



**Geotechnical Summation Report**  
Mine Subsidence Investigations for Proposed  
Seniors Living Development Part Lot 141  
DP1225076 and Lot 8 DP855275 Mount Vincent  
Road and Wilton Drive, East Maitland,  
New South Wales

Prepared for: GHT Holdings Pty Ltd C/-ACM Landmark  
EP0875.001 27 July 2018



# Geotechnical Summation Report

Mine Subsidence Investigations for Proposed Seniors Living Development Part Lot 141 DP1225076 and Lot 8 DP855275 Mount Vincent Road and Wilton Drive, East Maitland

GHT Holdings Pty Ltd C/-ACM Landmark  
76 Tuggerah Parade  
The Entrance 2261

27 July 2018

Our Ref: EP0875.001

## LIMITATIONS

This Geotechnical Summation Report was conducted on the behalf of GHT Holdings Pty Ltd C/-ACM Landmark for the purpose/s stated in **Section 1**.

EP Risk has prepared this document in good faith but is unable to provide certification outside of areas over which EP Risk had some control or were reasonably able to check. The report also relies upon information provided by third parties. EP Risk has undertaken all practical steps to confirm the reliability of the information provided by third parties and do not accept any liability for false or misleading information provided by these parties.

It is not possible in a Geotechnical Summation Report to present all data, which could be of interest to all readers of this report. Readers are referred to any referenced investigation reports for further data.

Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

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Version	Author	Date	Reviewer	Date	Quality Review	Date
v1	James Young	26.07.18	Rachel Condon	27.07.18	James Young	27.07.18

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Version	Date	Reference	Submitted to
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## Table of Contents

1	Introduction .....	1
2	Site History .....	2
2.1	Mine Workings .....	2
3	Geotechnical Constraints .....	3
4	Comments and Recommendations .....	4
4.1	Pavements .....	4
4.1.1	Rigid Pavements .....	4
4.1.2	Flexible Pavements .....	4
4.2	Stormwater, Sewer and other inground Services .....	4
5	Closure .....	5

## List of Appendices

Appendix A     ACM Landmark Concept Plans

# 1 Introduction

This report provides a summary of an investigation undertaken in relation to mine subsidence for a Proposed Seniors Living Development at Part Lot 141 Deposited Plan (DP) 1225076 (Lot 141) and Lot 8 DP855275 (Lot 8) are Mount Vincent Road and Wilton Drive, East Maitland, New South Wales (NSW) (the Site). The Proposed Development includes one hundred and thirty-four (134) dwellings and associated infrastructure including an associated community facility.

The Lot 141, DP1225076 was formerly part of Lot 42 DP846326 (Lot 42) and investigation undertaken for Lot 42 is referenced in this report. Reports reviewed for the production of this report includes:

1. Request for additional Information by Maitland City Council Ref DA-17-2520 dated 01 December 2017.
2. Subsidence Advisory NSW, Approval Determination dated 15 November 2017
3. *Site Investigation of Old Mine Workings Part Lot 141 DP1225076 & Lot 8 DP855275 Mount Vincent Road and Wilton Drive East Maitland* by Cole-Clark Mine Subsidence and Mining Engineering Pty Ltd (Cole-Clark), 28 August 2017.
4. *Mine Workings underlying and adjacent to Lot 42 DP846326 Wilton Drive – Updated Report*, Brunskill Pty Ltd, BMPR935A\_070514 7 May 2014
5. *Report on Mine Subsidence Investigation, Proposed Seniors Living Development, Corner Wilton Drive and Mount Vincent Road, East Maitland* Douglas Partners Pty Ltd (Douglas Partners) Project 81879.00 March 2016
6. *Report on Mine Subsidence Investigation, Proposed Rezoning Lot 42 DP846326, Corner Wilton Drive and Mount Vincent Road, East Maitland*, Douglas Partners Project 81674.00, September 2015
7. *Urban Capability Assessment Lot 42 DP846326 and Lot 1012 DP1103879 Mount Vincent Road East Maitland*, Cardno Geotech Solutions (CGS) Ref 1435-001/2 dated 22 August 2012.

The author is familiar with the Site and was involved in the preparation of the Urban Capability Assessment (reference 7 above) for the Site and advice in relation to further investigation.

This report was required in response to a request for additional information in relation to geotechnical issues by Maitland City Council Ref DA-17-2520 dated 01 December 2017 including:

- The assessment of the construction associated with the development and in particular, recommendations in relation to pavement construction and stormwater management systems.

This report provides a summation of the referenced reports and provides commentary and recommendations based on contents of those reports. The report should be read in entirety in relation to the recommendations provided in relation to the extent and remediation options for the mine workings.

EP Risk was engaged by Mr Chris Unicomb of GHT Holding Pty Ltd (the Client) via acceptance of proposal reference EP11572 dated 30 May 2018 via email on 11 July 2018. All work is to be care of ACM Landmark Pty Ltd (ACM Landmark).



## 2 Site History

The Site is located on the corner of Wilton Drive and Mount Vincent Road, East Maitland, NSW. The proposed layout of the Site is shown on the ACM Landmark Plan titled 'Preliminary Design for DA approval Only "Hunter Grange Lifestyle Village" Part Lot 14, DP 1225076 and Lot 8, DP 855275 Mount Vincent Road & Wilton Drive, East Maitland NSW 2323', provided as **Appendix A**.

The Site is located within the East Maitland Mine Subsidence District (Subsidence Advisory NSW (SA NSW) (formerly Mine Subsidence Board)) and has been used historically for grazing purposes. Approval is required for subdivision and surface development. Surface development has occurred in the general area to the east and west of Lot 8. The Client proposes to develop residential structures on the Lots for Seniors Living along with a larger community complex. The development has been located to minimise the extent of development on undermined land, but some development on undermined area is unavoidable.

SA NSW has provided a plan that indicates Lot 8 and Lot 141 are partially undermined by old shallow mine workings in the Rathluba Seam.

SA NSW and Maitland City Council (Council) have approved the development of a house and detached garage on Lot 141. Council has also approved the subdivision of Lot 8. However, the subdivision of Lot 8 did not proceed as the Lot is proposed for development as Seniors Living and will provide access to the development proposed on Part Lot 141. Initial staging of the development involves the development of Lot 8 by providing access through Lot 8 into Lot 141 to enable development to the west of the old mine workings and areas as shown on concept plans in **Appendix A**.

Conditional Consent was granted by SA NSW in November 2017 following the submission of the Greg Cole-Clark and Douglas Partners reports for the Site. The conditions imposed require the elimination of the risk of mine subsidence by suitable means to acceptance.

### 2.1 Mine Workings

Lot 8 and Lot 141 are partially underlain by old and abandoned shallow (<25) mine workings in the Rathluba Coal Seam of the Late Permian Age Tomago Coal Measures. The mine workings were mined by Rathluba Colliery and Rathluba No. 2 Colliery.

The mine plan indicates that the area was worked by the Bord and Pillar method, which involves the development of a series of headings and cut-throughs that usually leave rectangular shaped pillars of coal to support the mine roof during the development of panels. These pillars can then be extracted, in what is referred to as secondary or pillar extraction, leaving small sections of coal intact to control the collapse of roof material. Extraction rates can vary but it is likely >80% of coal would be extracted during secondary extraction creating a goaf area. Whilst the goaf area will be filled with crushed coal and fallen roof material it is possible there may still be some voids. The Record Tracing indicates first workings only were completed beneath Lot 8 and Lot 141.

Records indicate the Rathluba Seam had working sections ranging from 5' (1.52 m) to around 8' 6" (2.61 m) due to varying bands of dirty coal that affected coal quality. Based on references the total seam thickness is around 3.3 m and the seam dips at approximately 1 in 12 to the south-east. Investigation indicates the depth of workings are relatively shallow and generally less than 20 m depth across the Site.

Based on the Record Tracing there are no shafts or drifts on Lot 8 and Lot 141. A mine entry and shafts exist to the south of the Lot 141 boundary.

This report relates to the western and northern extent of the mine workings on Lot 141 and Lot 8 proposed for development. The mine workings to the east will be assessed when the staged Seniors Living development is scheduled for that area.

### 3 Geotechnical Constraints

Due to the previous mine working undertaken under the proposed Development site, mine subsidence investigations have been undertaken by others and referenced in **Section 1** of this report. The investigations have confirmed the presence of shallow working (<20 m) across Lot 8 are more extensive than mining records indicate and confirm shallow workings in the central and eastern portions of Lot 141. Due to the findings of their respective investigations and the presence of the shallow workings and the potential for mine subsidence, remediation has been recommended by Douglas Partners and Cole-Clarke and include:

- Bulk earthworks – cut and fill to remove voids;
- Grout injection of voids;
- Structural design (as per SA NSW design for potholes);
- Piering foundation of structures;
- Road construction using plastic geo-grid to span potential potholes or concrete slabs (reinforced) to span potholes;
- Surface drainage to reduce risk of infiltration; and
- Appropriate fencing and signage to restrict public access to undeveloped areas as required.

SA NSW, in their conditional approval provided on 15 November 2017, stipulate that a proposal is to be submitted to SA NSW to eliminate the risk of mine subsidence for SA NSW's acceptance by a suitable means such as grouting. Grouting is generally the most feasible way to eliminate the risk of subsidence, except where workings are very shallow, and earthworks can be undertaken practically and economically. Grouting of old and disused working is commonly undertaken in the Maitland and Newcastle areas and technology has seen considerable advancement in recent years with high rise development in the Newcastle Central Business District (CBD).

Geotechnical constraints on the Site include subsidence-related collapse of mine workings and the impact on structures, pavements and inground services. The risk of subsidence is not considered prohibitive to the development of the Site where remediation is undertaken with the recommendation of this and the reports referenced within, along with the approval by SA NSW of remediation.

The impact of potential subsidence on pavement and stormwater due to presence of old and abandoned mine workings can be eliminated by adoption of appropriate remediation as outlined above. The method of remediation adopted will largely depend on the costs and practicality of various methodology. Based on the investigation by Cole-Clark and Douglas Partners along with further discussion with Cole-Clark, there is evidence to suggest that there has been pillar collapse and that the roof is down in the majority of the first workings within Lot 8. Therefore, grouting of identified voids would, for all practical purposes, eliminate the potential for gross subsidence. There could be potential for minor subsidence, but this could be addressed within design of structure and other infrastructure.

It is noted that there is no history of subsidence on the Site, however excavation for the purpose of road construction and installation of inground service will reduce the cover to workings and may increase the potential for subsidence where grouting is not undertaken.

## 4 Comments and Recommendations

It is recommended that all working less <20 m depth should be remediated. The adoption of 20 m is considered conservative due to seam thickness and details of workings determined by records and investigations.

The risk of subsidence due to collapse of old or abandoned working can be reduced by the adoption of remediation options outlined in **Section 3** of this report. Grout injection of voids is considered the most cost effective and practical method for the elimination of large scale subsidence potential. Other options are offered, however grouting of workings is recommended and alternate methodology would need approval SA NSW.

Minor subsidence potential can be addressed by design of structures and infrastructure for the development including the following:

### 4.1 Pavements

Pavement within the Proposed Development should be designed by a geotechnical consultant with experience on mine subsidence sites. The pavements should consider the most appropriate remediation / risk mitigation measures when considering both mine working remediation and pavement design.

#### 4.1.1 Rigid Pavements

Roads within the Proposed Development are recommended to be constructed using rigid pavements, utilising reinforced concrete. This is recommended where pavement areas are not remediated by grouting of other means. Whole of life costing would be expected to show the benefit of reduced maintenance and disruption to the seniors' community for the use of a rigid pavement and would be the most cost-effective option longer term.

#### 4.1.2 Flexible Pavements

Where a flexible pavement option is preferred the use of geosynthetics such as a reinforced plastic geo-grid would be required to eliminate the risk of pavement failure due to subsidence where remediation by grouting or other methodology is not undertaken. A woven fabric geosynthetic such as Bidum A24 or equivalent should also be used in conjunction with a geo-grid or geocomposite used to prevent fines migration from the pavement should subsidence occur. Pavement deformation would be expected should significant pothole development occur under a flexible pavement. This would allow identification and remediation where required.

Where grouting of workings is undertaken under the road alignment, no special provisions for pavement design will be required.

### 4.2 Stormwater, Sewer and other inground Services

Stormwater Management Systems and other inground services will need to be designed considering the potential for subsidence where remediation is not undertaken to eliminate such risk and consider the potential for minor subsidence where remediation is undertaken. It is recommended that the use of high stiffness twin wall corrugated polypropylene pipes with a smooth bore would be suitable for non-pressure drainage and may be preferable to precast concrete systems. Vinidex StormPRO and SewerPro or equivalent products would offer performance benefits where there is a risk of subsidence. StormPro is available in 6 m lengths and together with flexible fittings would offer protection where pothole development was to occur.

Other inground services should be designed with consideration to potential subsidence and the use of flexible fittings and components similar to those specified for highly to extremely reactive sites are recommended.

It is likely that SA NSW will require grouting of the entire development area where the cover over workings < 20 m. If grouting is undertaken of the entire workings beneath the development site, no special provisions would be required for inground services.

## 5 Closure

Based on the investigations undertaken by Douglas Partners and Cole-Clark in relation to mine workings undertaken on the subject Site, it is recommended that remediation is undertaken for areas of the development Site where mine workings are <20 m depth, preferably by grout injection. This includes a significant portion of Lot 8 which was earlier presumed not to be undermined based on available plans of mine workings.

There are no geotechnical constraints that are considered prohibitive to development of the Site as proposed where remediation of the mine workings is undertaken in accordance with this report and reports referenced herein and to the satisfaction of SA NSW. It is considered likely that SA NSW will require grouting of workings beneath the proposed development where they are encountered at a depth of less than 20m.

Where remediation of the workings is undertaken by grout injection under the developable portion of the Site, there would be no impacts expected on the development of infrastructure on the subject Site that would require special provisions other than those specified by SA NSW.

Yours Sincerely

**EP Risk Management Pty Ltd**



James Young

Principal Geotechnical Scientist



# Appendix A

## ACM LANDMARK CONCEPT PLANS




Site area	=102,071.0m <sup>2</sup>	<b>Floor Space Ratio</b>	<b>=0.17:1</b>
Community Centre Floor Area	=1,499.3m <sup>2</sup>	MAXIMUM ALLOWABLE FSR = 0.5:1	
Total Gross Floor Area	=17,399.8m <sup>2</sup>		
Community Centre Building Area	=1,458.0m <sup>2</sup>	<b>Site Coverage Ratio</b>	<b>= 0.49:1</b>
Total Building Area	=24,938.6m <sup>2</sup>	MAXIMUM ALLOWABLE COVERAGE = 70% or 0.7:1	
Total Hardstand Area (Driveways & Road)	=23,220.2m <sup>2</sup>		
Total Coverage Area	=49,616.8m <sup>2</sup>		

TITLE:  
Hunter Grange Lifestyle Village  
Part Lot 141, DP 1225076 & Lot 8, 855275  
Mount Vincent Road & Wilton Drive  
EAST MAITLAND NSW 2323

DRAWING NO: 922F-A101

REV: A


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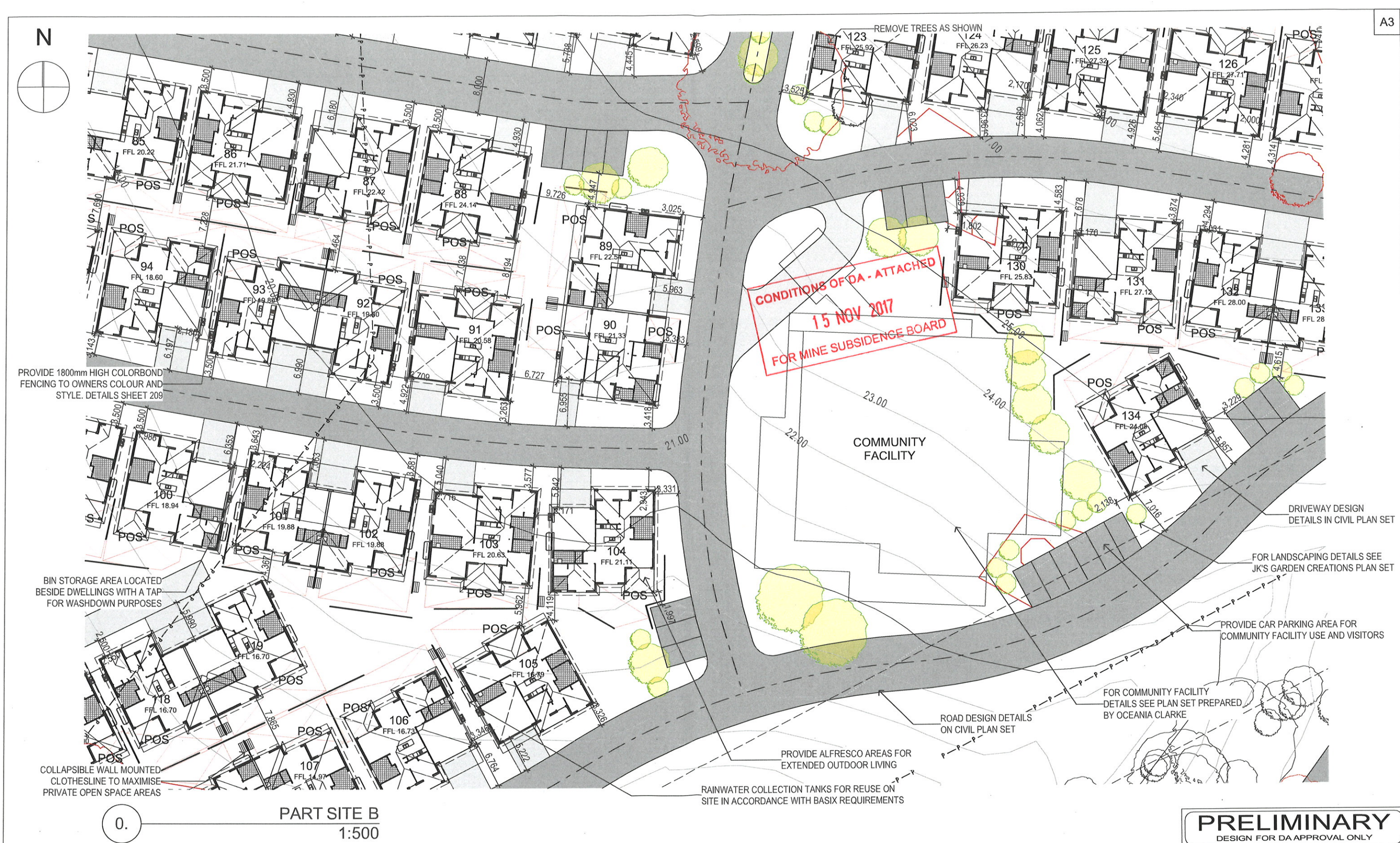


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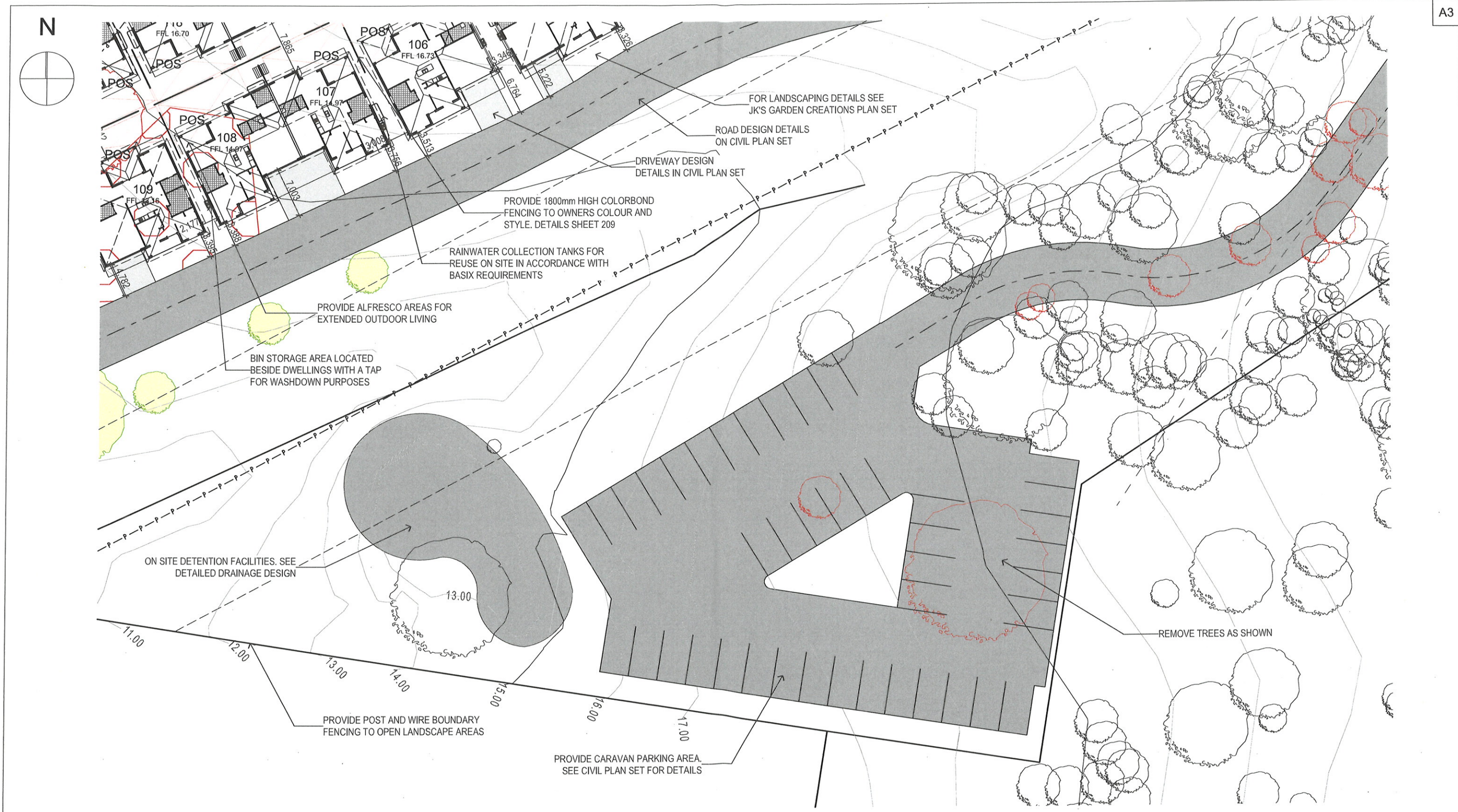
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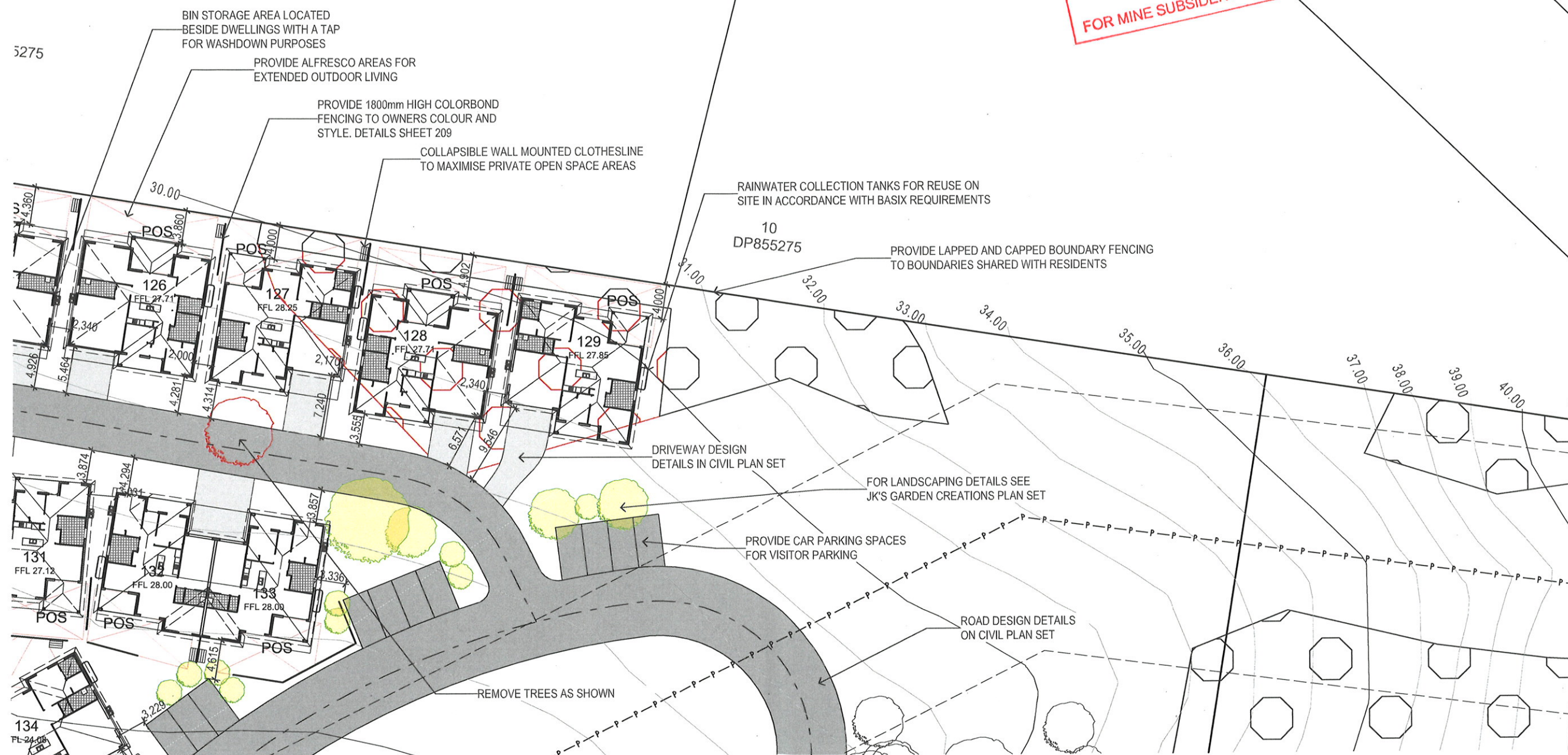
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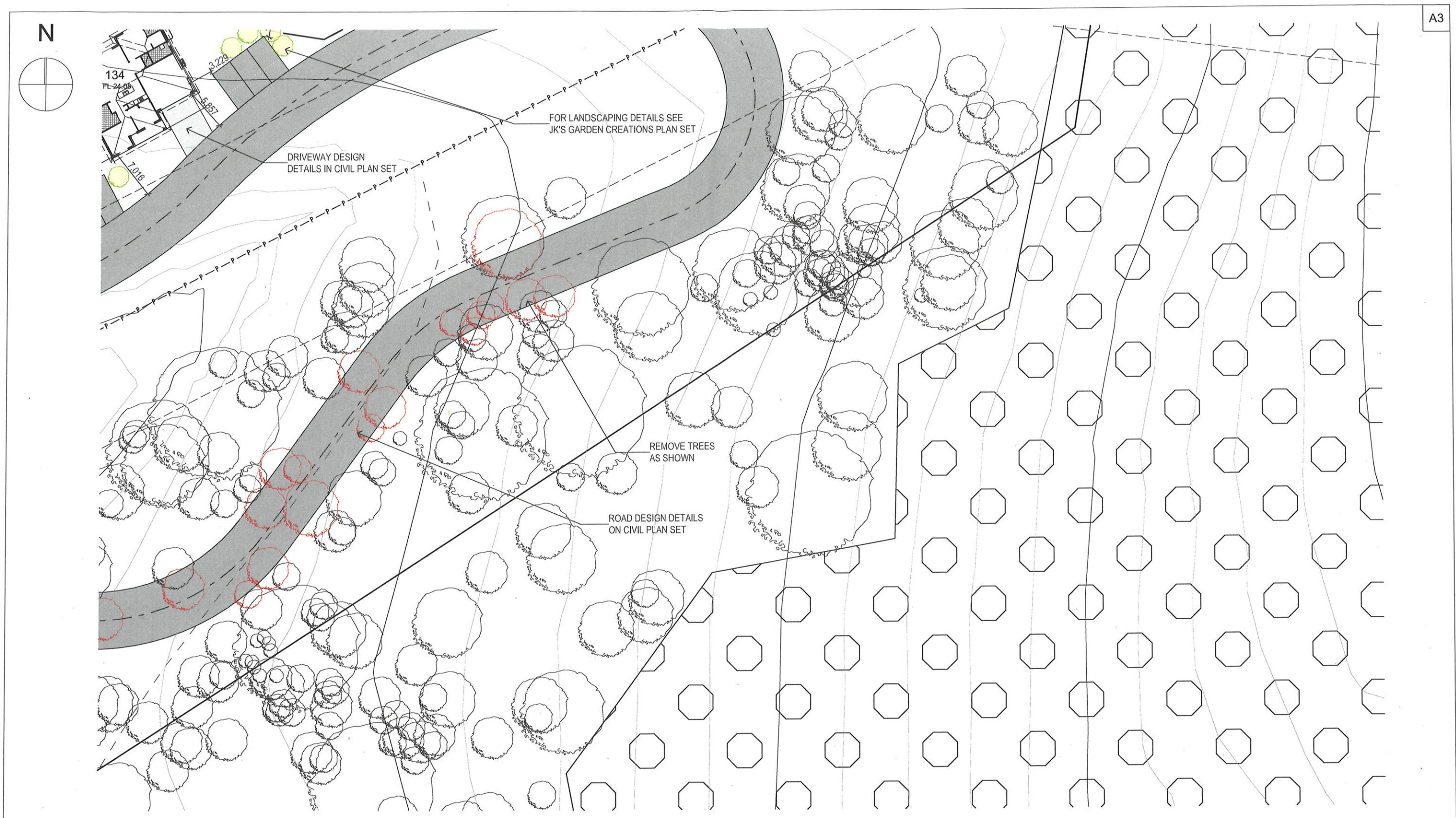
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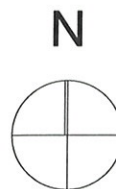


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BIN STORAGE AREA LOCATED  
BESIDE DWELLINGS WITH A TAP  
FOR WASHDOWN PURPOSES

PROVIDE LAPPED AND CAPPED BOUNDARY FENCING  
TO BOUNDARIES SHARED WITH RESIDENTS

RAINWATER COLLECTION TANKS FOR REUSE ON  
SITE IN ACCORDANCE WITH BASIX REQUIREMENTS

DP855275

REMOVE TREES  
AS SHOWN

ROAD DESIGN DETAILS  
ON CIVIL PLAN SET

FOR LANDSCAPING  
DETAILS SEE JK'S GARDEN  
CREATIONS PLAN SET

PROVIDE CAR PARKING SPACES  
FOR VISITOR PARKING

COLLAPSIBLE WALL MOUNTED CLOTHESLINE  
TO MAXIMISE PRIVATE OPEN SPACE AREAS

PROVIDE ALFRESCO AREAS FOR  
EXTENDED OUTDOOR LIVING

DP855275



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PART SITE F  
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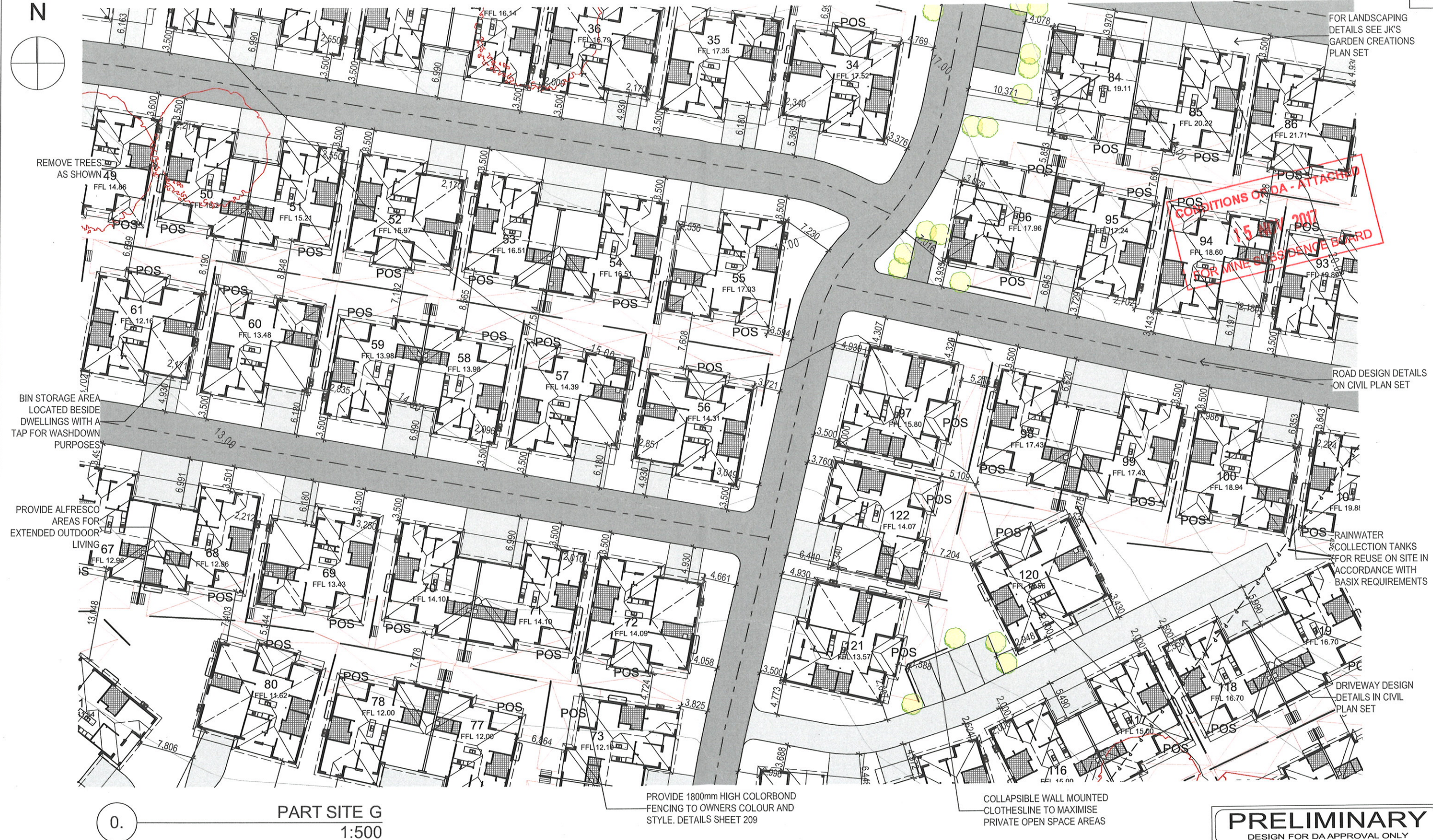
PROVIDE 1800mm HIGH COLORBOND  
FENCING TO OWNERS COLOUR AND  
STYLE. DETAILS SHEET 209


DRIVEWAY DESIGN  
DETAILS IN CIVIL PLAN SET

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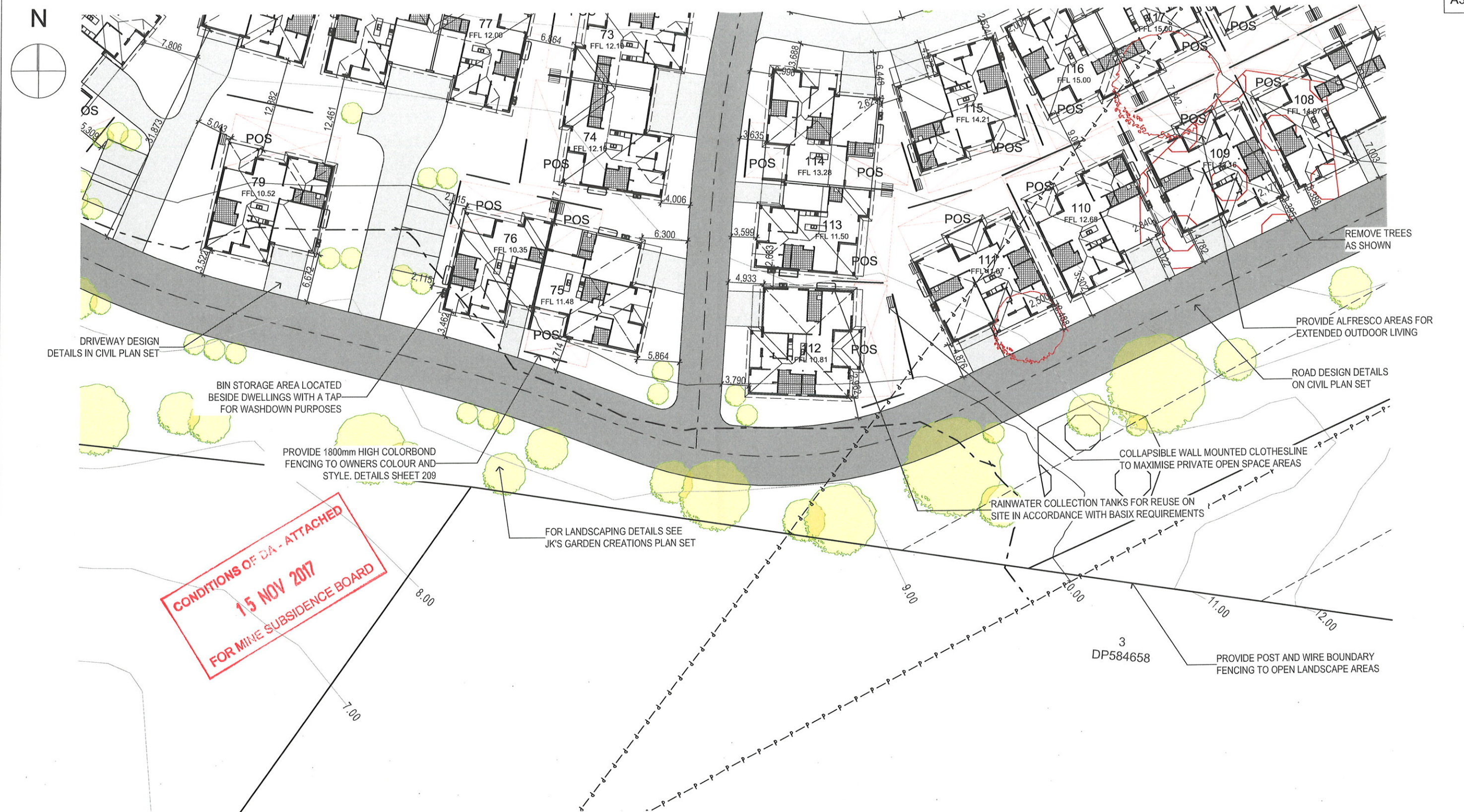
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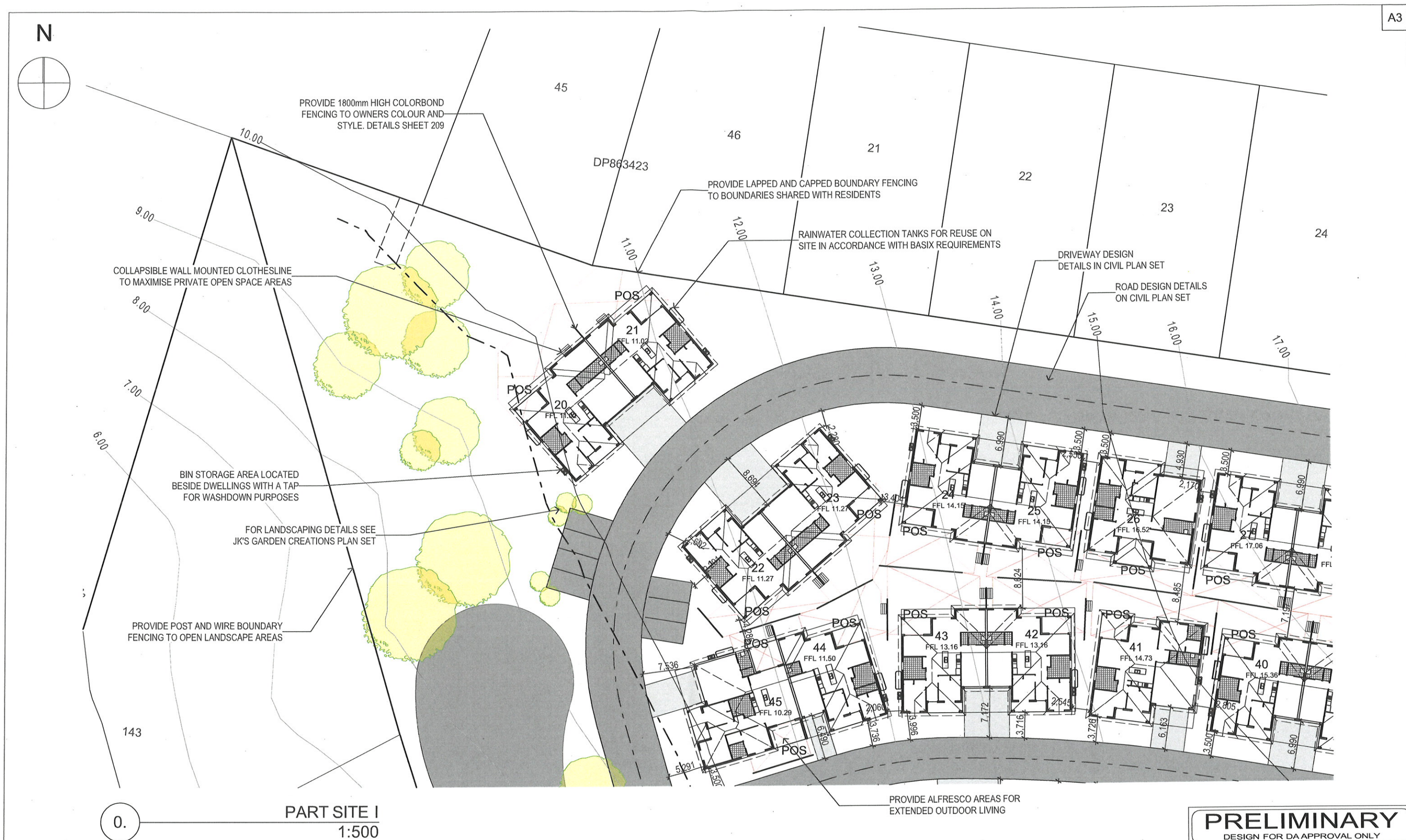



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**PRELIMINARY**  
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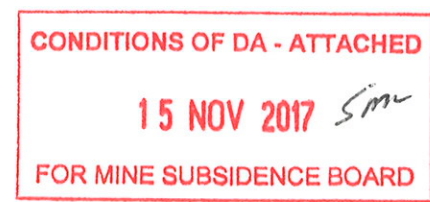
DATE	AMENDMENT	INITIAL	<div><p>acm LANDMARK LAND DEVELOPMENT CONSULTANTS</p><p>Suite 3/5 Edward St, PO Box 627, CRESSNOCK NSW 2325 P: (02) 4991 7171 - F: (02) 4991 7272 E: admin@acm.landmark.com.au</p></div>		SCALE:	As Shown	DRAWING CONTENTS:  PART SITE H	TITLE: Hunter Grange Lifestyle Village Part Lot 141, DP 1225076 & Lot 8, 855275 Mount Vincent Road & Wilton Drive EAST MAITLAND NSW 2323			
01.09.17	A - ORIGINAL ISSUE TO COUNCIL FOR DA APPROVAL	RL			DATUM:	AHD		CLIENT:  GHT HOLDINGS PTY LTD	SHEET NO:  DA09 of 209	REV:  A	
					DATE:	September, 2017					
					DRAWN:	RL	COPYRIGHT *This document is and shall remain the property of ACM Landmark Pty Ltd. The Document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.*				DRAWING NO:  922F-A101
					DESIGNED:	RL					





DATE	AMENDMENT	INITIAL	<div><p>acm LANDMARK</p></div> <div>LAND DEVELOPMENT CONSULTANTS</div> <div>Suite 3/5 Edward St, PO Box 627, CRESSNOCK NSW 2325 P: (02) 4991 7171 - F: (02) 4991 7272 E: admin@acmlandmark.com.au</div>		SCALE:	As Shown	DRAWING CONTENTS: PART SITE I	TITLE: Hunter Grange Lifestyle Village Part Lot 141, DP 1225076 & Lot 8, 855275 Mount Vincent Road & Wilton Drive EAST MAITLAND NSW 2323			
01.08.17	A - ORIGINAL ISSUE TO COUNCIL FOR DA APPROVAL	RL			DATUM:	AHD		CLIENT: GHT HOLDINGS PTY LTD	SHEET NO: DA10 of 209	REV: A	
					DATE:	September, 2017					
					DRAWN:	RL	COPYRIGHT "This document is and shall remain the property of ACM Landmark Pty Ltd. The Document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited."				DRAWING NO: 922F-A101
					DESIGNED:	RL					





**Wilton Drive  
East Maitland NSW 2323**

FOR  
**GHT Holdings Pty Ltd**  
PO Box 522 Maitland NSW 2320

DA Submission  
**Location and Site Plan**

SCALE: 1:500 on A1  
DATE: 30/10/2017  
DRAWN: GB

PROJECT	173
DRAWING No.	DA.01-A

[illegible]









