF DAY GROUP LTD. REGISTRATION NO. 492417. VAT REGISTRATION NO. GB 222 6659 65. SIC Number 48730 WASTE CARRIERS LICENCE NO. CBDU116811. WHERE APPLICABLE CE INFORMATION IS AVAILABLE ON REQUEST, EMAIL TECHNICAL@DAYGROUP.CO.UK RECYCLED AGGREGATES PRODUCED BY DAY GROUP ARE MANUFACTURED IN ACCORDANCE WITH WRAP QUALITY PROTOCOL. THE SIGNEE CONFIRMS THAT THE WASTE HIERARCHY HAS BEEN APPLIED AS REQUIRED BY REGULATION 12 OF THE WASTE (ENGLAND & WALES) REGULATIONS 2011.



Aggregate Test Certificate

Client: Dudman Aggregates Ltd.
Albion Wharf, Albion Street
Southwick
Brighton BN42 4DP

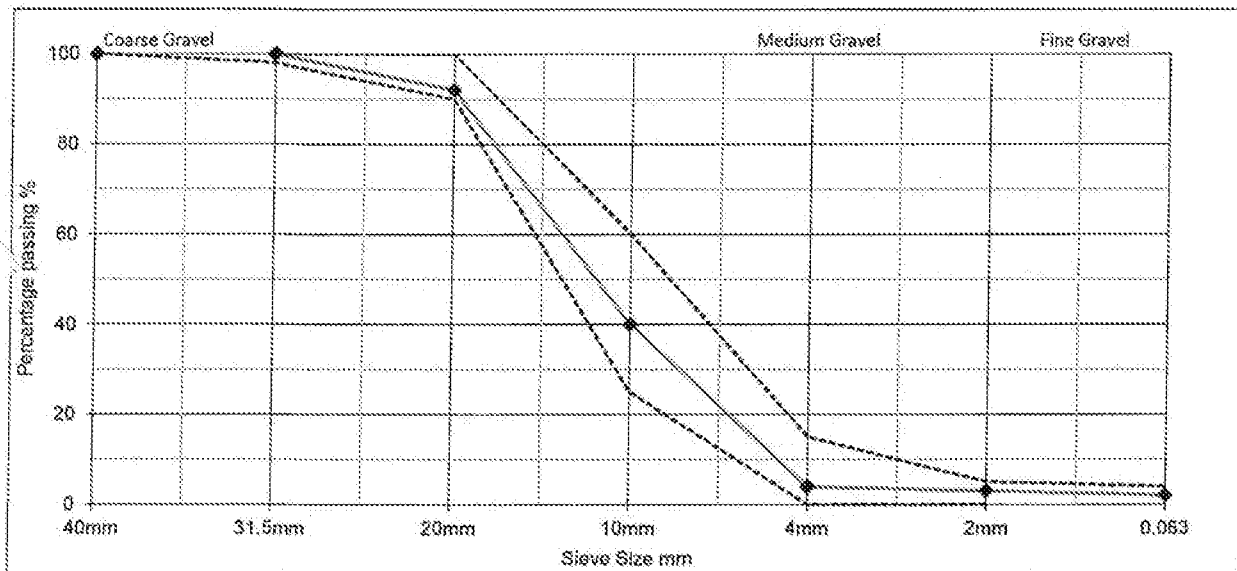
Sample Reference: 21.35.4/20 (LS).01
Source of Material: Carboniferous L/stone
Torr Works

Material Description: 4/20mm Con. Graded (In-House Grading)
Visual Description: Grey/Pink Carboniferous Limestone
Test Method: Particle Size Distribution to BS EN 933-1

Sieve Size	Percentage Passing	Limits
40mm	100	100
31.5mm	100	98-100
20mm	92	90-100
10mm	40	25-60
4mm	4	0-15
2mm	3	0-5
0.063	2	0-4

Date Sampled: 30th August 2021
Date Tested: 6th September 2021

Particle Size Distribution Grading Curve



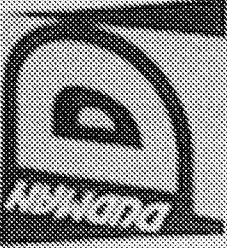
The material tested complies with the above in-house grading requirements

Signed:

Date of Issue: 20th September 2021

Neil Jay :-Group Technical Manager:-Dudman Aggregates Limited

Company registration Number : 7803522



13/07/21 14:40

Dudman Engineering Limited
Kingsdown Quarry

☐ ☐ ☐ ☐

Pardshaw Groundservices Ltd
c/o Danlons, Pardshaw Lane, North End Road
Yate, Bristol
Avon
Bristol
Bristol

Date	Customer ref	Invoice	Unit	Rate	Qty
13/07/21	1300	Pardshaw Lane Ground Services Ltd	Tarmac	12.750	30.750
Total 30.750					

For Customer: GROUND & PAVING OVER FOR WILSONS MIDDLE

Comments: *Subsidence investigation available to view at Kingsdown Quarry*

Terms of Payment: Cash - Kingsdown

Van Reg No: WVA2579310

Driver Name: Smith

Cash: Kingsdown

£

Driver Signature: _____

Time: _____ Date: _____

Customer Signature: _____

Handwritten note: *Handwritten note at bottom right of page*

Site Name: Stakers Farm, Yaptan



Revision: A

4-20-10

Site Name: Stakers Farm, Yapton



Note Number: ABL418-38
Date: 15th March 2021
Subject: SuDS As Built Information Form – 38 Unit Site
Revision: A

[illegible]

Site Name: Stakers Farm, Yapton

S1 (Between Plots 2 & 9 and including driveways for Plots 3-8) - Type 4 Construction

[illegible]





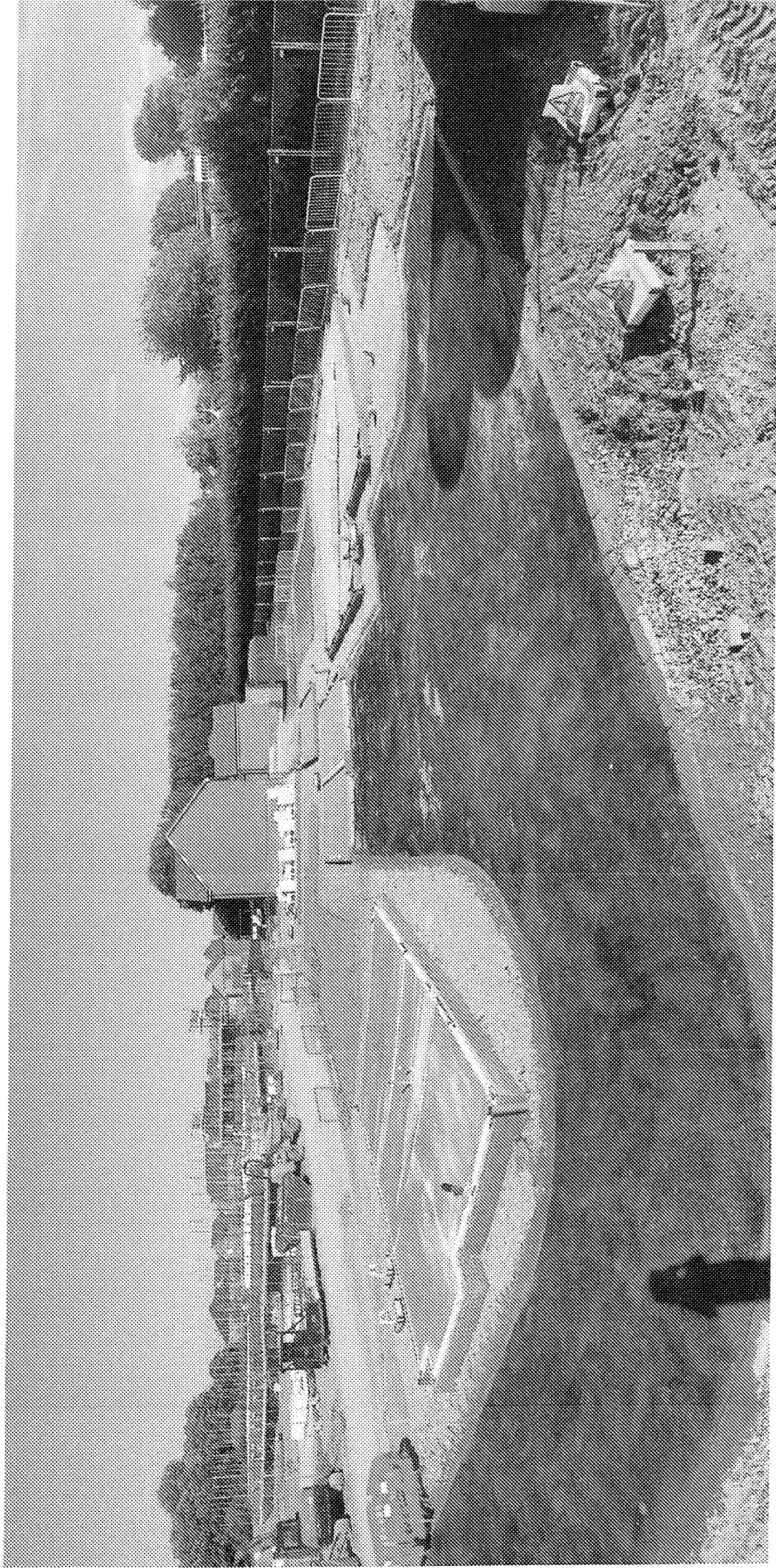


Site Name: Stakers Farm, Yapton

[illegible]

Site Name: Stakers Farm, Yapton

[illegible]









Site Name: Stakers Farm, Yapton

[illegible]

Site Name: Stakers Farm, Yapton

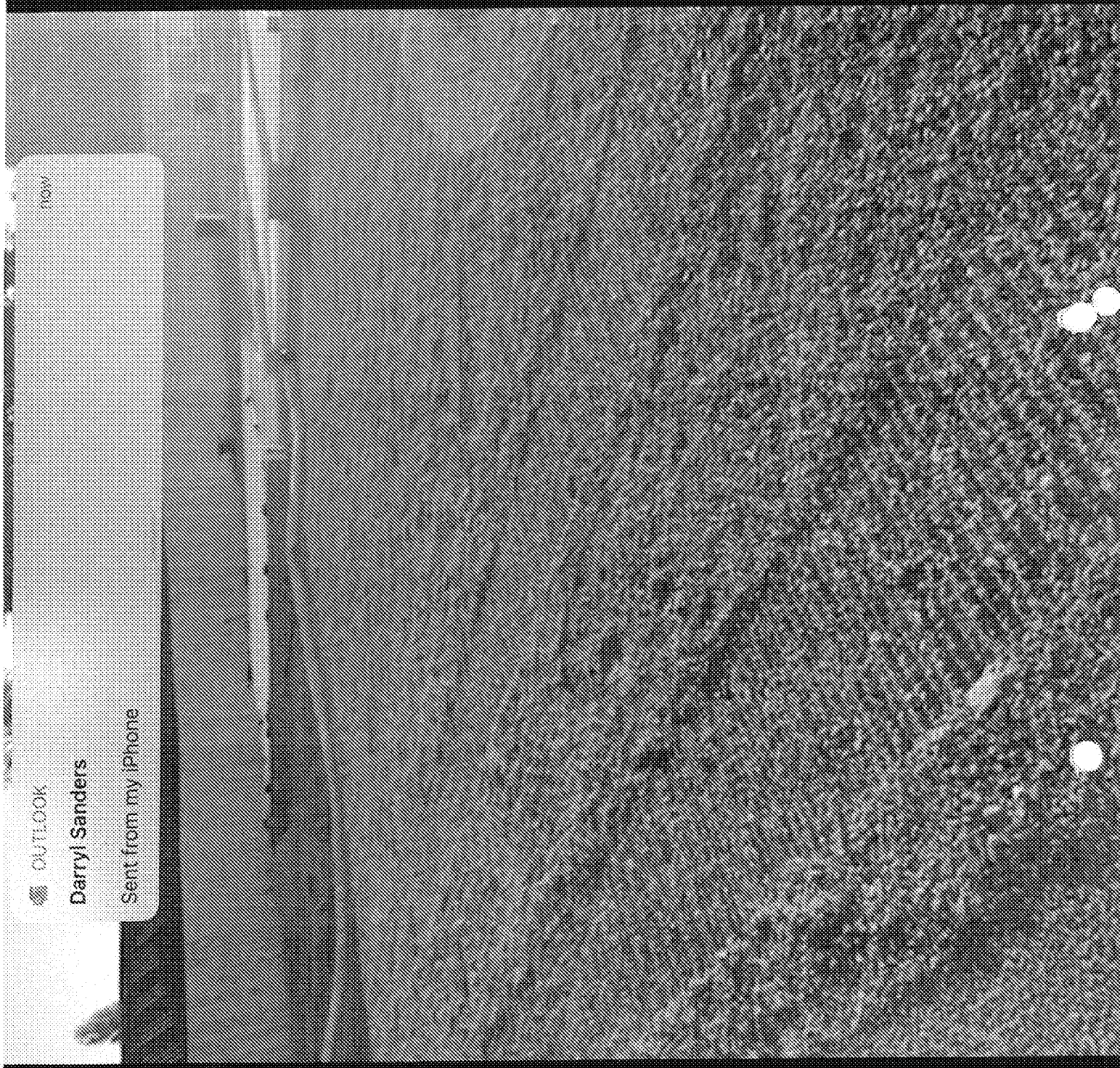
[illegible]

OUTLOOK

Darryl Sanders

Sent from my iPhone

now





OUTLOOK

Darryl Sanders

Sent from my iPhone

now



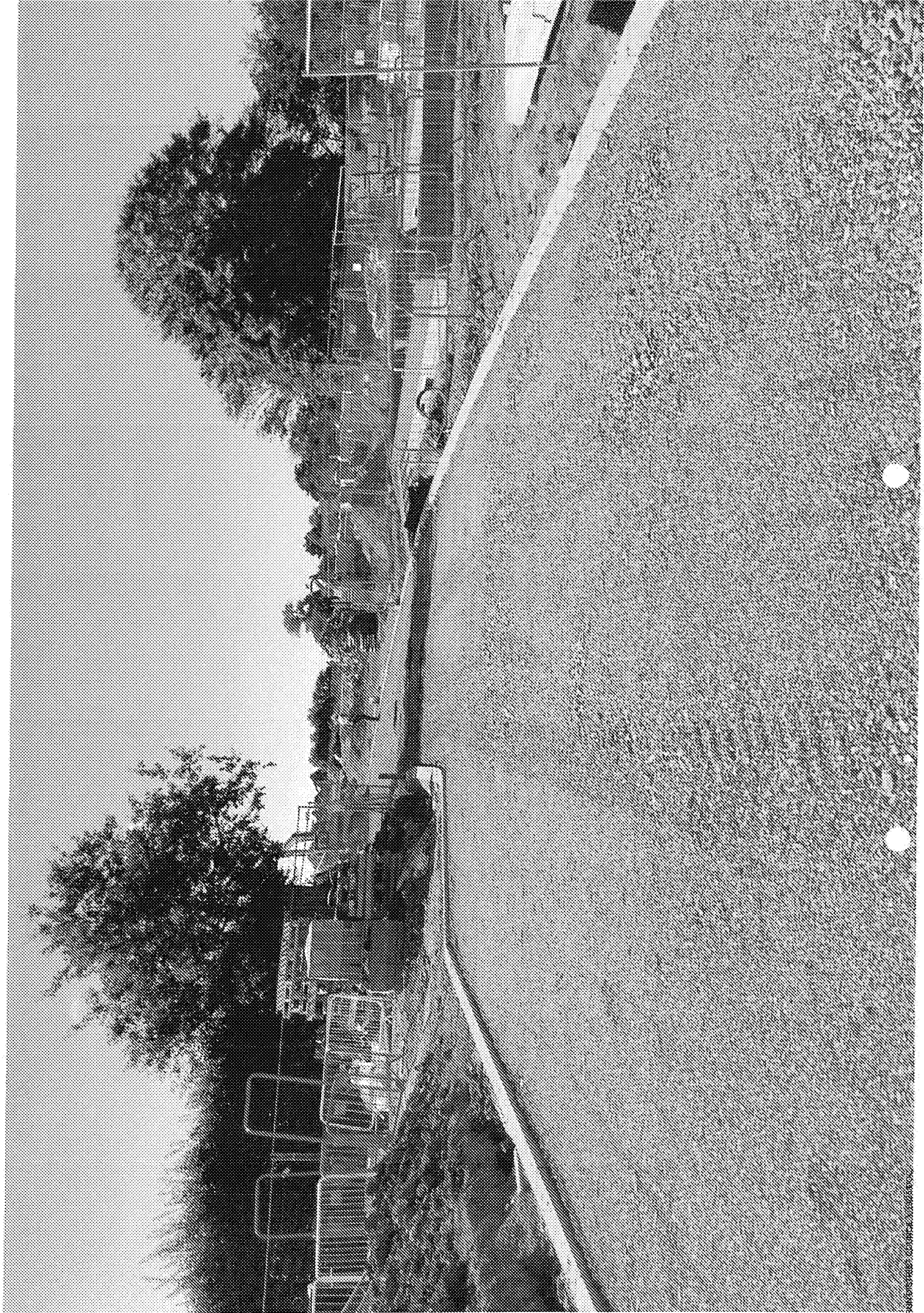


Site Name: Stakers Farm, Yapton

RUN DISTRICT COUNCIL Y/19/25/DOC

[illegible]





2.

Private Drives

All Private Drives are to be supported by photos at all stages of the infrastructure build and .dwg as built CAD files. Any variations to the design must be supported by demonstrable calculations and approvals from Dandara (Engineering Department only) or the Civil Engineering Designer (Odyssey).

Private Drive (Plots 1-2) – Type 5B Construction

Details	Units	As Built Recording	Notes <i>Including justifications for varying the design</i>
Has the drive been surveyed in GPS and CAD .dwg format?	N/A	Yes / No	State Drawing Number
Formation Level	mAOD		
Terram Geotextile installed?	N/A	Yes / No	Supporting Photos
Thickness of Sub-base	mm		
Sub-base material and reference to import ticket	N/A		Supplier name and details. Import Ticket Reference Number.

Private Drive (Plots 37-38) – Type 5B Construction

Details	Units	As Built Recording	Notes <i>Including justifications for varying the design</i>
Has the drive been surveyed in GPS and CAD .dwg format?	N/A	Yes / No	State Drawing Number
Formation Level	mAOD		
Terram Geotextile installed?	N/A	Yes / No	Supporting Photos
Thickness of Sub-base	mm	395 mm	
Sub-base material and reference to import ticket	N/A	4/20	Supplier name and details. Import Ticket Reference Number.

AS BUILT INFORMATION
Site Name: Stakers Farm, Yapton



Private Drive (Plots 36) – Type 5B Construction

N/A Show home

Details	Units	As Recording	Built	Notes <i>Including justifications for varying the design</i>
Has the drive been surveyed in GPS and CAD .dwg format?	N/A	☒ Yes ☐ No		State Drawing Number
Formation Level	mAOD	7.038 7.038 7.031		
Terram Geotextile installed?	N/A	☒ Yes ☐ No		Supporting Photos
Thickness of Sub-base	mm	395		
Sub-base material and reference to import ticket	N/A			Supplier name and details. Import Ticket Reference Number.

Private Drive (Plots 9-10) – Type 5B Construction

Details	Units	As Recording	Built	Notes <i>Including justifications for varying the design</i>
Has the drive been surveyed in GPS and CAD .dwg format?	N/A	☒ Yes ☐ No		State Drawing Number
Formation Level	mAOD	7.038 7.031		
Terram Geotextile installed?	N/A	☒ Yes ☐ No		Supporting Photos
Thickness of Sub-base	mm	395.		
Sub-base material and reference to import ticket	N/A	4/20.		Supplier name and details. Import Ticket Reference Number.

Private Drive (Plots 11-12) – Type 5B Construction

Details	Units	As Recording	Built	Notes <i>Including justifications for varying the design</i>
Has the drive been surveyed in GPS and CAD .dwg format?	N/A	☒ Yes / No		State Drawing Number
Formation Level	mAOD	6.981 6.871		
Terram Geotextile installed?	N/A	☒ Yes / No		Supporting Photos
Thickness of Sub-base	mm	395		
Sub-base material and reference to import ticket	N/A	4/20		Supplier name and details. Import Ticket Reference Number.

Private Drive (Plots 13-14) – Type 5B Construction

Details	Units	As Recording	Built	Notes <i>Including justifications for varying the design</i>
Has the drive been surveyed in GPS and CAD .dwg format?	N/A	☒ Yes / No		State Drawing Number
Formation Level	mAOD	6.844 6.674 6.668		
Terram Geotextile installed?	N/A	☒ Yes / No		Supporting Photos
Thickness of Sub-base	mm	395		
Sub-base material and reference to import ticket	N/A	4/20		Supplier name and details. Import Ticket Reference Number.