



Department of **Planning,**  
**Lands and Heritage**

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# DESIGN WA R-CODES VOLUME 1 MEDIUM DENSITY TESTING REPORT

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*The R-Codes Volume 1 Medium Density Testing Report was produced by the Department of Planning, Lands and Heritage on behalf of the Western Australian Planning Commission as part of Design WA Stage Three - Medium Density.*

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# Contents

**Introduction** ..... 2

**Design Concepts**

**Infill development**

Site 1 Terrace ..... 8  
Site 2 Triplex ..... 13  
Site 3 Apartment ..... 20  
Site 4 Apartment ..... 22  
Site 5 Apartment ..... 26

**Greenfield Development**

Site 6 Single house ..... 28  
Site 7 Single house ..... 32  
Site 8 Single house ..... 36  
Site 9 Single house ..... 37  
Site 10 Terrace ..... 38

**Costing and Feasibility** ..... 40

Site 1 Terrace ..... 42  
Site 2 Triplex ..... 44  
Site 2 Triplex ..... 46  
Site 3 Apartment ..... 48  
Site 5 Apartment ..... 50  
Site 6 Single house ..... 52  
Site 7 Single house ..... 54  
Site 9 Terrace ..... 56



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# INTRODUCTION

# Introduction

## Purpose

Industry testing was undertaken by designers during the final drafting stages of the R-Codes Vol. 1 Part C (medium density) (the Code) in order to understand the effects of the Code settings on design outcomes and construction costs. Eight designers with a range of experience and expertise were commissioned to prepare concepts for two sites, with 26 concepts prepared in total.

This phase of testing aimed to understand the following objectives:

- the impact of the deemed-to-comply provisions on the level of design quality achieved
- the impact of the Code on design outcomes
- the impact on construction costs and high-level feasibility
- the ability of designers and developers to pivot to the Code settings

The sites were selected based on typical greenfield and infill sized lots and relevance to the Code. Sites selected included a range of conditions including:

- R30-R60 R-coding
- greenfield and infill context
- a range of lot orientations
- a range of lot frontage widths
- front loaded and rear loaded vehicular access
- a range of housing types – single houses, grouped dwellings and multiple dwellings

The testing sought responses from the following designers and architects:

- BGC Housing Group
- Department of Communities
- Inspired Homes
- Maine Architecture
- Parcel Property and ABN Group
- Ross North Homes
- Stockland
- Summit Homes Group

## Method

### Site selection

Designers were asked to develop schematic design concepts for two sites. One site was selected by Department of Planning, Lands and Heritage (the Department) based on typical lot sizes found in medium density development, the second site was selected by the designer based on relevance to their current business model. Designers selected the orientation of the lots.

### Design brief

Designers were to apply the updated Code provisions to satisfy deemed-to-comply or apply design principles where required. Provisions tested were different to the advertised draft version released during the public consultation period. Provisions had been modified based on feedback from public submissions received, stakeholder engagement and further design and assessment testing.

### Testing process

Designers were allocated four weeks to prepare schematic design concepts. An interim review was undertaken by the the Department to clarify the intent of the Code settings, application and interpretation as well as design outcomes. Following review, designers were asked to address the feedback when preparing final concepts.

To establish the impact of the Code on construction costs designers used a comparison base plan to test industry rates. Some designers provided high level feedback on feasibility.

Each designer prepared a feedback report outlining key findings, benefits and concerns with the Code settings relating to design outcomes achieved, Code interpretation, as well as high level costs.

Site	R-code	Site dimensions	Housing types considered
<b>Infill context</b>			
Site 1 Triplex	R40	Area: 693m <sup>2</sup>   Frontage 18.9m	Grouped dwelling/Terrace
Site 2 Triplex	R40	Area: 728m <sup>2</sup>   Frontage 18m	Grouped dwelling
Site 3 Apartment	R40	Area: 1,012m <sup>2</sup>   Frontage 20.1m	Apartments
Site 4 Apartment	R50	Area: 1,012m <sup>2</sup>   Frontage 20.1m	Apartments
Site 5 Apartment	R60	Area: 750m <sup>2</sup>   Frontage 15.6m	Apartments
<b>Greenfield context</b>			
Site 6 Single house	R30	Area: 315m <sup>2</sup>   Frontage 10.5m	Single house
Site 7 Single house	R30	Area: 312.5m <sup>2</sup>   Frontage 12.5m	Single house
Site 8 Single house	R30	Area: 375m <sup>2</sup>   Frontage 12.5m	Single house
Site 9 Single house	R30	Area: 375m <sup>2</sup>   Frontage 15m	Single house
Site 10 Terrace	R60	Area: 168m <sup>2</sup>   Frontage 6m	Single house

## Key Findings

With some modifications to the internal layout of dwellings, designers were able to achieve:

- deemed-to-comply outcomes with the Code settings
- consolidated primary garden areas, soft landscaping and trees
- good solar access to primary living spaces

The following concerns were raised:

- garage width restrictions and the impact on greenfield housing types currently in the market
- the ability of grouped dwelling triplex sites to yield 3x three-bedroom, two bathroom and double car garage houses on site

### Greenfield development key findings:

#### *Single houses on R30 coded lots*

- were able to achieve deemed-to-comply outcomes without increasing current lot sizes or reducing bedroom and bathroom numbers or carparking
- some designers found base plans were easily adapted to the new Code provisions
- internal planning required consideration for solar access and connection from primary living space to primary garden areas
- courtyard type housing proposed for narrow lots led to good design outcomes for solar access and direct connection to gardens. This led to higher external wall to floor area ratios impacting on construction costs
- primary garden areas much larger than required under the code could be achieved
- tree requirements were able to be achieved

#### *Single houses on R60 coded lots*

- mostly able to achieve garden requirements
- narrow lots with depths around 28m could readily achieve primary garden area, soft landscaping and deep soil area requirements
- bedroom widths were able to be achieved on narrow lot terrace housing
- primary living space required widths were almost able to be achieved for narrow lot terrace housing
- total boundary wall lengths restrictions were difficult to achieve for some terraces
- single garages proposed on narrow lot frontages raised concerns about meeting market demand and would impact feasibility

*\*3 bedroom, 2 bathroom and 2 garage*

### **Infill development key findings:**

#### *Triplex development on R40 coded lots*

- good solar orientation was achieved to primary living spaces and primary garden areas, most chose to split the primary garden area into two
- designers couldn't achieve all 3x2x2\* dwelling mix and looked at a range of options to achieve deemed-to-comply outcomes. Designers reviewed the number of bedrooms, number of bathrooms, number of garaged cars, tandem parking configurations, two storey dwellings, duplex dwellings instead of triplex development, as well as applying the small dwelling site area concession to achieve housing diversity
- most developments proposed were single storey due to cost implications of two storey construction
- solar access to the primary living space was gained through providing an additional window where the sliding glazed door was covered with an alfresco
- extent of soft landscaping was typically able to be achieved
- boundary wall construction was used readily to maximise floor area to houses and to consolidate space for primary garden areas

#### *Apartments on R40-R60 coded lots*

- mostly compliant concepts produced
- it was found that the application of site area instead of plot ratio could lead to consistently larger apartment sizes and larger building envelopes than would have been permitted under a plot ratio approach

### **Costing and feasibility**

Costing and feasibility was undertaken during the COVID global pandemic and the building and construction industry has experienced a spike in demand with supply and labour shortages due to the pandemic. These factors have resulted in significant cost increases which can adversely influence the viability of housing developments.

### **Construction cost key findings:**

Most designs indicated marginal costs differences except where there was:

- an increase in boundary wall construction
- a higher proportion of external walls to floor area
- two-storey construction

### **Development feasibility key findings:**

Development feasibility indicated that most designs were viable with a marginal difference to market value. Larger differences in value were seen where there was:

- a decrease in the size of the internal floor areas
- an increased construction cost due to the factors listed above
- a change in dwelling mix such as a reduction in the number of bedrooms, garaged cars, or bathrooms
- a reduction in development yield

Implications of industry testing for R-Codes Vol. 1 Part C (medium density)

Design Element	Key findings	Policy response
<b>Site area</b>	<p>The average site area instead of plot ratio approach for multiple dwellings could result in oversupply of large apartments.</p> <p>Site area concession for small dwellings allowed for flexible design outcomes and dwelling diversity on triplex sites.</p>	<p>Retain average site area and introduce provisions to require dwelling mix for multiple dwellings.</p> <p>Retain site area concessions to encourage diverse housing types. Widen provisions to include multiple dwellings.</p>
<b>Private open space</b>	<p>Single consolidated primary garden areas led to high quality outcomes for functional outdoor spaces, natural ventilation and solar access to primary living spaces.</p> <p>Ability to split primary garden area for grouped dwellings still maintained functional outdoor areas for occupants, alfrescos and space for tree planting.</p> <p>Northern orientation to primary garden area for some lot orientations meant concepts were not compliant with the deemed-to-comply provisions. Designers found it difficult to achieve context specific outcomes where primary garden area orientations were mandated.</p>	<p>Review requirement for primary garden area to northern half of the lot. Focus on ensuring adequate solar access to primary living space.</p>
<b>Trees and landscaping</b>	<p>Designers responded well to tree and landscaping requirements with most able to achieve minimum deep soil dimensions for trees and adequate landscaping areas.</p> <p>Terrace housing on narrow lot frontages found it difficult to meet soft landscaping requirements for street setbacks due to competing factors such as driveways, footpaths, verandas, porches and other hardstand requirements.</p>	<p>Review soft landscaping requirements in front setback.</p>
<b>Size and layout of dwellings</b>	<p>Minimum dimensions to primary living space were supported by designers however there was confusion on application of minimum dimension and what is to be included and excluded.</p> <p>Ceiling heights to multiple dwellings led to good design outcomes however dimension did not align with typical brick construction.</p> <p>Good outcomes for amenity in multiple dwellings however it was found that circulation space requirements were missing from the Code.</p>	<p>Clarify when cabinetry is included or excluded from minimum dimensions and areas both for bedrooms and primary living areas.</p> <p>Review minimum ceiling height dimension for multiple dwellings.</p> <p>Look to include requirements for circulation and common spaces.</p>
<b>Solar access and natural ventilation</b>	<p>Support for the intent of the provisions. Designers provided alternative major openings where solar access was being impacted by east to north-west facing alfresco areas. Some designs didn't achieve good solar access with alternative windows either too close to building elements or boundary fences.</p> <p>Although good outcomes were achieved it was found that major openings or windows with a sill height below 1.6m would trigger visual privacy and furnish-ability issues for habitable rooms.</p>	<p>Look to support good solar access to primary living space through minimum requirements for uncovered major openings.</p> <p>Review requirement for windows to habitable rooms to support design flexibility while ensuring good outlook, daylighting and natural ventilation.</p>
<b>Parking</b>	<p>Designs responded well to maximum parking standards. No designs included the use of carports with all designers choosing to garage at least one car.</p>	<p>Review how the Code may encourage the uptake of carports.</p>



Design Element	Key findings	Policy response
<b>Waste management</b>	Provision well understood and supported.	Minor modifications
<b>Site cover</b>	Good design outcomes were achieved with revised site cover standards. However, it was found that site cover maximums for grouped dwellings excluding common property was low when compared with current R-codes.	Review site cover requirements due to grouped dwellings.
<b>Building height</b>	Building heights well understood and supported.	Minor modifications.
<b>Street setbacks</b>	<p>Support for reduction in setbacks for verandahs and patios, however no verandahs were included in designs.</p> <p>It was found that the inability to move building forward of the street setback line limited flexibility and may contribute to flat facades.</p> <p>Setback of garages behind the building supported good outcomes. Garage setback in R30 coded areas limited dwelling configuration and impacted garden areas and landscaping.</p>	<p>Encourage further building articulation through building permitted forward of the street setback line.</p> <p>Review to minimise setback of garages in line with Australian Standards for parking.</p>
<b>Lot boundary setbacks</b>	<p>Simplification of lot boundary setbacks was well supported and designs sought boundary walls to consolidate primary garden areas.</p> <p>Maximum wall lengths for two storey setbacks and boundary walls was found to be too short for typical terrace construction, particularly where balconies and storage spaces were provided.</p>	Review maximum wall lengths to support flexible arrangements for terrace housing.
<b>Streetscape</b>	<p>General support for the porch provision however it was found that area requirements were difficult to achieve for narrow lots.</p> <p>Garage width standards supported positive streetscape outcomes improving the extent of active facades fronting the street. However, it was found that these standards would impact greenfield housing types, particularly the 8.5m wide front loaded dwellings. This may impact two storey construction in greenfield areas where a move away from laneway product was seen as desirable.</p>	<p>Review porch requirements.</p> <p>Review to simplify garage width standards while supporting good streetscapes and active frontages.</p>
<b>Access</b>	<p>Access via lowest available street was strongly supported for ability to respond to context.</p> <p>Crossover standards improved streetscape outcomes for grouped dwelling development and reduced the number of crossovers and garages facing onto streets. However this requirement made triplex internal planning arrangements more difficult to achieve good outcomes, particularly where the primary garden area was required to be to the north of the site.</p> <p>Clarification was sought for access requirements for passing points and vehicle entries.</p>	<p>Minor modifications.</p> <p>Review to align access requirements with Australian Standards.</p>



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# DESIGN CONCEPTS

# Site 1 Triplex

R-code: R40

Area: 693m<sup>2</sup>

Frontage: 18.9m

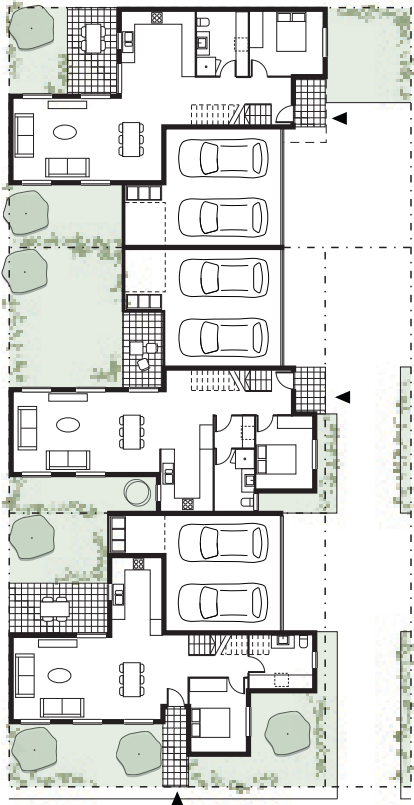
## CONCEPT 1A

### Project Data

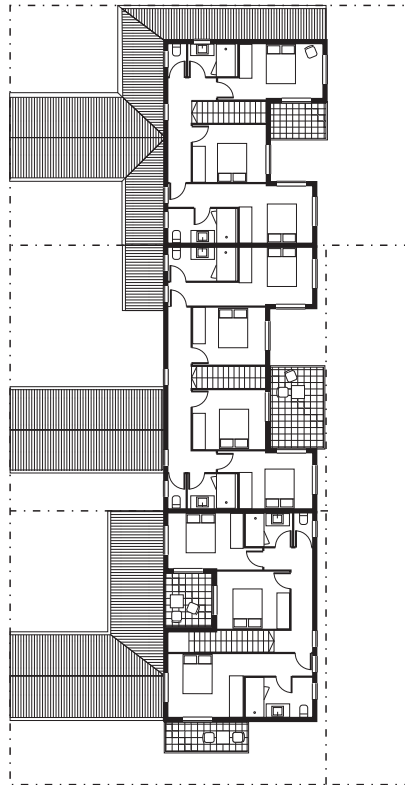
Dwelling type:	3 grouped dwellings
Building height: (storeys)	Two storey
Site cover	61% (average)
Primary garden area:	42m <sup>2</sup> (average)
Soft landscaping	20% (average)
Trees:	7
Parking:	3 x double garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
2	4	3	2
1	5	3	2



Ground Floor Plan



First Floor Plan



### Design Description

Two storey development with additional bedrooms to offset construction cost.

#### Pros

- ✓ two storey construction achieves consolidated primary garden areas and soft landscaping
- ✓ compact floor plan with bulk contained to centre of site
- ✓ well considered orientation with sunlight to primary living spaces
- ✓ good cross-ventilation to capture breeze paths

#### Cons

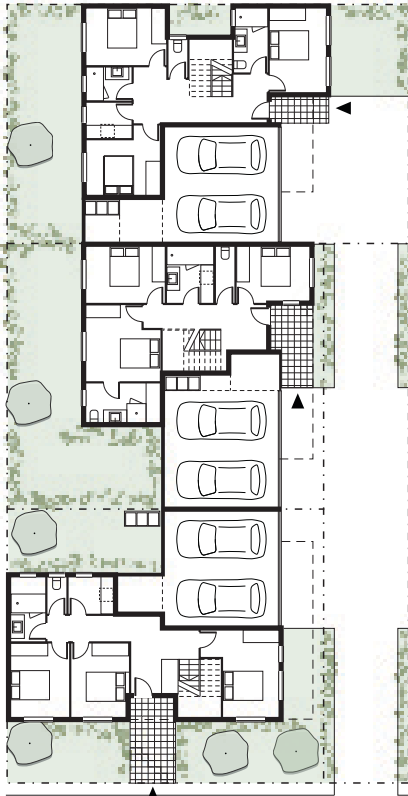
- ✗ two storey development may increase construction costs

#### Supports provisions for:

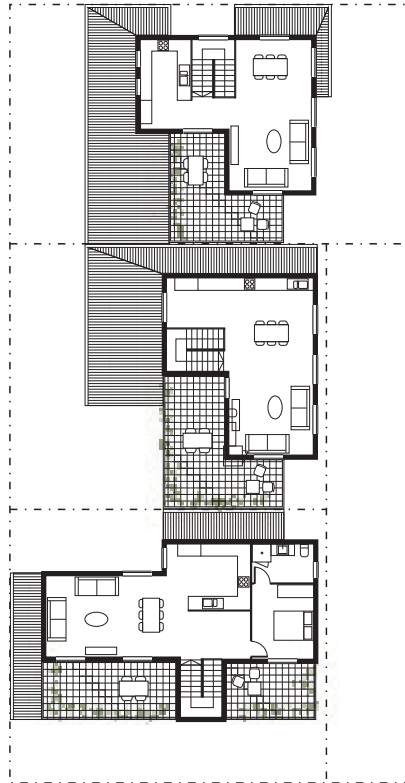
- ✓ consolidated primary garden areas
- ✓ solar access to primary living spaces for climate zones 4, 5, and 6
- ✓ deep soil area related to trees

# Infill Context

## CONCEPT 1B



Ground Floor Plan



First Floor Plan

### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	Two storey
Site cover	59% (average)
Primary garden area:	46m <sup>2</sup> (average)
Soft landscaping	20% (average)
Trees:	6
Parking:	3 x double garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
2	3	2	2
1	4	2	2

### Design Description

Two storey development with reverse living - primary living space on first floor.

#### Pros

- ✓ two storey construction achieves consolidated primary garden areas and soft landscaping
- ✓ direct access from primary living space to private open space (balconies)

#### Cons

- ✗ two storey development may increase construction costs

#### Supports provisions for:

- ✓ tree requirement in private lots and street setback
- ✓ reduced side setbacks for two storey development

# Site 1 Triplex (cont.)

R-code: R40

Area: 693m<sup>2</sup>

Frontage: 18.9m

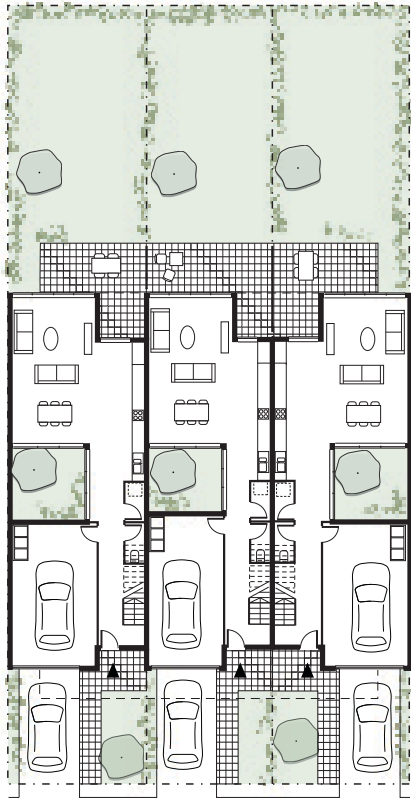
## CONCEPT 1C

### Project Data

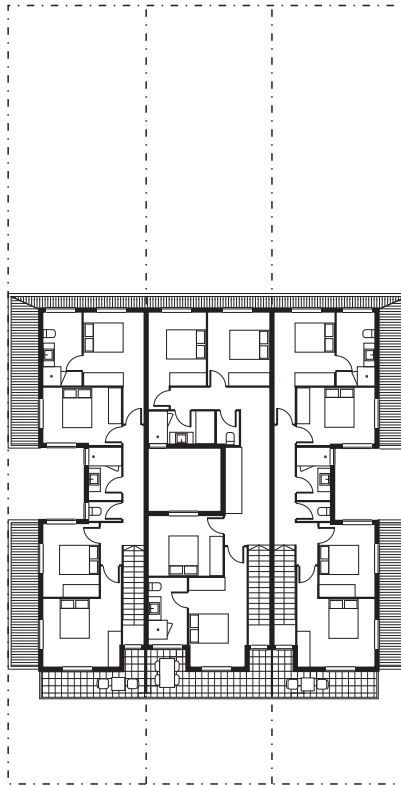
Dwelling type:	3 green title dwellings
Building height: (storeys)	Two storey
Site cover	42% (average)
Primary garden area:	97m <sup>2</sup> (average)
Soft landscaping	39% (average)
Trees:	8
Parking:	3 x single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	4	2	1



Ground Floor Plan



First Floor Plan

### Design Description

Two storey terrace type development with additional bedrooms to offset construction cost

#### Pros

- ✓ single garaged parking with additional parking space on driveway
- ✓ generous areas for primary garden area, deep soil areas and trees

#### Cons

- ✗ multiple vehicle access points and crossovers
- ✗ side setback restrictions

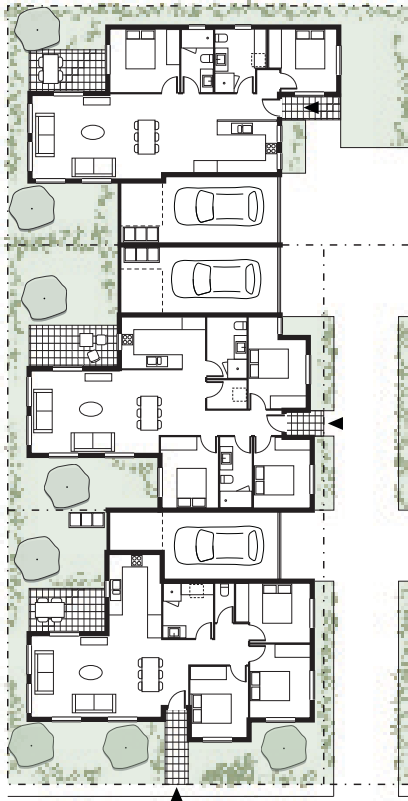
#### Supports provisions for:

- ✓ consolidated primary garden areas
- ✓ garage widths proportionate to lot frontages
- ✓ side setbacks with setback courtyard space
- ✓ lightwells/courtyards for daylighting

#### Suggested further refinement of provisions as a result of testing:

- increase extent of side setbacks and boundary walls to permit typical terrace typologies

## CONCEPT 1D



Ground Floor Plan



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	One storey
Site cover	56% (average)
Primary garden area:	38m <sup>2</sup> (average)
Soft landscaping	24% (average)
Trees:	8
Parking:	3 x single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	1	1
1	3	2	1
1	2	2	1

### Design Description

Single storey triplex development with reduced car parking.

#### Pros

- ✓ generous areas for trees and gardens
- ✓ direct access from primary living space to primary garden areas
- ✓ reduced carparking allows space for gardens

#### Cons

- ✗ common driveway can be a poor quality space if not designed and executed well
- ✗ vehicle access and manoeuvring dominates site

### Testing Implications

Testing supports provisions for:

- ✓ consolidated primary garden areas
- ✓ tree requirement in private lots and street setback
- ✓ deep soil area related to trees

Further refinement of provisions relating to:

- solar access to primary living spaces
- soft landscaping minimum dimension

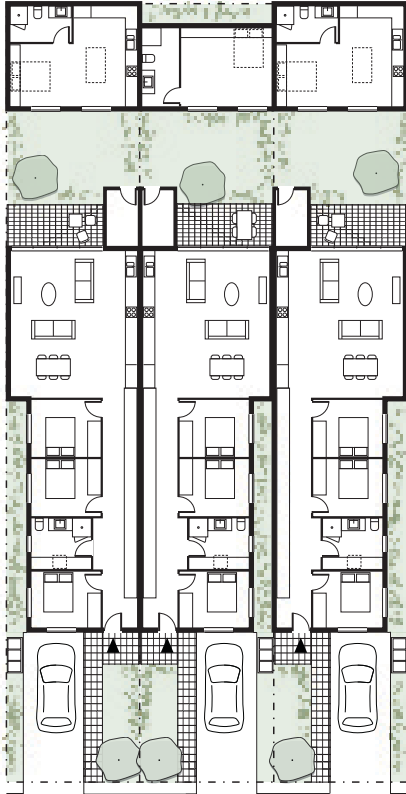
# Site 1 Triplex (cont.)

R-code: R40

Area: 693m<sup>2</sup>

Frontage: 18.9m

## CONCEPT 1E



Ground Floor Plan



### Project Data

Dwelling type:	3 green title dwellings
Building height: (storeys)	Two storey
Site cover	58% (average)
Primary garden area:	41m <sup>2</sup> (average)
Soft landscaping	17% (average)
Trees:	6
Parking:	3 x single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	3	1	1

### Design Description

Single storey terrace type development with ancillary development to rear of lot. Single car parking space proposed.

#### Pros

- ✓ generous areas for trees and gardens
- ✓ shared boundary wall construction
- ✓ well sized, functional primary living spaces
- ✓ multiple boundary wall construction

#### Cons

- ✗ daylighting and cross ventilation may be difficult to achieve
- ✗ parking provided in the front setback area detracts from the streetscape
- ✗ habitable rooms fronting onto carparking areas
- ✗ high proportion of internal circulation
- ✗ reduction in carparking to may impact feasibility

#### Supports provisions for:

- ✓ primary garden area connected to primary living space
- ✓ deep soil area related to trees
- ✓ site cover instead of open space calculation
- ✓ boundary walls on multiple boundaries

#### Suggested further refinement of provisions as a result of testing:

- carport widths proportionate to lot frontages
- single storey boundary wall in R40
- extent of boundary walls to permit typical terrace typologies



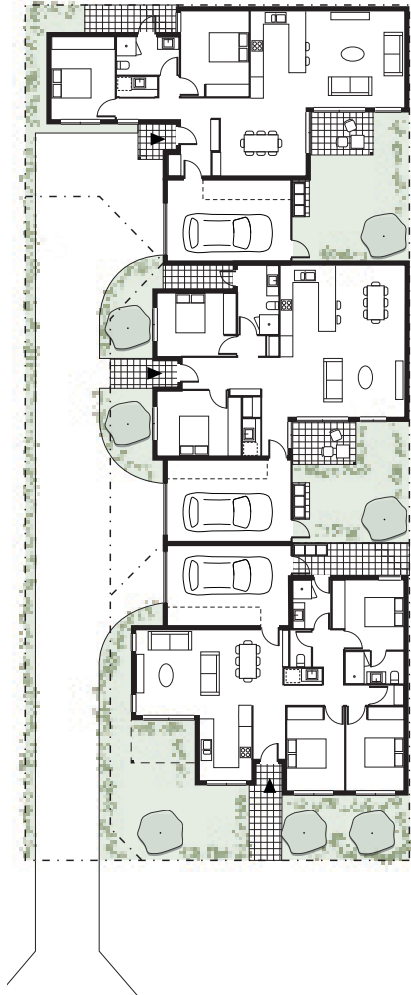
# Site 2 Triplex

R-code: R40

Area: 728m<sup>2</sup>

Frontage: 18m

## CONCEPT 2A



Ground Floor Plan



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	One storey
Site cover	66% (average)
Primary garden area:	33m <sup>2</sup> (average)
Soft landscaping	18% (average)
Trees:	7
Parking:	3 x single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
2	2	1	1
1	3	2	1

### Design Description

Single storey triplex development with reduced car parking and bedrooms.

#### Pros

- ✓ consolidated areas for trees and gardens
- ✓ multiple boundary wall construction
- ✓ primary living spaces have direct access to a private open space
- ✓ well sized, functional primary living spaces
- ✓ adequate bedroom sizes

#### Cons

- ✗ reduction in number of bedrooms and carparking to may impact feasibility
- ✗ common driveway can be a poor quality space if not designed and executed well
- ✗ cost to build on boundary

#### Supports provisions for:

- ✓ primary garden area connected to primary living space
- ✓ simplified encroachments for primary garden area
- ✓ reduced vehicle access points

#### Suggested further refinement of provisions as a result of testing:

- solar access to primary living spaces
- primary garden area to north half of site
- soft landscaping minimum dimension
- site cover percentages

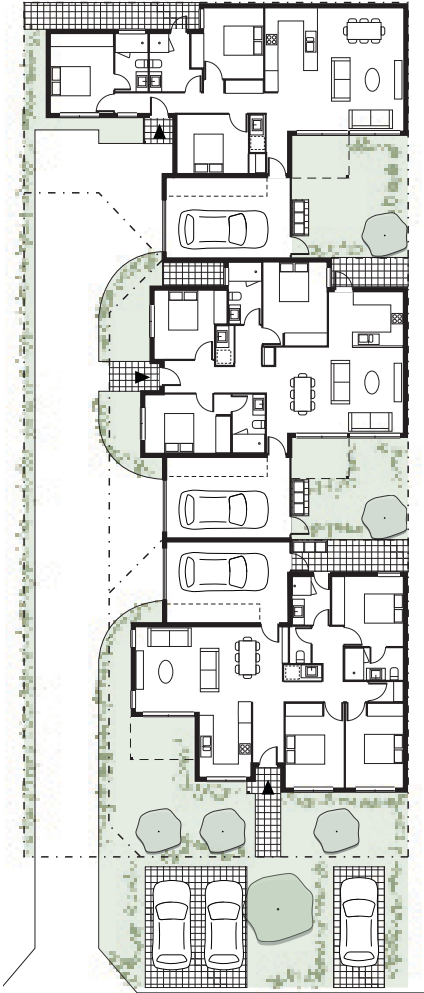
# Site 2 Triplex (contd.)

R-code: R40

Area: 728m<sup>2</sup>

Frontage: 18m

## CONCEPT 2B



Ground Floor Plan



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	One storey
Site cover	63% (average)
Primary garden area:	31m <sup>2</sup> (average)
Soft landscaping	18% (average)
Trees:	5
Parking:	3 single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	3	2	1

### Design Description

Single storey triplex development with reduced on-site car parking, additional spaces provided on the verge.

#### Pros

- ✓ additional trees provided in private lots
- ✓ well considered orientation with sunlight to primary living spaces
- ✓ boundary wall construction
- ✓ multiple boundary wall construction
- ✓ articulation to streetscape
- ✓ verge parking coordinated with local government

#### Cons

- ✗ reduction in garaged carparking to may impact feasibility
- ✗ common driveway can be a poor quality space if not designed and executed well
- ✗ cost to build on boundary

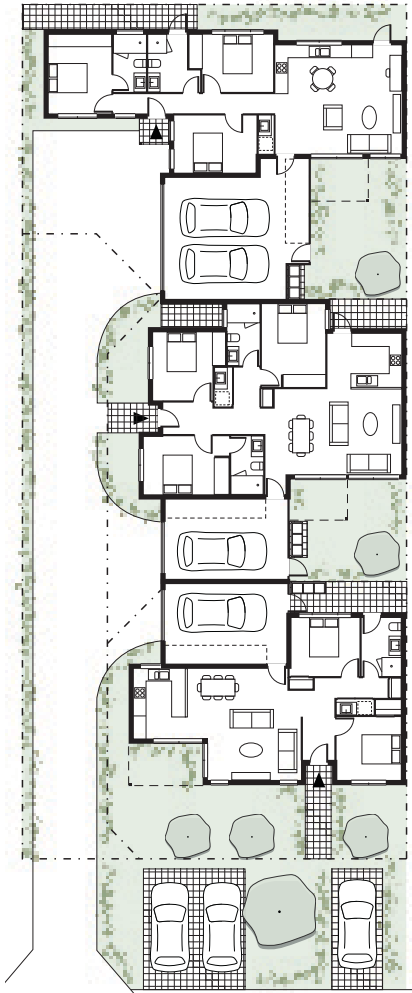
#### Supports provisions for:

- ✓ soft landscaping percentages
- ✓ minimum floor areas for bedrooms
- ✓ boundary walls on multiple boundaries
- ✓ reduced vehicle access points

#### Suggested further refinement of provisions as a result of testing:

- solar access to primary living spaces
- simplify tree requirements and deep soil areas
- site cover percentages
- dwelling encroachments into primary street setbacks

## CONCEPT 2C



Ground Floor Plan



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	One storey
Site cover	60% (average)
Primary garden area:	30m <sup>2</sup> (average)
Soft landscaping	20% (average)
Trees:	5
Parking:	2 x single garage 1 x double garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2
1	3	2	1
1	2	1	1

### Design Description

Single storey triplex development with reduced bedroom and garaged parking. Additional parking spaces provided on the verge.

#### Pros

- ✓ well considered orientation with sunlight to primary living spaces
- ✓ boundary wall construction
- ✓ multiple boundary wall construction
- ✓ articulation to streetscape
- ✓ verge parking coordinated with local government

#### Cons

- ✗ reduction in number of bedrooms may impact feasibility
- ✗ common driveway can be a poor quality space if not designed and executed well
- ✗ cost to build on boundary

#### Supports provisions for:

- ✓ soft landscaping percentages
- ✓ minimum floor areas for bedrooms
- ✓ boundary walls on multiple boundaries
- ✓ reduced vehicle access points

#### Suggested further refinement of provisions as a result of testing:

- solar access to primary living spaces
- simplify tree requirements and deep soil areas
- site cover percentages
- dwelling encroachments into primary street setbacks

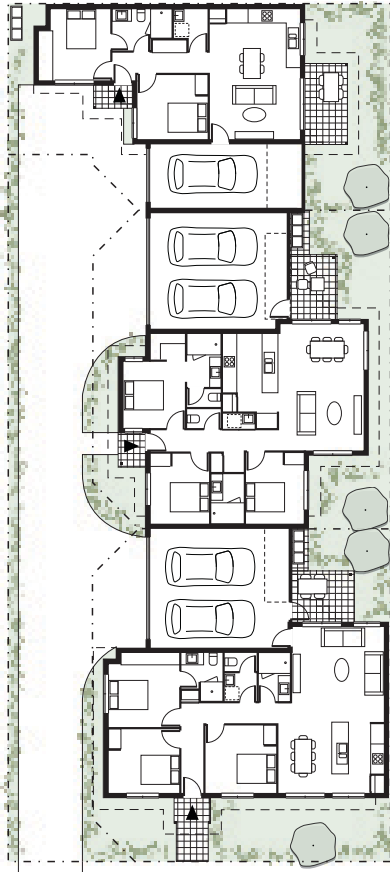
# Site 2 Triplex (contd.)

R-code: R40

Area: 728m<sup>2</sup>

Frontage: 18m

## CONCEPT 2D



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	One storey
Site cover	62% (average)
Primary garden area:	40m <sup>2</sup> (average)
Soft landscaping	21% (average)
Trees:	5
Parking:	1 x single garage 2 x double garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
2	3	2	2
1	2	1	1

### Design Description

Single storey triplex development with small dwelling site area concession applied to Unit 3.

#### Pros

- ✓ site area incentives for small dwellings encourages housing diversity
- ✓ generous areas for trees and gardens
- ✓ well considered orientation with sunlight to primary living spaces

#### Cons

- ✗ tree selection important to support solar access into primary living space
- ✗ cross ventilation may be difficult to achieve
- ✗ solar access to primary living space

#### Supports provisions for:

- ✓ site area incentives for small dwellings
- ✓ consolidated primary garden areas
- ✓ soft landscaping percentages

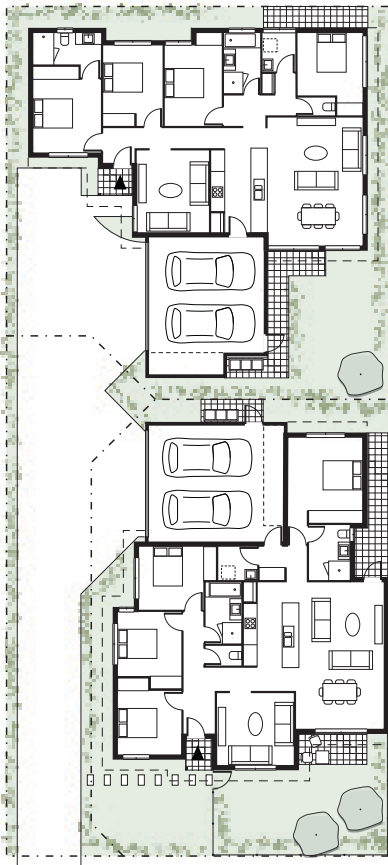
#### Suggested further refinement of provisions as a result of testing:

- primary garden area to north half of site
- split primary garden areas
- solar access to primary living spaces

Ground Floor Plan



## CONCEPT 2E



### Project Data

Dwelling type:	2 grouped dwellings
Building height: (storeys)	One storey
Site cover	58% (average)
Primary garden area:	40m <sup>2</sup> (average)
Soft landscaping	24% (average)
Trees:	3
Parking:	2 x double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
2	4	2	2

### Design Description

Single storey battleaxe development.

#### Pros

- ✓ generous areas for trees and gardens
- ✓ well considered orientation with sunlight to primary living spaces

#### Cons

- ✗ reduced yield may impact feasibility
- ✗ large family homes reduces housing choice and diversity

#### Supports provisions for:

- ✓ consolidated primary garden areas
- ✓ soft landscaping percentages
- ✓ minimum floor areas for bedrooms

Ground Floor Plan



# Site 2 Triplex (contd.)

R-code: R40

Area: 728m<sup>2</sup>

Frontage: 18m

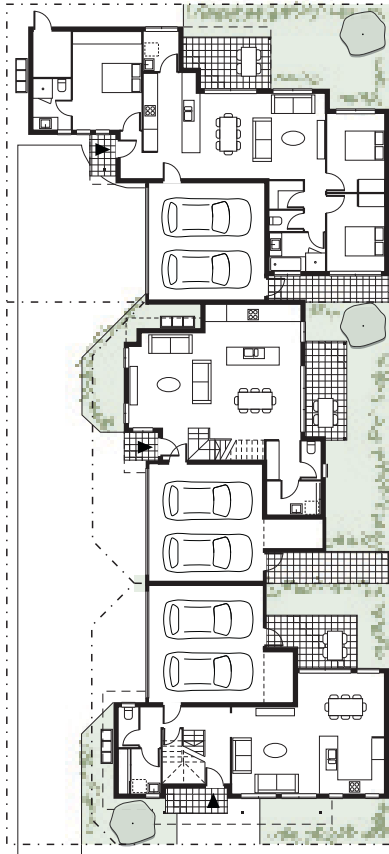
## CONCEPT 2F

### Project Data

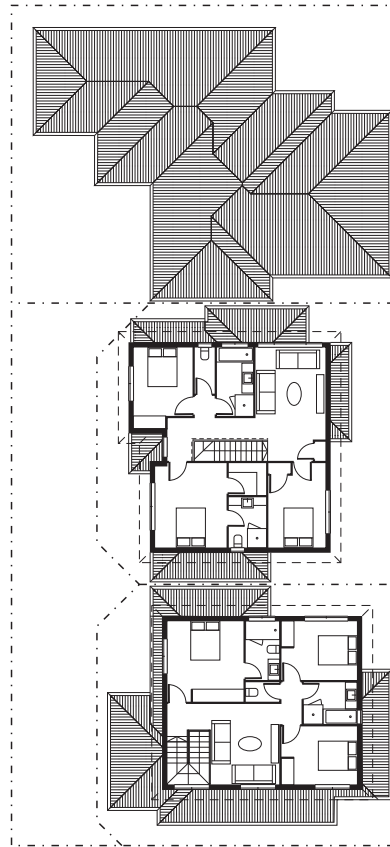
Dwelling type:	3 grouped dwellings
Building height:	2 x two storey 1 x one storey
Site cover	56% (average)
Primary garden area:	41m <sup>2</sup> (average)
Soft landscaping	13% (average)
Trees:	3
Parking:	3 x double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	3	2	2



Ground Floor Plan



Upper Floor Plan

### Design Description

Triplex type development with single and two storey dwellings.

#### Pros

- ✓ generous areas for trees and gardens
- ✓ direct access from primary living space to primary garden areas
- ✓ well sized, functional primary living spaces and bedrooms

#### Cons

- ✗ cost of two storey development
- ✗ solar access to primary living space
- ✗ cross ventilation may be difficult to achieve

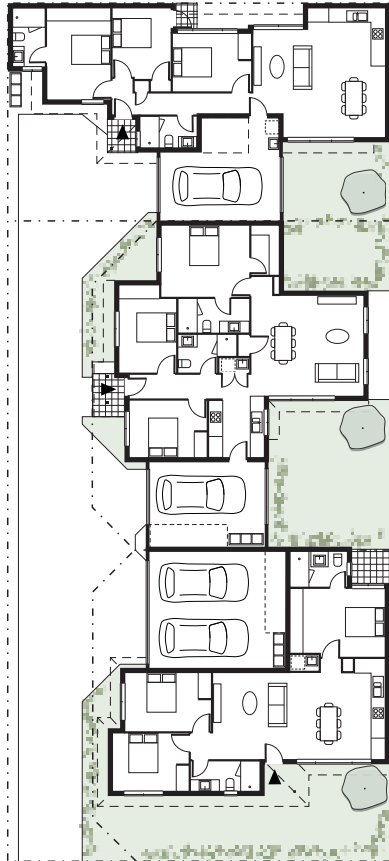
#### Supports provisions for:

- ✓ deep soil area related to trees
- ✓ simplified wall setback calculations

#### Suggested further refinement of provisions as a result of testing:

- solar access to primary living spaces
- split primary garden areas

## CONCEPT 2G



Ground Floor Plan



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	One storey
Site cover	63% (average)
Primary garden area:	40m <sup>2</sup> (average)
Soft landscaping	19% (average)
Trees:	3
Parking:	2 x single garage 1 x double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
2	3	2	1
1	3	2	2

### Design Description

Single storey triplex development with reduced car parking.

#### Pros

- ✓ consolidated areas for trees and gardens
- ✓ well considered orientation with sunlight to primary living spaces
- ✓ multiple boundary wall construction

#### Cons

- ✗ cross ventilation
- ✗ reduced carparking may impact feasibility in some locations

#### Supports provisions for:

- ✓ consolidated primary garden areas
- ✓ soft landscaping percentages
- ✓ minimum floor areas for bedrooms
- ✓ minimum dimensions for primary living space

#### Suggested further refinement of provisions as a result of testing:

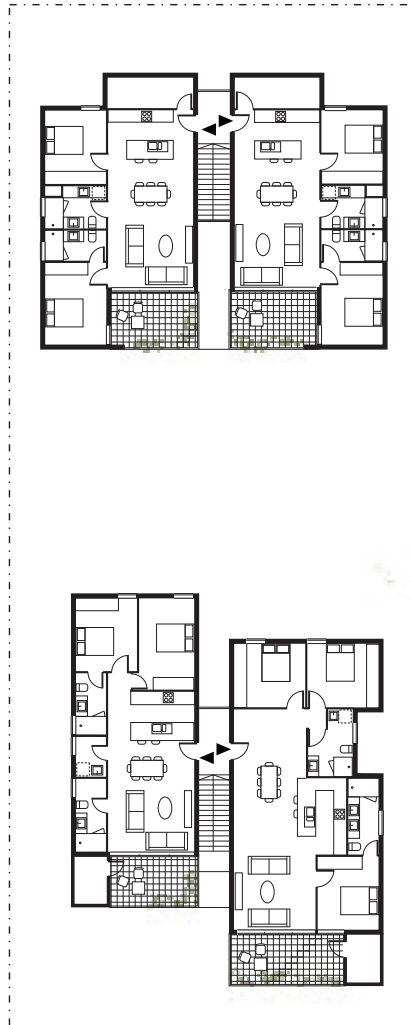
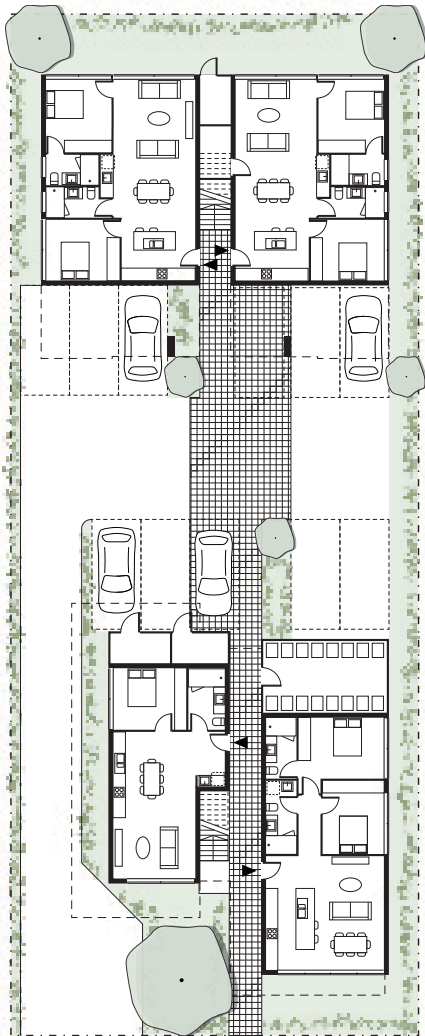
- split primary garden areas

# Site 3 Apartment

R-code: R40

Area: 1012m<sup>2</sup>

Frontage: 20.1m



## CONCEPT 3A

### Project Data

Dwelling type:	8 multiple dwellings
Building height: (storeys)	Two storey
Site cover	47%
Primary garden area:	NA
Soft landscaping	23% (average)
Trees:	6
Parking:	9 occupant bays 2 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
6	2	2	1
1	3	2	1
1	1	1	1

### Design Description

Two storey apartments with at-grade central parking.

#### Pros

- ✓ landscaping improves building mass
- ✓ compact floor plan with bulk contained to centre of site
- ✓ well considered orientation, airflow, outlook and 'access to the sky'
- ✓ modest development suits suburban/semi-urban context
- ✓ building separation provides daylighting, ventilation and visual privacy
- ✓ well located, accessible dedicated bin store and utilities

#### Cons

- ✗ site area approach instead of plot ratio may lead to larger apartments with less diversity

#### Supports provisions for:

- ✓ average site area instead of plot ratio to determine dwelling yield. Encourages larger family size apartments
- ✓ deep soil area related to trees
- ✓ daylighting to long single aspect terraces
- ✓ setbacks to support bulk to middle of the site

#### Suggested further refinement of provisions as a result of testing:

- dwelling mix provision for multiple dwellings
- simplify tree requirements and deep soil areas
- circulation and common space for apartments
- apartment ceiling heights



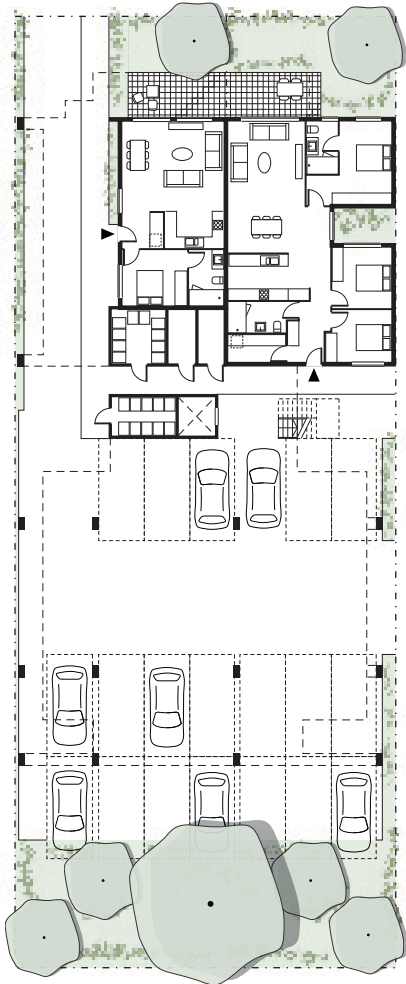
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# Site 4 Apartment

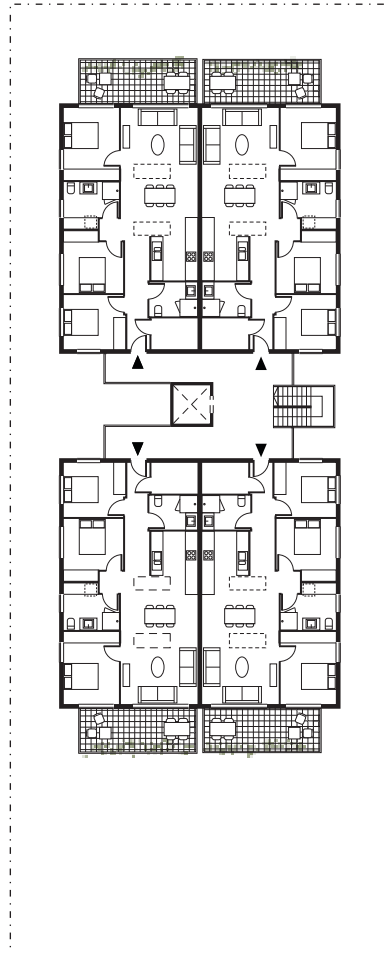
R-code: R50

Area: 1012m<sup>2</sup>

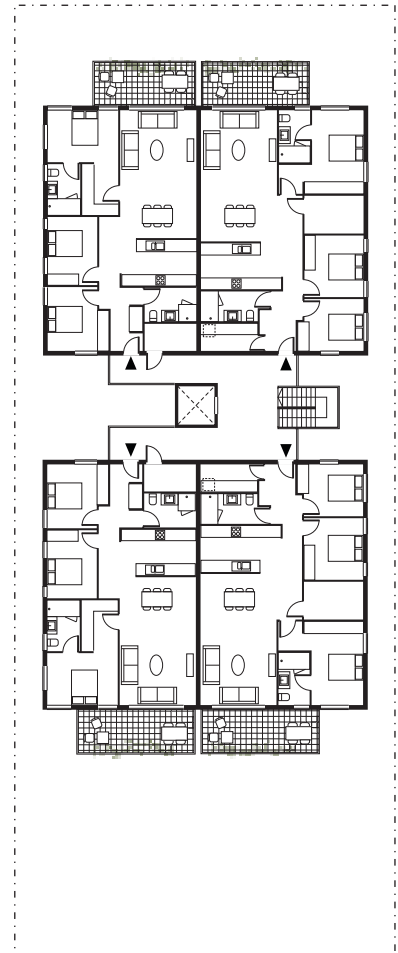
Frontage: 20.1m



Ground Floor Plan



First Floor Plan



Second Floor Plan

## CONCEPT 4A

### Project Data

Dwelling type:	10 multiple dwellings
Building height: (storeys)	Three storey
Site cover	58%
Primary garden area:	NA
Soft landscaping	20%
Trees:	5
Parking:	17 occupant bays 3 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
8	3	2	2
1	2	1	1
1	1	1	1

### Design Description

Three storey apartments with at-grade undercroft parking with central core.

#### Pros

- ✓ site area calculations encourage larger 'family' apartments
- ✓ direct access from primary living space to private open space and views to communal areas
- ✓ light-wells/courtyards allow for daylighting and natural ventilation

#### Cons

- ✗ site area approach instead of plot ratio may lead to larger apartments with less diversity
- ✗ site cover may exceed plot ratio approach

### Supports provisions for:

- ✓ average site area instead of plot ratio to determine dwelling yield. Encourages larger family size apartments
- ✓ soft landscaping percentages
- ✓ minimum dwelling areas for apartments

### Suggested further refinement of provisions as a result of testing:

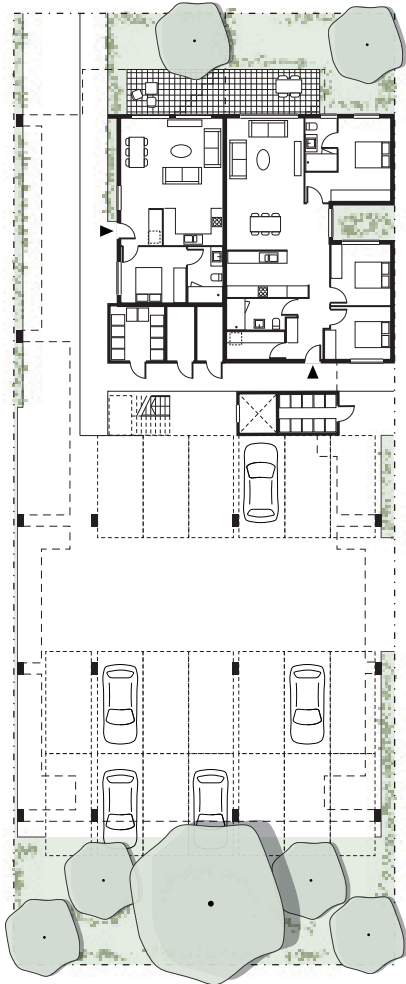
- dwelling mix provision for multiple dwellings
- site area incentives for tree retention for multiple dwellings
- circulation and common space for apartments
- layout of dwellings to support amenity

# Site 4 Apartment (contd.)

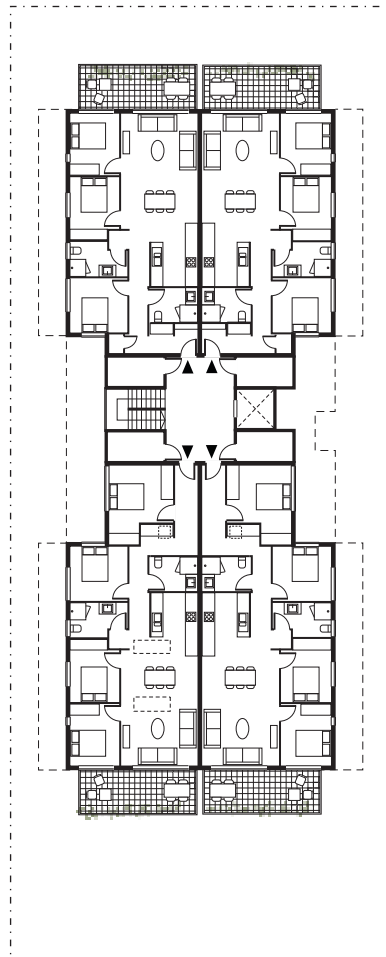
R-code: R50

Area: 1012m<sup>2</sup>

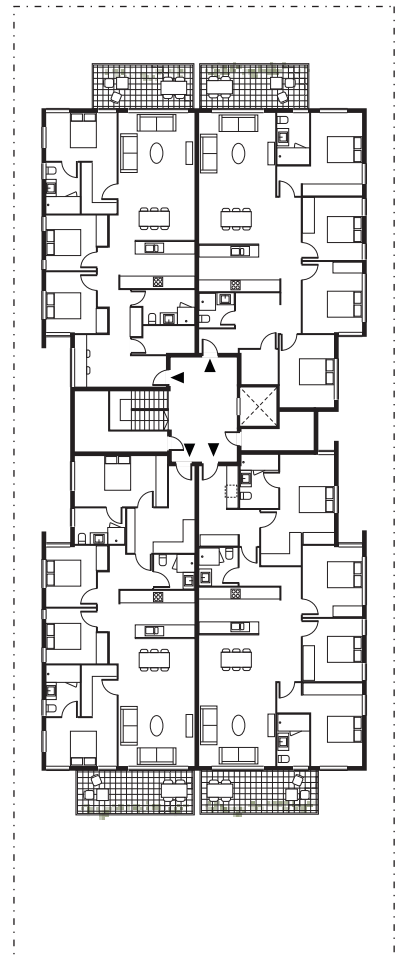
Frontage: 20.1m



Ground Floor Plan



First Floor Plan



Second Floor Plan

## CONCEPT 4B

### Project Data

Dwelling type:	10 multiple dwellings
Building height: (storeys)	Three storey
Site cover	64%
Primary garden area:	NA
Soft landscaping	20%
Trees:	5
Parking:	17 occupant bays 3 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
9	3	2	2
1	1	1	1

### Design Description

Three storey apartments with at-grade undercroft parking - 'maxed out' version with larger apartments.

#### Pros

- ✓ site area calculations encourage larger 'family' apartments
- ✓ direct access from primary living space to private open space and views to communal areas
- ✓ balcony to primary street supports neighbourliness
- ✓ cone of vision for facing portions of buildings on the same lot

#### Cons

- ✗ site area approach instead of plot ratio may lead to larger apartments with less diversity
- ✗ site cover may exceed a plot ratio approach

#### Supports provisions for:

- ✓ average site area instead of plot ratio to determine dwelling yield.
- ✓ Minimum dwelling areas for apartments
- ✓ tree requirement in private lots and street setback
- ✓ setbacks to support bulk to middle of the site

#### Suggested further refinement of provisions as a result of testing:

- dwelling mix provision for multiple dwellings
- circulation and common space for apartments
- layout of dwellings to support amenity

# Site 5 Apartment

R-code: R60

Area: 750m<sup>2</sup>

Frontage: 15.6m

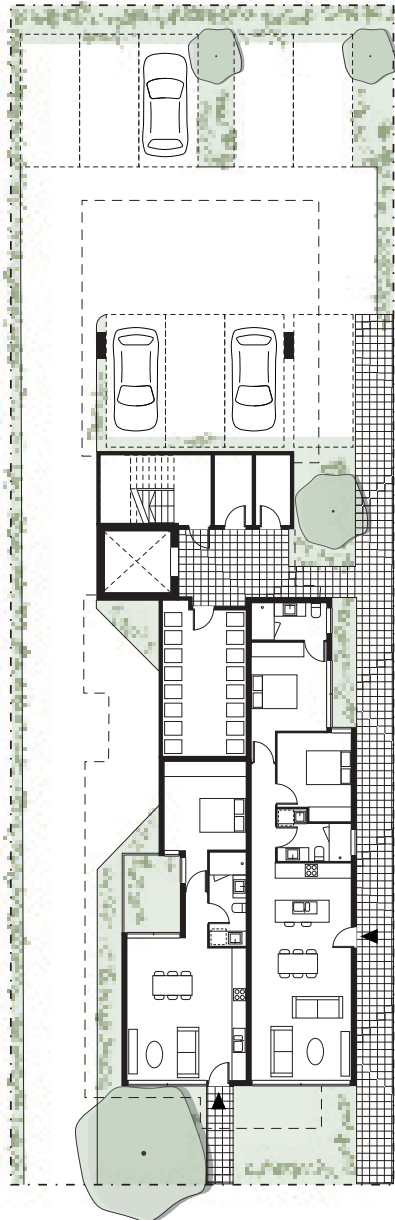
## CONCEPT 5A

### Project Data

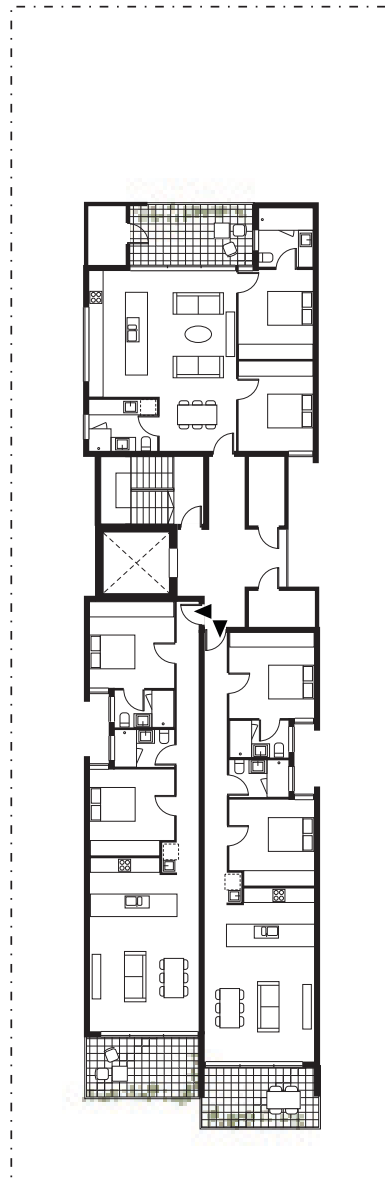
Dwelling type:	8 multiple dwellings
Building height: (storeys)	Three storey
Site cover	70%
Primary garden area:	NA
Soft landscaping	20%
Trees:	5
Parking:	7 occupant bays 2 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
7	2	2	1
1	1	1	0

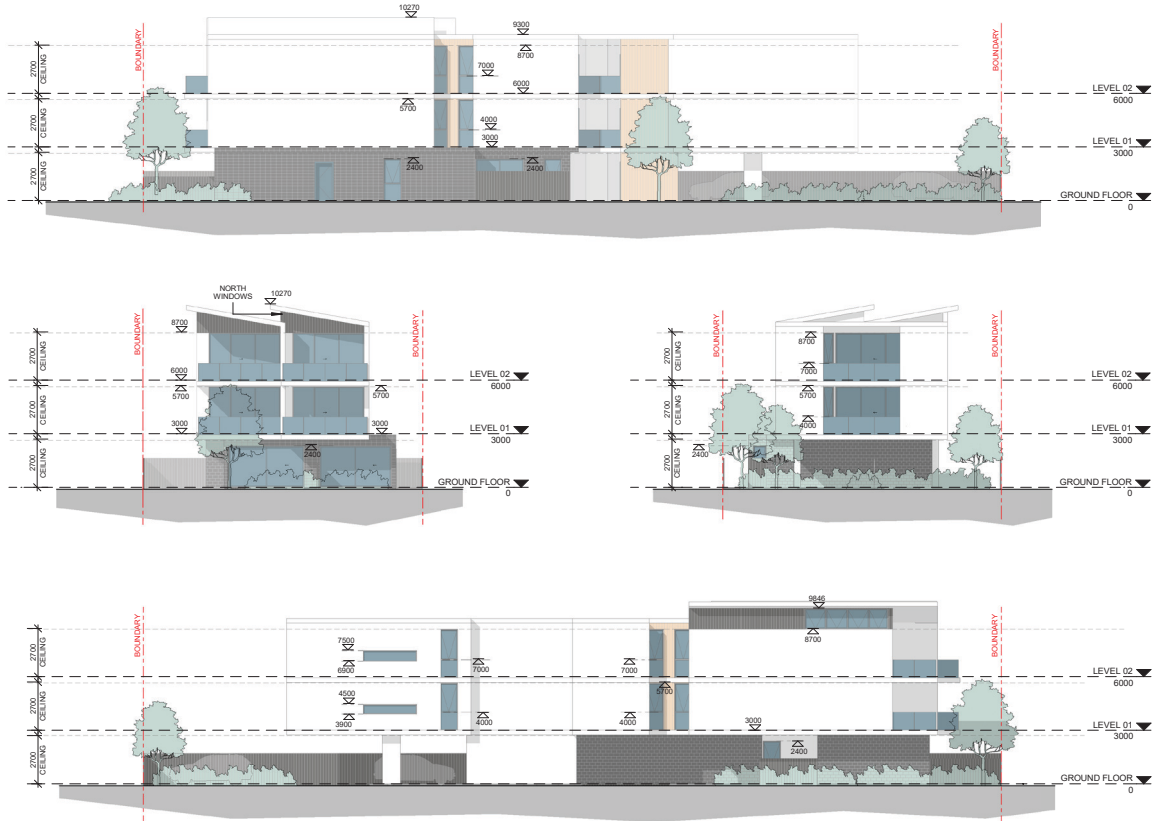


Ground Floor Plan



First/Second Floor Plan

# Infill Context



## Design Description

Three storey apartments with parking to rear of site.

### Pros

- ✓ landscaping improves building mass
- ✓ articulation to streetscape
- ✓ clear pedestrian access
- ✓ side setbacks support reduce bulk and scale to neighbours
- ✓ well located, accessible dedicated bin store and utilities

### Cons

- ✗ high proportion of internal circulation space
- ✗ healthy growth of tree impacted by building above

### Supports provisions for:

- ✓ average site area instead of plot ratio to determine dwelling yield. Encourages larger family size apartments
- ✓ daylighting to long single aspect terraces
- ✓ setbacks to support bulk to middle of the site

### Suggested further refinement of provisions as a result of testing:

- dwelling mix provision for multiple dwellings
- circulation and common space for apartments
- apartment ceiling heights
- passing points dimensions - align with Australian Standards

# Site 6 Single house

R-code: R30

Area: 315m<sup>2</sup>

Frontage: 10.5m

## CONCEPT 6A



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	63m <sup>2</sup>
Soft landscaping	25%
Trees:	2
Parking:	Double tandem garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Design Description

Single storey house with a tandem garage. North to side of lot.

#### Pros

- ✓ large, well oriented primary garden area to rear of lots
- ✓ trees provided in front setback and primary garden area
- ✓ reduced garage width to narrow lot frontages supports passive surveillance and active streetscapes

#### Cons

- ✗ tandem parking may impact feasibility
- ✗ cross ventilation may be difficult to achieve
- ✗ solar access to primary living space impacted

#### Supports provisions for:

- ✓ tier primary garden area size to site area
- ✓ site cover instead of open space calculation
- ✓ garage widths proportionate to frontages

#### Suggested further refinement of provisions as a result of testing:

- primary garden area to north half of site
- solar access to primary living spaces
- soft landscaping minimum dimension



## CONCEPT 6B



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	40m <sup>2</sup>
Soft landscaping	20%
Trees:	2
Parking:	Double tandem garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Design Description

Single storey house with a tandem garage and central courtyard. North to front of lot.

#### Pros

- ✓ well considered orientation with sunlight to primary living spaces
- ✓ direct access from primary living space to primary garden areas
- ✓ site cover supports gardens and open space
- ✓ trees provided in primary garden area and front setback

#### Cons

- ✗ tandem parking may impact feasibility
- ✗ high proportion of circulation and external walls

#### Supports provisions for:

- ✓ garage widths proportionate to frontages
- ✓ solar access to primary living spaces for climate zones 4, 5, and 6
- ✓ site cover instead of open space calculation
- ✓ storage for single houses
- ✓ minimum floor areas for bedrooms

#### Suggested further refinement of provisions as a result of testing:

- site cover percentages
- proportion of garaged parking to lot width
- primary garden area to north half of site
- solar access to primary living spaces

Ground Floor Plan



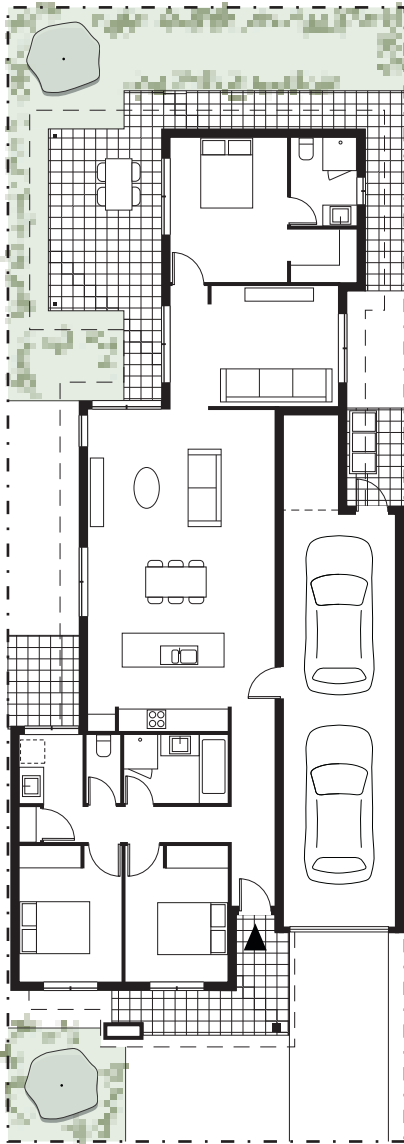
# Site 6 Single house (contd.)

R-code: R30

Area: 315m<sup>2</sup>

Frontage: 10.5m

## CONCEPT 6C



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	63m <sup>2</sup>
Soft landscaping	20%
Trees:	2
Parking:	Double tandem garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Design Description

Single storey house with a tandem garage. North to rear of lot.

#### Pros

- ✓ additional trees provided in private lots
- ✓ large primary garden areas to rear of lot
- ✓ well sized, functional primary living spaces
- ✓ reduced garage width to narrow lot frontages supports passive surveillance and active streetscapes

#### Cons

- ✗ tandem parking may impact feasibility
- ✗ high proportion of circulation and external walls
- ✗ cost to build on boundary
- ✗ solar access to primary living space impacted by alfresco

#### Supports provisions for:

- ✓ garage widths proportionate to lot frontages
- ✓ simplified wall setback calculations
- ✓ deep soil area related to trees

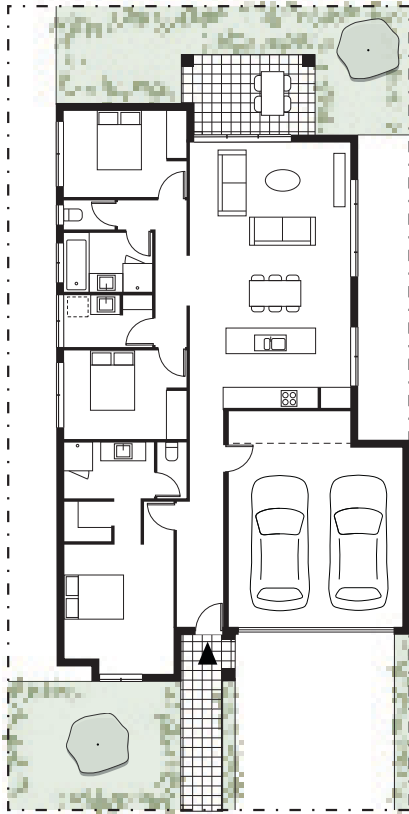
#### Suggested further refinement of provisions as a result of testing:

- solar access to primary living spaces
- primary garden area to north half of site
- soft landscaping minimum dimension

# Site 7 Single house

R-code: R30  
 Area: 312.5m<sup>2</sup>  
 Frontage: 12.5m

## CONCEPT 7A



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	47%
Primary garden area:	40m <sup>2</sup>
Soft landscaping	29%
Trees:	2
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Design Description

Single storey house with rear garden area, bedroom to front of lot.

#### Pros

- ✓ functional primary garden areas
- ✓ garage width proportional to lot frontage
- ✓ articulation to streetscape
- ✓ site cover supports gardens and open space

#### Cons

- ✗ solar access to primary living space impacted by alfresco location and proximity to boundary
- ✗ reduced bedrooms may impact feasibility in some locations

#### Supports provisions for:

- ✓ primary garden area connected to primary living space
- ✓ soft landscaping percentages
- ✓ garage widths proportionate to lot frontages

#### Suggested further refinement of provisions as a result of testing:

- solar access to primary living spaces
- soft landscaping minimum dimension
- site cover percentages

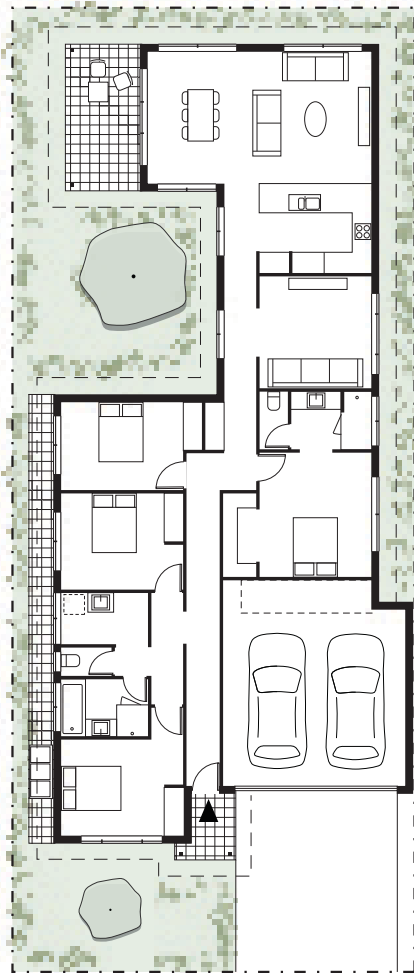
# Site 8 Single house

R-code: R30

Area: 375m<sup>2</sup>

Frontage: 12.5m

## CONCEPT 8A



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	63m <sup>2</sup>
Soft landscaping	31%
Trees:	2
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	4	2	2

### Design Description

Single storey house with side courtyard. Living space to rear of lot.

#### Pros

- ✓ generous areas for trees and gardens
- ✓ well considered orientation with sunlight to primary living spaces
- ✓ direct access from primary living space to primary garden areas
- ✓ adequate bedroom sizes

#### Cons

- ✗ high proportion of internal circulation space and external walls
- ✗ tree selection important to support solar access into primary living space

#### Supports provisions for:

- ✓ primary garden area connected to primary living space
- ✓ soft landscaping percentages
- ✓ tree requirement in private lots and street setback
- ✓ solar access to primary living spaces for climate zones 4, 5, and 6

#### Suggested further refinement of provisions as a result of testing:

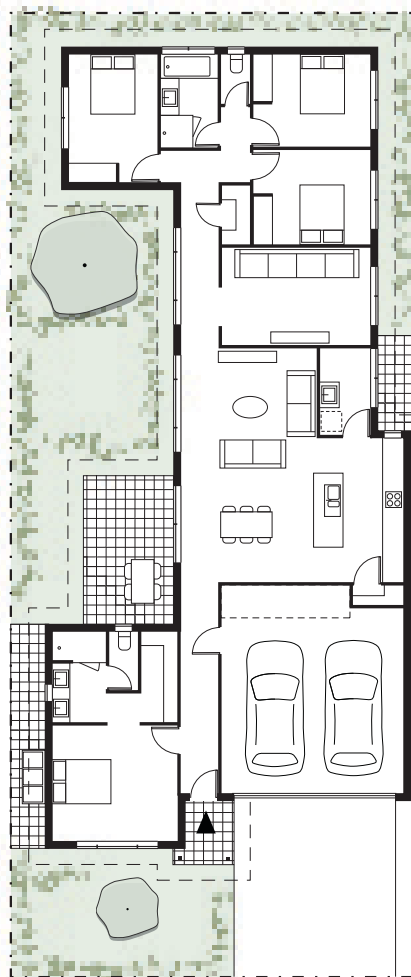
- site cover percentages
- proportion of garaged parking to lot width
- solar access to primary living spaces

Ground Floor Plan



R-code: R30  
 Area: 375m<sup>2</sup>  
 Frontage: 12.5m

## CONCEPT 8B



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	68m <sup>2</sup>
Soft landscaping	31%
Trees:	2
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	4	2	2

### Design Description

Single storey house with side courtyard. Living space to centre of lot.

#### Pros

- ✓ generous areas for trees and gardens
- ✓ well considered orientation, airflow, outlook and 'access to the sky'
- ✓ covered entry thresholds with well defined street address
- ✓ adequate bedroom sizes

#### Cons

- ✗ high proportion of internal circulation space and external walls
- ✗ cost to build on boundary

#### Supports provisions for:

- ✓ consolidated primary garden areas
- ✓ soft landscaping percentages
- ✓ solar access to primary living spaces for climate zones 4, 5, and 6
- ✓ simplified wall setback calculations

#### Suggested further refinement of provisions as a result of testing:

- site cover percentages
- solar access to primary living spaces
- soft landscaping minimum dimension

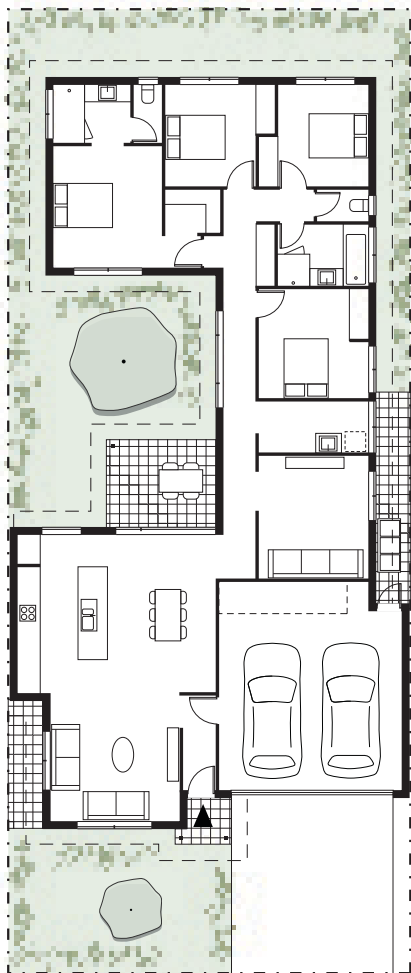
# Site 8 Single house (contd.)

R-code: R30

Area: 375m<sup>2</sup>

Frontage: 12.5m

## CONCEPT 8C



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	51m <sup>2</sup>
Soft landscaping	31%
Trees:	2
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	4	2	2

### Design Description

Single storey house with side courtyard. Living space to front of lot.

#### Pros

- ✓ generous areas for trees and gardens
- ✓ well considered orientation, airflow, outlook and 'access to the sky'
- ✓ covered entry thresholds with well defined street address
- ✓ adequate bedroom sizes

#### Cons

- ✗ high proportion of internal circulation space and external walls
- ✗ cost to build on boundary

#### Supports provisions for:

- ✓ consolidated primary garden areas
- ✓ soft landscaping percentages
- ✓ solar access to primary living spaces for climate zones 4, 5, and 6
- ✓ simplified wall setback calculations

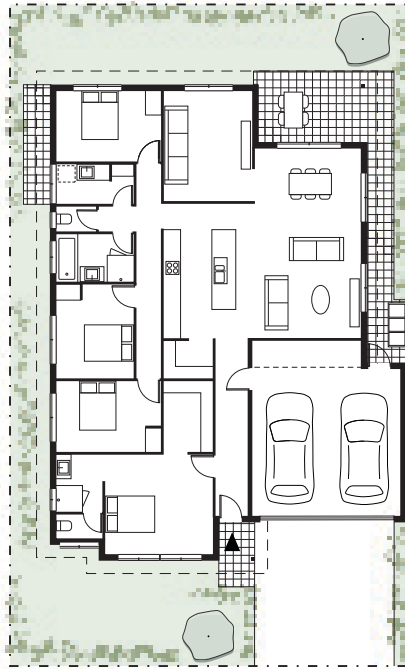
#### Suggested further refinement of provisions as a result of testing:

- site cover percentages
- primary garden area to north half of site
- soft landscaping minimum dimension

# Site 9 Single house

R-code: R30  
 Area: 375m<sup>2</sup>  
 Frontage: 15m

## CONCEPT 9A



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	57m <sup>2</sup>
Soft landscaping	29%
Trees:	2
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	4	2	2

### Design Description

Single storey house with rear garden area, bedroom to front of lot.

#### Pros

- ✓ functional primary garden areas
- ✓ garage width proportional to lot frontage
- ✓ site cover supports gardens and open space

#### Cons

- ✗ narrow areas for landscaping, not future-proof
- ✗ solar access to primary living space impacted by alfresco location and proximity to boundary

#### Supports provisions for:

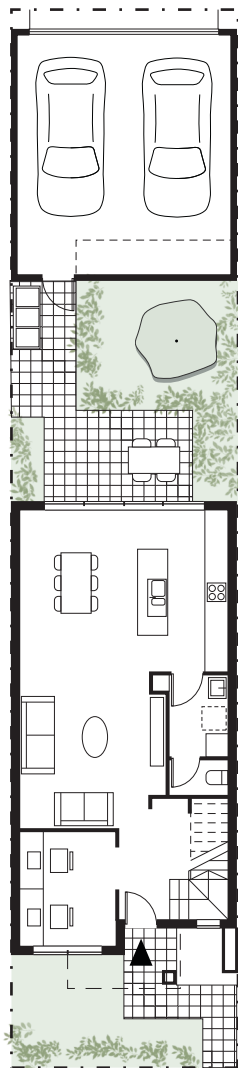
- ✓ simplified encroachments for primary garden area
- ✓ deep soil area related to trees
- ✓ soft landscaping percentages
- ✓ site cover instead of open space calculation

#### Suggested further refinement of provisions as a result of testing:

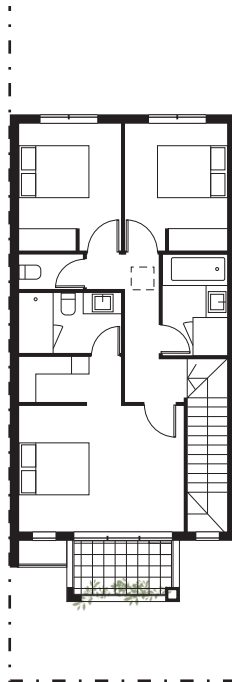
- soft landscaping minimum dimension
- solar access to primary living spaces
- primary garden area to north half of site
- landscape application requirements

# Site 10 Terrace

R-code: R60  
 Area: 168m<sup>2</sup>  
 Frontage: 6m



Ground Floor Plan



First Floor Plan

## CONCEPT 10A

### Project Data

Dwelling type:	Single House (Terrace)
Building height: (storeys)	Two storey
Site cover	65%
Primary garden area:	35m <sup>2</sup>
Soft landscaping	20%
Trees:	1
Parking:	Double garage (rear loaded)

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Design Description

Two storey terrace, garage accessed from laneway.

#### Pros

- ✓ two storey construction achieves large primary garden areas and soft landscaping
- ✓ large primary garden area to rear of lot
- ✓ well considered orientation with sunlight to primary living spaces
- ✓ shared boundary wall construction
- ✓ covered entry thresholds with well defined street address
- ✓ balcony to primary street supports neighbourliness

#### Cons

- ✗ two storey development may increase construction costs
- ✗ cost to build on boundary
- ✗ cross ventilation may be difficult to achieve

### Supports provisions for:

- ✓ solar access to primary living spaces for climate zones 4, 5, and 6
- ✓ two storey boundary walls for narrow lots
- ✓ minimum dimensions for bedrooms

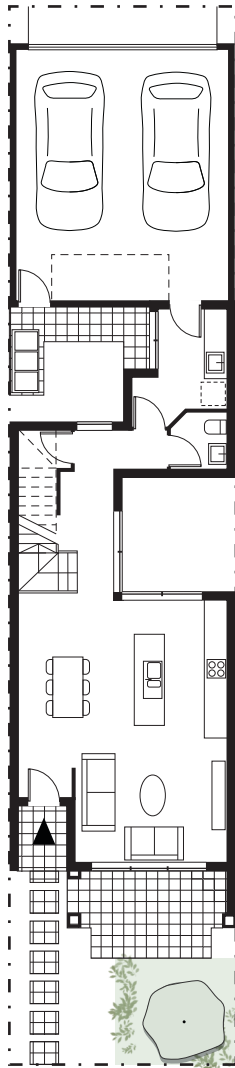
### Suggested further refinement of provisions as a result of testing:

- primary garden area to north half of site
- site cover percentages
- increase extent of side setbacks and boundary walls to permit typical terrace typologies
- overshadowing for narrow lot housing

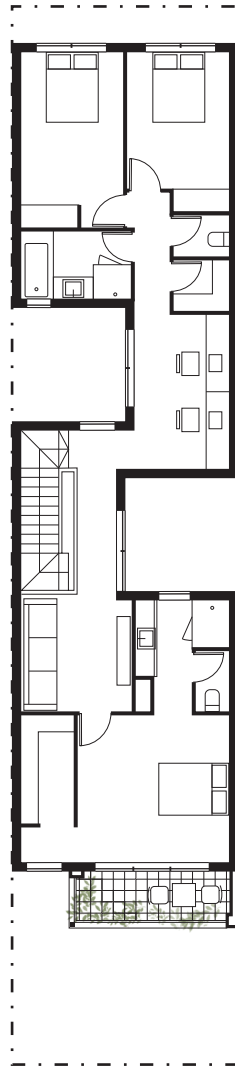


# Greenfield Context

## CONCEPT 10B



Ground Floor Plan



First Floor Plan

### Project Data

Dwelling type:	Single House (Terrace)
Building height: (storeys)	Two storey
Site cover	67%
Primary garden area:	30m <sup>2</sup>
Soft landscaping	20%
Trees:	1
Parking:	Double garage (rear loaded)

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Design Description

Two storey terrace, garage accessed from laneway. Direct access to dwelling from garage.

#### Pros

- ✓ balcony to primary street supports neighbourliness
- ✓ good cross-ventilation to capture breeze paths
- ✓ covered entry thresholds with well defined street address

- ✓ light-wells/courtyards allow for daylighting and natural ventilation

#### Cons

- ✗ high proportion of internal circulation space
- ✗ primary garden area in street setback

#### Supports provisions for:

- ✓ setbacks for lightwells
- ✓ minimum dimensions for bedrooms

- ✓ two storey boundary walls for narrow lots

#### Suggested further refinement of provisions as a result of testing:

- primary garden area to north half of site
- site cover percentages
- increase extent of side setbacks and boundary walls to permit typical terrace typologies
- overshadowing for narrow lot housing



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# **COSTING AND FEASIBILITY**

# Costing and feasibility

## Method

Costing and feasibility was undertaken on selected proposals to better understand construction costs and financial implications of the Code. Eight designs were costed and compared against base plan costing.

Selected designs included a range of building types across infill and greenfield development. For ease of reference the numbering of sites aligns with the design concepts in the previous section. These include:

### Site 1 Terrace

3x two storey terrace development in an infill context

### Site 2 Triplex

3x single storey grouped dwelling, using the small dwelling concession in an infill context

### Site 2 Triplex

1x single storey grouped dwelling, 2 x two storey grouped dwelling in an infill context

### Site 4 Apartment

8 apartments over two levels in an infill context

### Site 5 Apartment

8 apartments over three levels in an infill context

### Site 6 Single house

Single house with tandem car garaging in a greenfield context

### Site 8 Single house

Single house with double car garaging in a greenfield context

### Site 10 Terrace

Single terrace style house with narrow lot frontage in greenfield context

Proposed plans designed under the Code and comparison base plans were costed by Ralph Beatty Bosworth quantity surveyors. Builders margin was not included.

Valuation was undertaken by Hemsley Patterson consultant valuers and analysed against hypothetical land values of \$400,000 (low land value) and \$625,000 (high land value). Greenfield values were derived from comparable development. Accurate greenfield values were difficult to obtain due to limited comparable development and unknown pricing of land. Because of this the difference in construction costs was considered to be good indication of viability.

Costing and feasibility was undertaken during the COVID global pandemic and the building and construction industry has experienced a significant spike in demand with supply and labour shortages due to the pandemic. These factors have resulted in significant cost increases which can adversely influence the viability of housing developments. Because of this, in some scenarios the base plan was not considered viable. Evaluating the change in construction cost and market value between the base plan and proposed designs was considered to be beneficial when understanding the impacts of the Code on development feasibility.

## Key Findings

Testing confirmed that changes to dwelling yield, mix and construction costs were a key indicator on development feasibility. Where changes to internal floor arrangements were proposed, with minimal difference in overall yield, mix or number of storeys, construction costs and feasibility were similar.

### Site 1 Terrace

Terrace style housing, when compared to triplex housing, decreases the space used for vehicle access and manoeuvring, allowing for larger primary garden areas. The proposed design increases the number of bedroom from 3 to 4. There is a slight increase in construction cost due to the larger floor area. Market value indicates an impact in low land value areas, but less in areas of high land value.

### Site 2 Triplex

Developed as single storey triplexes, the proposed design applies a small dwelling concession to the rear dwelling to support large primary garden areas and soft landscaping. Housing diversity and affordability is provided through the two bedroom dwelling on a smaller sized site. The floor area for the proposed design is reduced along with construction costs. There is very little change to the market value in both low and high land value areas.

### Site 2 Triplex

Presenting as single storey and two storey grouped dwellings, the additional storey allows for at least a 3x2x2 dwelling mix while providing adequate space for gardens and trees. Two storey construction and an increase in floor area saw construction cost increase significantly. Market valuation indicated the proposed design would be less viable in both low and high land value areas.

### Site 3 Apartment

The proposed design achieved eight apartments over two storeys. The apartment mix is varied and includes single bedroom and three bedroom apartments, with a higher total floor area and construction cost. The market value of the proposed design is impacted in a low land value area with less impact in areas with a higher land value.

### Site 5 Apartment

The proposed plan achieved eight apartments over three levels with a mixed yield incorporating single bedroom and three bedroom units. The overall yield is reduced from the base plan by one apartment, however most apartments had an additional bathroom. The total floor area for the proposed design is reduced given the yield reduction and the construction cost is increased with the additional bathrooms. Market valuation would be impacted in both high and low land value areas.

## Site 6 Single house

The proposed design provides a tandem garage allowing for a higher proportion of windows and active rooms to front the street. This supports passive surveillance and street activation. The internal planning configuration provides a 'C' shaped house with internal courtyard. Valuation indicated a reasonably minor difference to construction cost and market value between the proposed design and the base plan.

## Site 8 Single house

The design proposes four bedrooms, a theatre room and a double car garage in a 'C' shaped internal planning configuration. This arrangement allows for a large internal courtyard providing space for gardens and trees and functional outdoor areas. Living areas are dual-aspect with good street frontage and sunlight, linking to garden and alfresco areas. There is a marginal difference in the total floor area and construction costs, however valuation indicates that the design is superior and would achieve a similar market value to the base plan.

## Site 10 Terrace

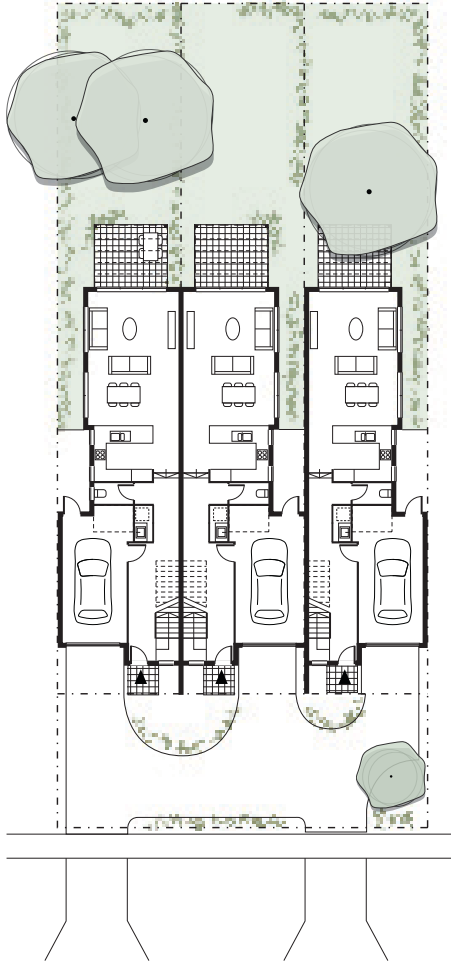
Achieving three bedrooms and a double car garage, there is very little difference in the internal planning configuration between the base plan and the proposed design. Additional space has been provided for storage areas. This indicates that with very few changes, good outcomes in greenfield terrace type buildings can be achieved under the Code provisions. Construction costs would be increased slightly with minimal impact on market value.

# Site 1 Terrace

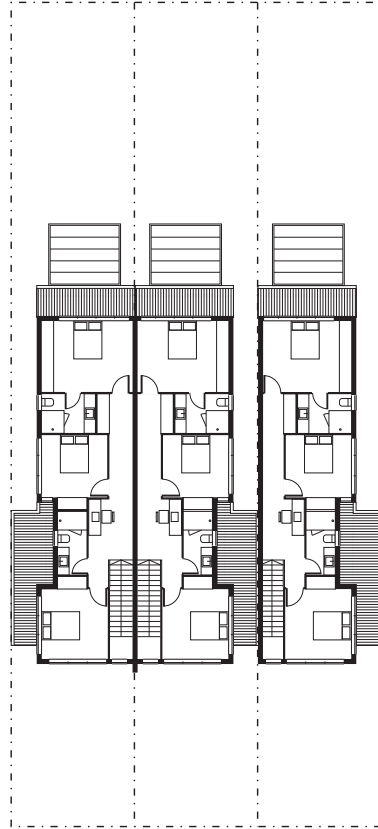
Site description: R40 green title terraces

Area: 693m<sup>2</sup>

Frontage: 18.9m



Ground Floor Plan



First Floor Plan

## Comparison Base Plan

3 infill terraces with front loaded access via multiple crossovers

### Project Data

Dwelling type:	3 green title dwellings
Building height: (storeys)	Two storey
Site cover:	38%
Primary garden area	84m <sup>2</sup> (average)
Soft landscaping:	44%
Trees:	5
Parking:	3 x single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	3	2.5	2

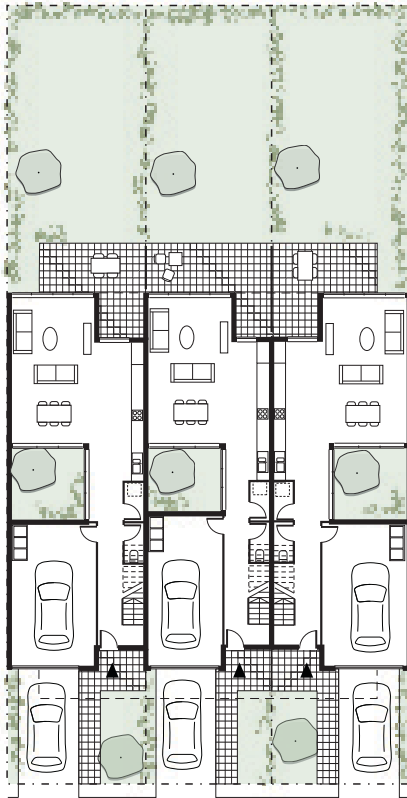
### Construction costs

GFA:	455m <sup>2</sup>
Total build cost:	\$916,380
Cost / m <sup>2</sup>	\$2,020

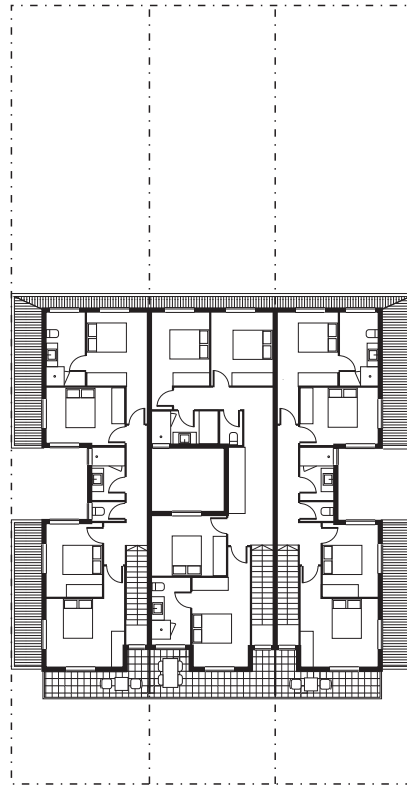
as costed by quantity surveyor (May 2022)

# Costing & Feasibility

## CONCEPT 1C



Ground Floor Plan



First Floor Plan

### Project Data

Dwelling type:	3 green title dwellings
Building height: (storeys)	Two storey
Site cover:	42% (average)
Primary garden area:	97m <sup>2</sup> (average)
Soft landscaping	39% (average)
Trees:	8
Parking:	3 x single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	4	2	1

### Construction costs

GFA:	476m <sup>2</sup>
Total build cost:	\$978,650
Cost / m <sup>2</sup>	\$2,054

+\$24/m<sup>2</sup> from comparison base plan

as costed by quantity surveyor  
(May 2022)

### Costing summary

- larger footprint to base plan comparison
- additional bedrooms per dwelling
- no rear access around dwelling
- increase in proportion of external wall
- general increases in cost due to additional internal and external walls

### Feasibility summary

- building type not generally supported in low land value areas
- higher cost of construction impacts return on sale, particularly in low land value areas
- may be viable in higher land value areas
- minor changes to project return from the base plan

# Site 2 Triplex

Site description: R40 triplex development - small dwelling concession

Area: 728m<sup>2</sup>

Frontage: 18m

## Comparison Base Plan

### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	Single storey
Site cover:	65%
Primary garden area:	22.2 (average)
Soft landscaping:	10%
Trees:	3
Parking:	3 x double garages

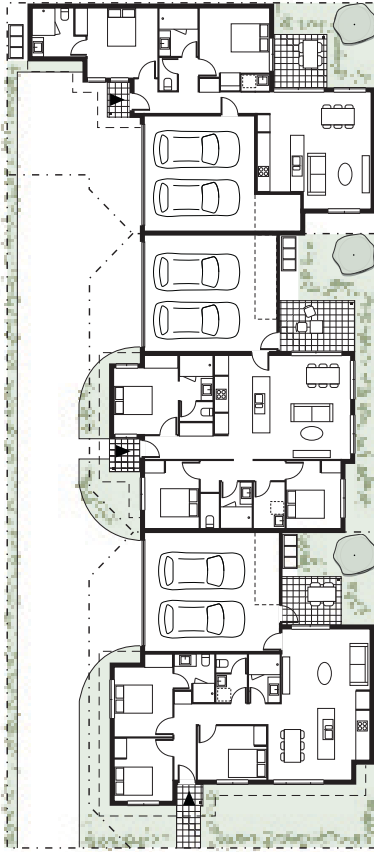
### Product Mix

Dw. No.	Bdrm	Bath	Car
3	3	2.5	2

### Construction costs

GFA:	359m <sup>2</sup>
Total build cost:	\$507,715
Cost / m <sup>2</sup>	\$1,420

*as costed by quantity surveyor  
(May 2022)*



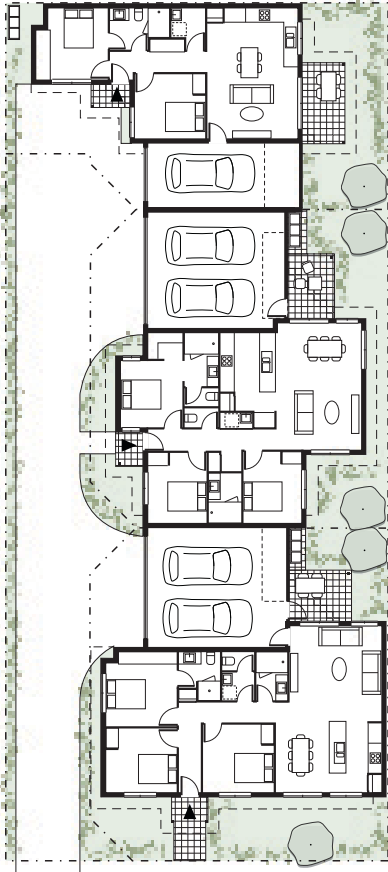
Ground Floor Plan





# Costing & Feasibility

## CONCEPT 2D



Ground Floor Plan



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	One storey
Site cover	62% (average)
Primary garden area:	40m <sup>2</sup> (average)
Soft landscaping	21% (average)
Trees:	5
Parking:	1 x single garage 2 x double garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
2	3	2	2
1	2	1	1

### Construction costs

GFA:	342m <sup>2</sup>
Total build cost:	\$478,710
Cost / m <sup>2</sup>	\$1,400

-\$40/m<sup>2</sup> from comparison base plan  
as costed by quantity surveyor (May 2022)

### Costing summary

- reduction in construction costs for all units
- smaller footprint compared to base plan
- decreased extent of internal and external walls
- rear unit is a smaller home with two bedrooms and a single garage
- land area for rear unit is reduced
- front two units have larger site area compared to base plan

### Feasibility summary

- considered viable in low and high land value areas
- market value of rear unit reduced due to reduction in bedroom and garaged parking
- reduction in market value of rear unit offset by increase in market value of remaining units

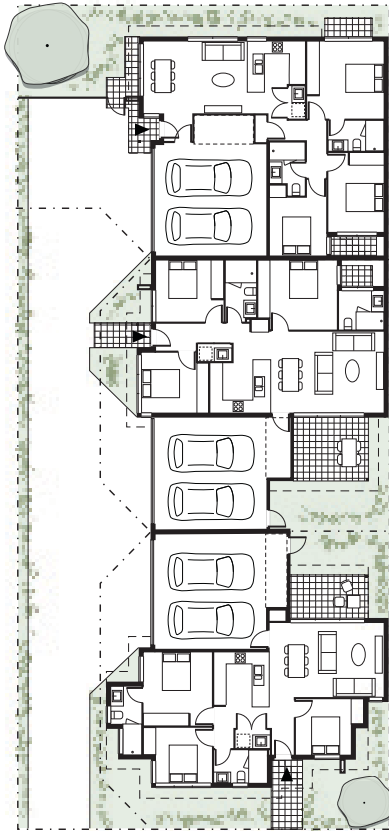
# Site 2 Triplex

Site description: R40 triplex development - two storey

Area: 728m<sup>2</sup>

Frontage: 18m

## Comparison Base Plan



### Project Data

Dwelling type:	3 grouped dwellings
Building height: (storeys)	Single storey
Site cover:	51%
Primary garden area:	22.3 (average)
Soft landscaping:	15%
Trees:	5
Parking:	3 x single garages

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	3	2	2

### Construction costs

GFA:	354m <sup>2</sup>
Total build cost:	\$609,340
Cost / m <sup>2</sup>	\$1,722

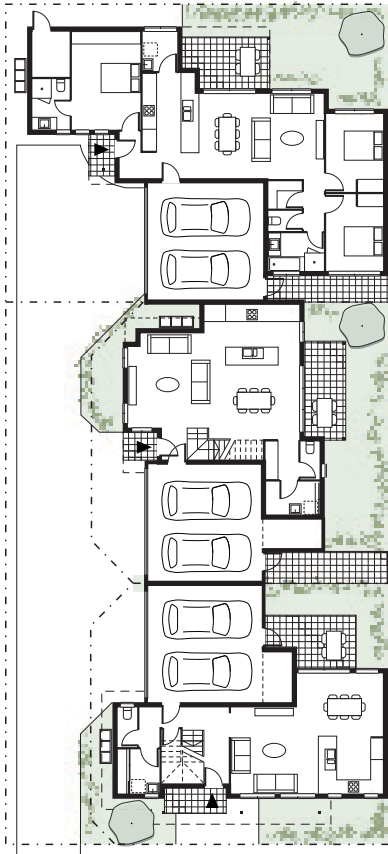
*as costed by quantity surveyor  
(May 2022)*

Ground Floor Plan

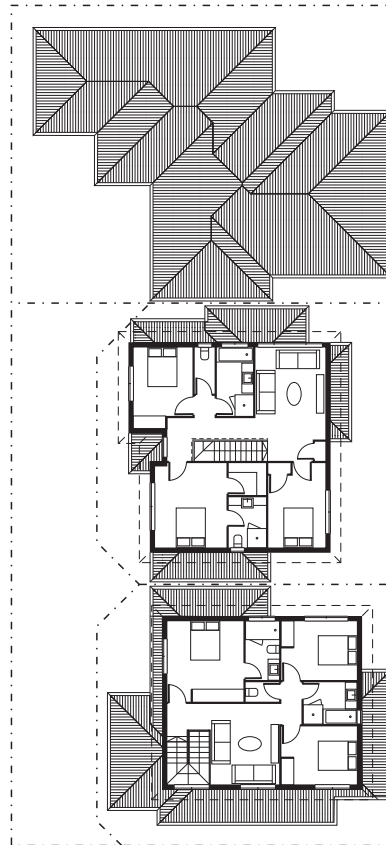


# Costing & Feasibility

## CONCEPT 2F



Ground Floor Plan



First Floor Plan

### Project Data

Dwelling type:	3 grouped dwellings
Building height:	2 x two storey
(storeys)	1 x one storey
Site cover	56% (average)
Primary garden area:	41m <sup>2</sup> (average)
Soft landscaping	13% (average)
Trees:	3
Parking:	3 x double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
3	3	2	2

### Construction costs

GFA:	472m <sup>2</sup>
Total build cost:	\$872,660
Cost / m <sup>2</sup>	\$1,850

+\$128/m<sup>2</sup> from comparison base plan

as costed by quantity surveyor  
(May 2022)

### Costing summary

- significant increase in internal floor areas compared with base plan
- additional costs due to two storey construction to unit 1 and unit 2
- increased costs through additional internal and external walls

### Feasibility summary

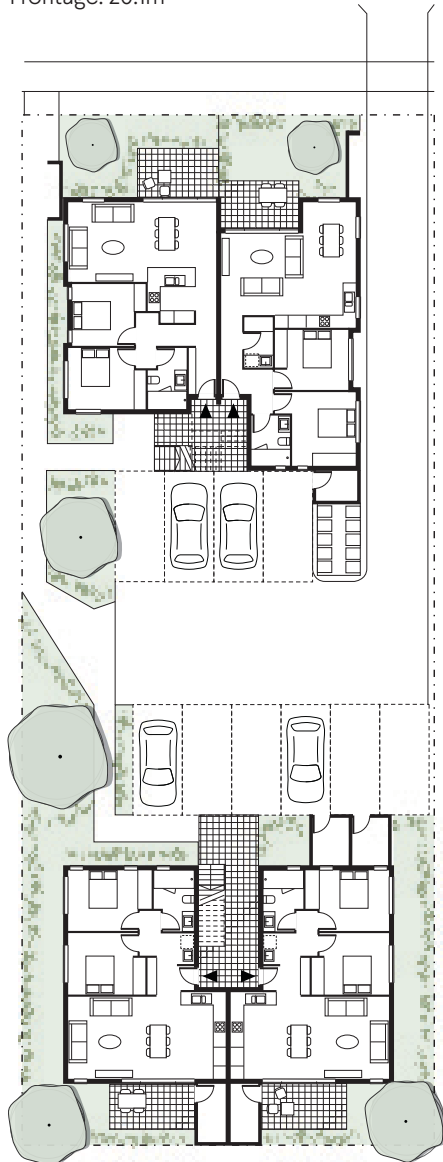
- building type not generally supported in low land value areas
- higher cost of construction impacts return on sale, particularly in low land value areas

# Site 3 Apartment

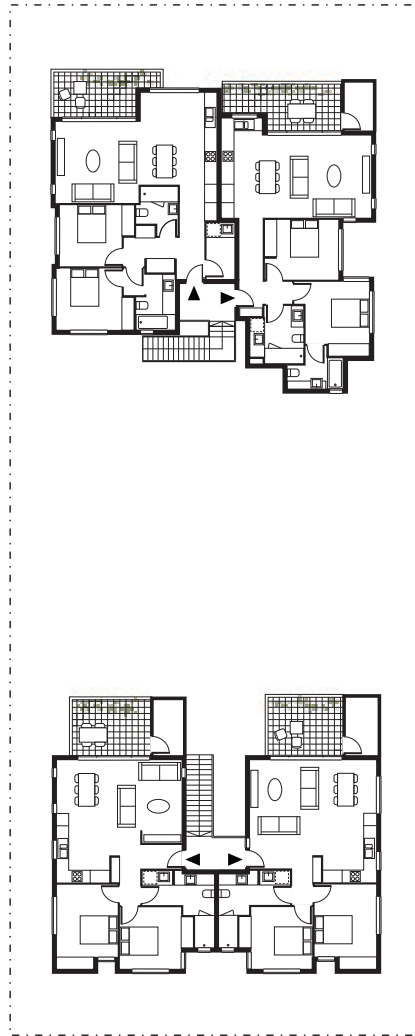
Site description: R40 apartment

Area: 1012m<sup>2</sup>

Frontage: 20.1m



Ground Floor Plan



First Floor Plan

## Comparison Base Plan

### Project Data

Dwelling type:	8 multiple dwellings
Building height: (storeys)	Two storey
Site cover:	59%
Primary garden area:	NA
Soft landscaping:	18%
Trees:	6
Parking:	8 occupant bays 2 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
8	2	1	1

### Construction costs

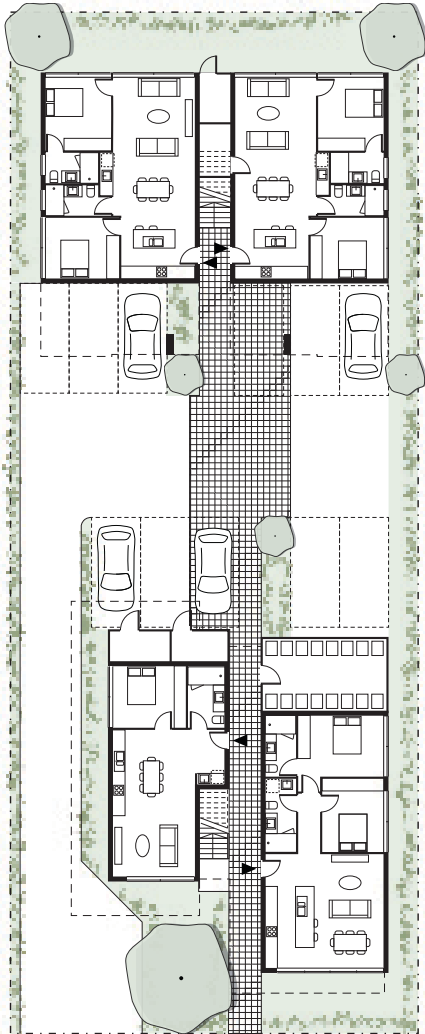
GFA:	714m <sup>2</sup>
Total build cost:	\$1,220,075
Cost / m <sup>2</sup>	\$1,710

*as costed by quantity surveyor  
(May 2022)*

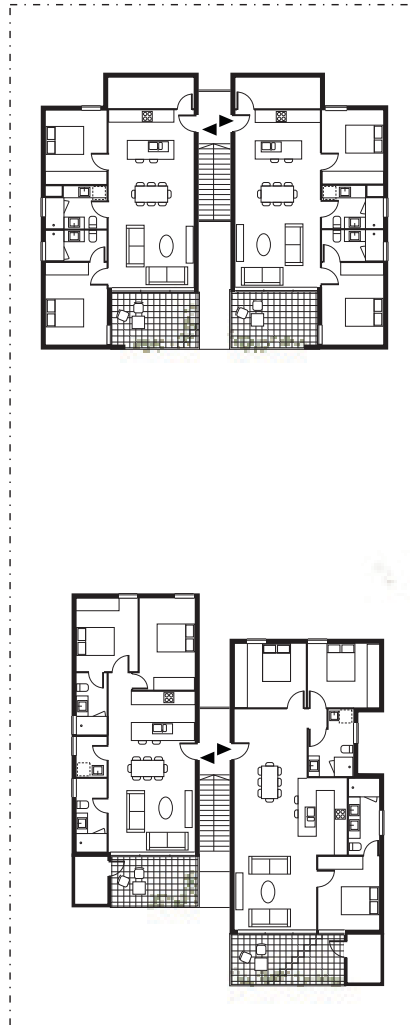
Design produced in 2019 using R-Codes  
Vol.2 Apartments

# Costing & Feasibility

## CONCEPT 3A



Ground Floor Plan



First Floor Plan

### Project Data

Dwelling type:	8 multiple dwellings
Building height: (storeys)	Two storey
Site cover	47%
Primary garden area:	NA
Soft landscaping	23% (average)
Trees:	6
Parking:	9 occupant bays 2 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
6	2	2	1
1	3	2	1
1	1	1	1

### Construction costs

GFA:	774m <sup>2</sup>
Total build cost:	\$1,360,570
Cost / m <sup>2</sup>	\$1,760

+\$50/m<sup>2</sup> from comparison base plan

as costed by quantity surveyor  
(May 2022)

### Costing summary

- additional costs due to increase in floor area compared with base plan
- change to apartment mix and size with additional bathrooms proposed

### Feasibility summary

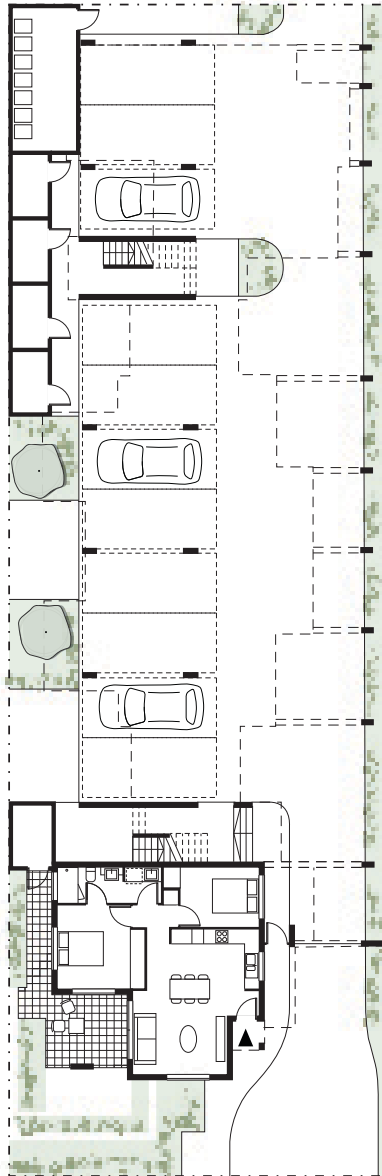
- considered viable in high land value areas
- higher cost of construction impacts return on sale, particularly in low land value areas

# Site 5 Apartment

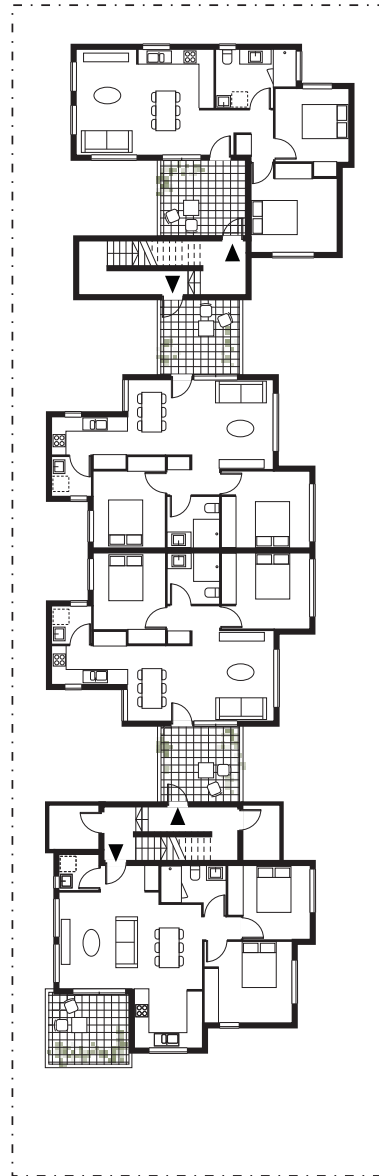
Site description: R60 apartment

Area: 750m<sup>2</sup>

Frontage: 15.6m



Ground Floor Plan



First/Second Floor Plan

## Comparison Base Plan

### Project Data

Dwelling type:	9 multiple dwellings
Building height: (storeys)	Three storey
Site cover:	55%
Primary garden area:	NA
Soft landscaping:	18%
Trees:	4
Parking:	9 occupant bays 2 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
9	2	1	9

### Construction costs

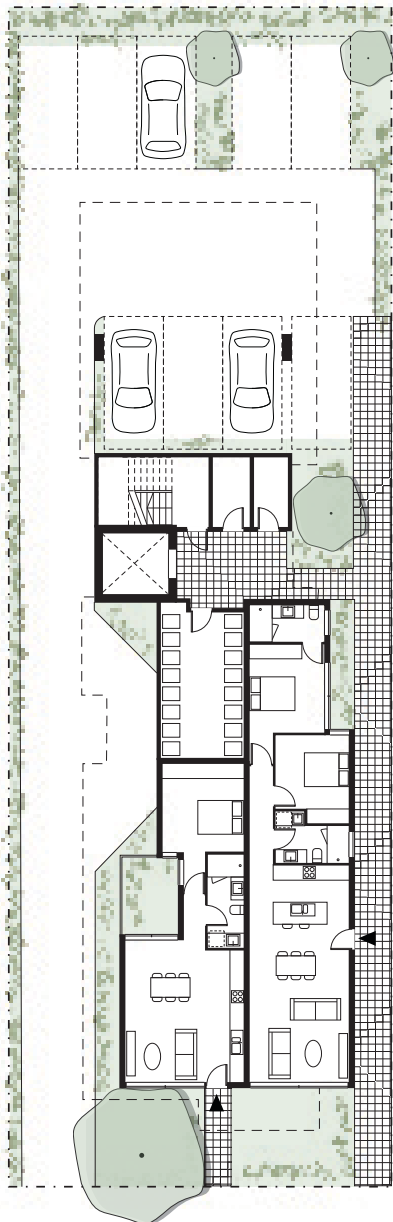
GFA:	1035m <sup>2</sup>
Total build cost:	\$1,536,685
Cost / m <sup>2</sup>	\$1,484

*as costed by quantity surveyor  
(May 2022)*

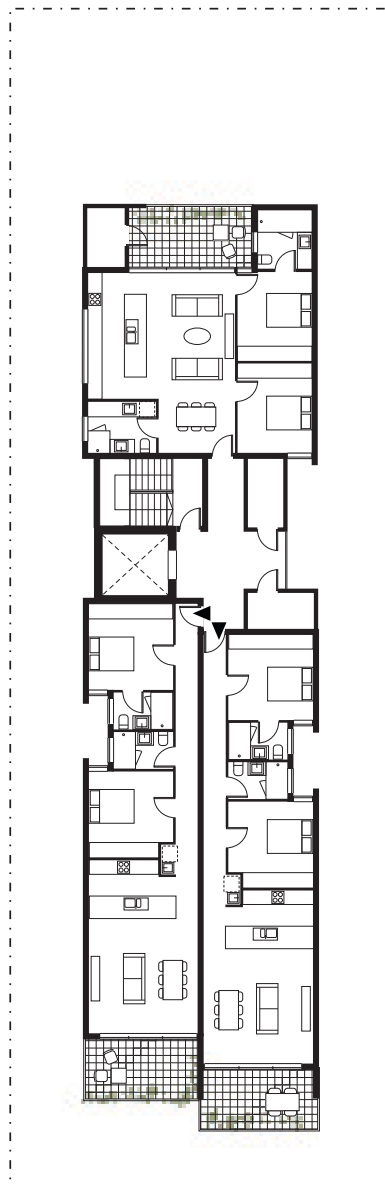
Design produced in 2014 prior to R-Codes  
Vol. 2 Apartments

# Costing & Feasibility

## CONCEPT 5A



Ground Floor Plan



First/Second Floor Plan

### Project Data

Dwelling type:	8 multiple dwellings
Building height: (storeys)	Three storey
Site cover	70%
Primary garden area:	NA
Soft landscaping	20%
Trees:	5
Parking:	7 occupant bays 2 visitor bays

### Product Mix

Dw. No.	Bdrm	Bath	Car
7	2	2	1
1	1	1	0

### Construction costs

GFA:	810m <sup>2</sup>
Total build cost:	\$1,571,690
Cost / m <sup>2</sup>	\$1,940

+\$456/m<sup>2</sup> from comparison base plan

as costed by quantity surveyor  
(May 2022)

### Costing summary

- reduction in costs due to smaller internal floor areas
- higher construction costs due to additional bathrooms
- reduction in yield from 9 apartments to 8 apartments
- change to apartment mix and size with additional bathrooms proposed

### Feasibility summary

- considered viable in low and high land value areas
- higher cost of construction impacts return on sale, particularly in low land value areas

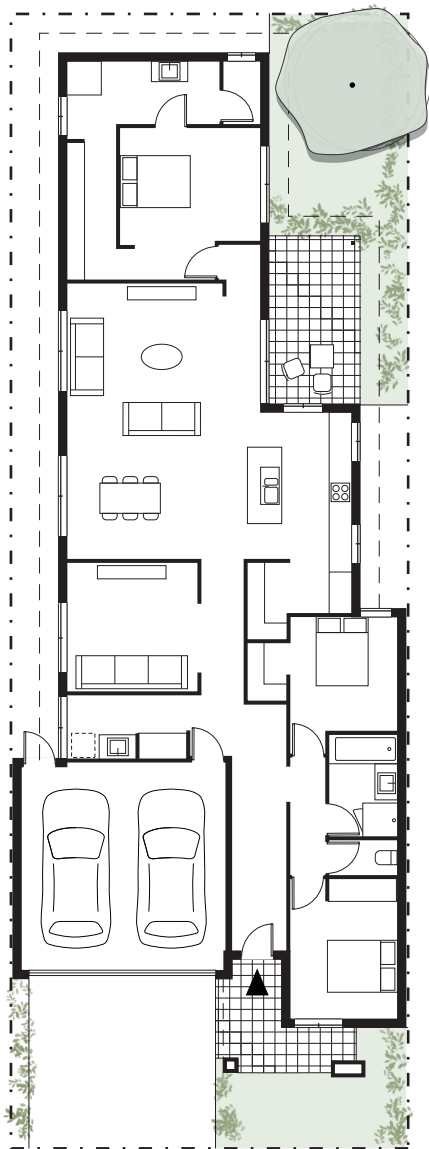
# Site 6 Single house

Site description: R30 single house

Area: 315m<sup>2</sup>

Frontage: 10.5m

## Comparison Base Plan



### Project Data

Dwelling type:	Single house
Building height: (storeys)	Single storey
Site cover:	63%
Primary garden area:	37.5m <sup>2</sup>
Soft landscaping:	20%
Trees:	1
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Construction costs

GFA:	185m <sup>2</sup>
Total build cost:	\$237,140
Cost / m <sup>2</sup>	\$1,280

*as costed by quantity surveyor  
(May 2022)*

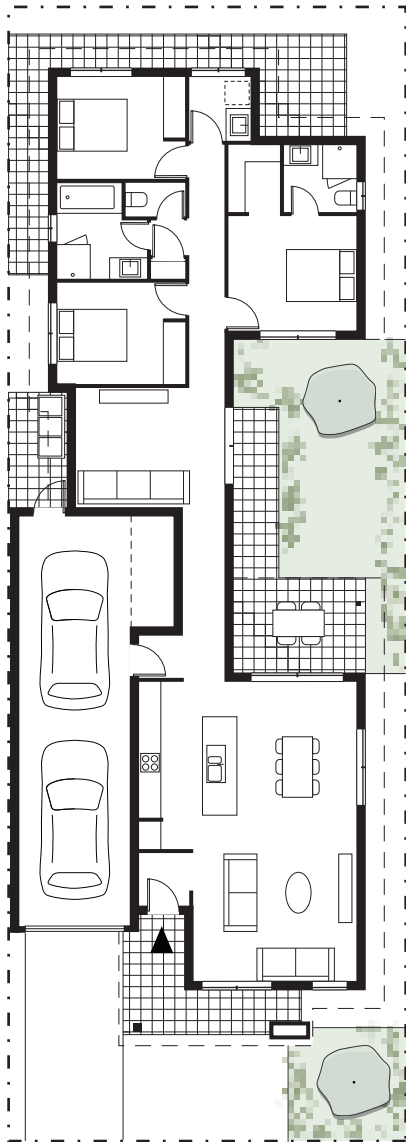
Ground Floor Plan





# Costing & Feasibility

## CONCEPT 6B



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	40m <sup>2</sup>
Soft landscaping	20%
Trees:	2
Parking:	Double tandem garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Construction costs

GFA:	163m <sup>2</sup>
Total build cost:	\$194,955
Cost / m <sup>2</sup>	\$1,200

-\$80/m<sup>2</sup> from comparison base plan  
as costed by quantity surveyor  
(May 2022)

### Costing summary

- reduction in costs due to internal floor area
- minor decrease in internal walls
- increase in external walls relative to floor area

### Feasibility summary

- considered viable in high and low land value areas
- market value on par with base plan
- central courtyard increases market value
- tandem garaging reduces market value
- reduction in construction costs

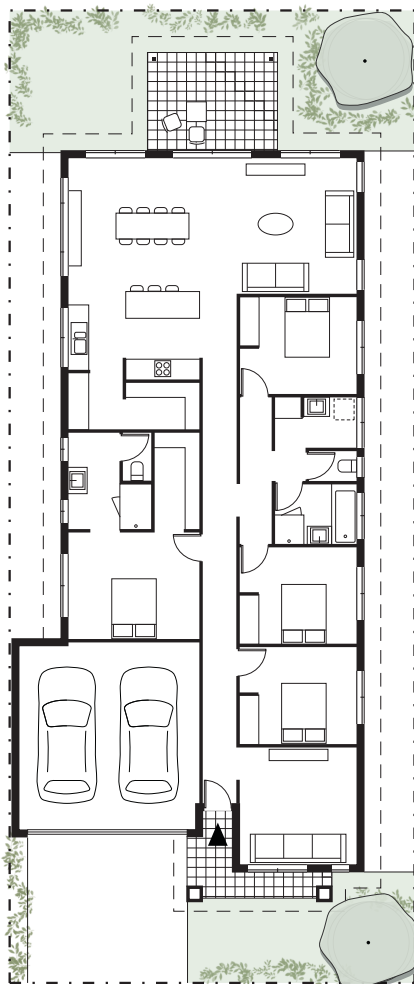
# Site 8 Single house

Site description: R30 single house

Area: 375m<sup>2</sup>

Frontage: 12.5m

## Comparison Base Plan



### Project Data

Dwelling type:	Single house
Building height: (storeys)	Single storey
Site cover:	56%
Primary garden area:	54m <sup>2</sup>
Soft landscaping:	16%
Trees:	2
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	4	2	2

### Construction costs

GFA:	202m <sup>2</sup>
Total build cost:	\$283,000
Cost / m <sup>2</sup>	\$1,402

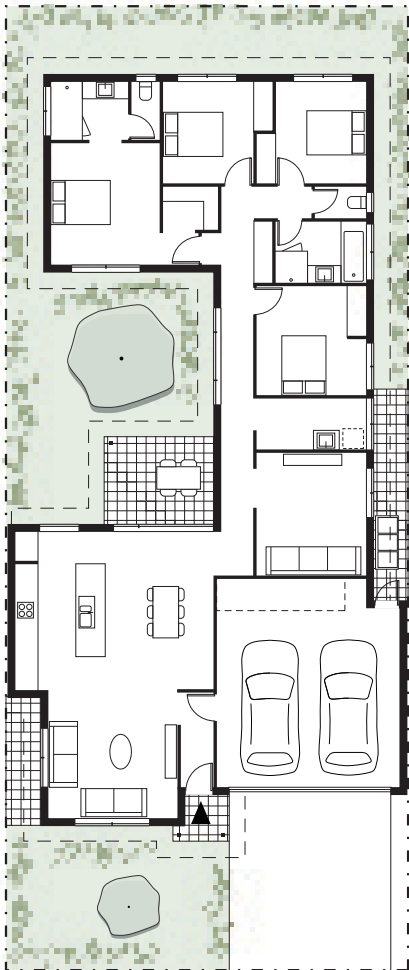
*as costed by quantity surveyor  
(May 2022)*

Ground Floor Plan



# Costing & Feasibility

## CONCEPT 8C



Ground Floor Plan



### Project Data

Dwelling type:	Single House
Building height: (storeys)	Single storey
Site cover	55%
Primary garden area:	51m <sup>2</sup>
Soft landscaping	31%
Trees:	2
Parking:	Double garage

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	4	2	2

### Construction costs

GFA:	195m <sup>2</sup>
Total build cost:	\$286,850
Cost / m <sup>2</sup>	\$1,470

+\$68/m<sup>2</sup> from comparison base plan  
as costed by quantity surveyor  
(May 2022)

### Costing summary

- slight increase in construction cost
- slight decrease in internal floor area
- increase in external walls relative to floor area
- decrease in internal walls

### Feasibility summary

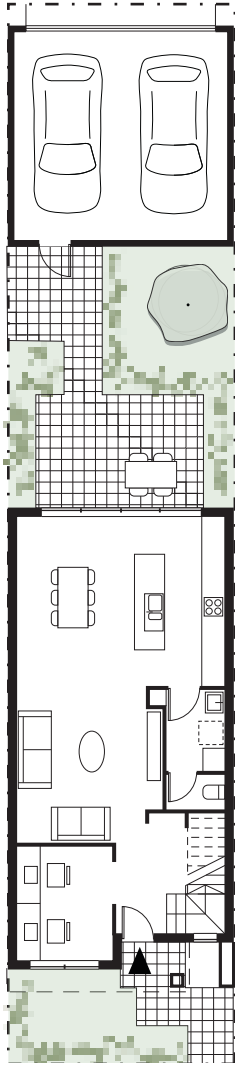
- considered viable in high and low land value areas
- market value on par with base plan
- central courtyard and improved design increases market value

# Site 10 Single house

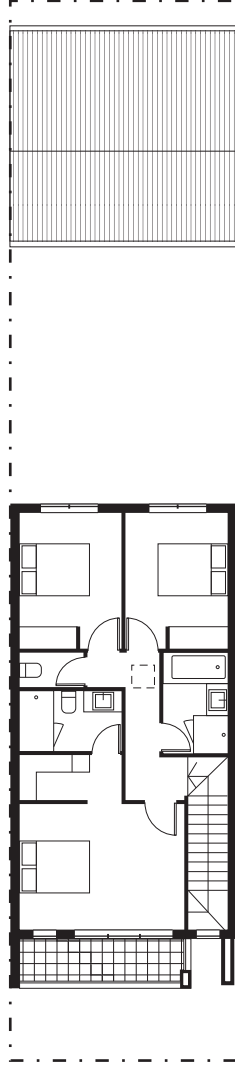
Site description: R60 single house

Area: 168m<sup>2</sup>

Frontage: 6m



Ground Floor Plan



First Floor Plan

## Comparison Base Plan

### Project Data

Dwelling type:	Single house (terrace)
Building height: (storeys)	Two storey
Site cover:	66%
Primary garden area:	41.5m <sup>2</sup>
Soft landscaping:	19%
Trees:	1
Parking:	Double garage (rear loaded)

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

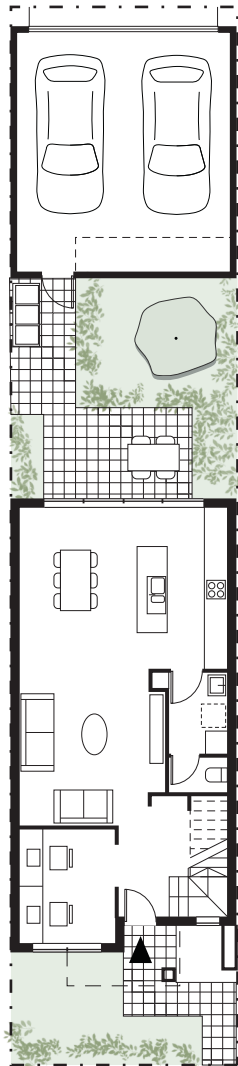
### Construction costs

GFA:	169m <sup>2</sup>
Total build cost:	\$321,200
Cost / m <sup>2</sup>	\$1,903

*as costed by quantity surveyor (May 2022)*

# Costing & Feasibility

## CONCEPT 10A



Ground Floor Plan



First Floor Plan

### Project Data

Dwelling type:	Single House (Terrace)
Building height: (storeys)	Two storey
Site cover	65%
Primary garden area:	35m <sup>2</sup>
Soft landscaping	20%
Trees:	1
Parking:	Double garage (rear loaded)

### Product Mix

Dw. No.	Bdrm	Bath	Car
1	3	2	2

### Construction costs

GFA:	170m <sup>2</sup>
Total build cost:	\$324,915
Cost / m <sup>2</sup>	\$1,910

+\$7/m<sup>2</sup> from comparison base plan

as costed by quantity surveyor (May 2022)

### Costing summary

- slight increase in construction cost
- slight increase in internal floor area
- increase in external walls relative to floor area

### Feasibility summary

- considered viable in high and low land value areas
- market value on par with base plan
- minor differences between plans