

RESIDENTIAL DENSITY STUDY

The following examples of residential density have been prepared to demonstrate the variables that apply in development of both green-fields and brownfields sites.

Figures for density have been presented as 'nett', that is excluding road reserves, open spaces, riparian margins.

Therefore, for assessing water supply and wastewater servicing for larger developments where 'gross' density is required, the nett densities would be multiplied by the fraction of developable area, ie if nett density is assumed at 40 dwellings/ net hectare, and the road reserve area is 30% of the total area, and open space/ reserves/ riparians are 15%, the developable % is 55%.

Therefore the gross density is $40 \times 0.55 = 22$ dwellings per hectare. This would be a typical greenfields development figure for a large development.

For brownfields development, the public open spaces, reserves and riparian margins are typically excluded from the development area, as they already exist. For these areas, developable percentages could reach 70% of the overall area (assuming roading at 30%).

For the above example, 40 d/ nett hectare translates as 28 dwellings per gross hectare for 70% developable area.

The variables that are defined in the examples include:

Storey height

Typology type; Stand-alone, duplex, terrace, apartment

Rear-loaded or front-loaded access

Car parking: Garage (single, double or tandem), Carpad, surface group parking, basement parking.

Percentage building area coverage and impermeable area.

APARTMENTS - 370 DPH

EXAMPLE 1;
TERRACE HOUSE & APARTMENT ZONE
ASSEMBLY APARTMENTS, MELBOURNE
ARCHITECT: WOODS BAGOT

4 STOREY APARTMENTS:
1 & 2 bedroom apartments
SITE AREA: 3715m²

NUMBER OF UNITS: 138, 71 x 1B, 67 x 2B
NUMBER OF BEDROOMS- 205
GFA: APARTMENT & CORES 12,000m²
BASEMENT PARKING 7,400m²
SITE/ FLOOR AREA RATIO - 5.22

DWELLINGS PER HECTARE: 370
BEDROOMS PER HECTARE = 552
ASSUME 1.5 PERSONS PER BEDROOM = 828 PERSONS/ HECTARE

PARKING: 2 levels of basement parking, providing 136 car parks.

DISADVANTAGES:
2 levels of basement parking creates a large excavation at one end of site. As the site falls one level between streets, there is one basement level at the lower side of the site. The apartments are deep, but relatively narrow, so second bedrooms have reduced external wall area

ADVANTAGES
4 cores of lifts and stairs allows about 34 apartments for each lift. A very dense development for four stories of apartments. The 3 & 6m 'gaps' through the development work surprisingly well as walkways and landscaped areas. Overlooking across these gaps is minimised by solid walls, angled windows and high level bedroom windows. Roof terraces within a strong roofscape offer additional outdoor living areas for each block.



Elevation - Capel Street



Elevation - Queensberry Street

APARTMENTS - 300 DPH

EXAMPLE 4:

TERRACE HOUSE & APARTMENT ZONE
4 STOREY APARTMENT WITH BASEMENT CAR-
PARKING

SITE AREA: 2572m2 (Gross)

NUMBER OF UNITS: 77

1 bedroom apts- 52m² to 68m²

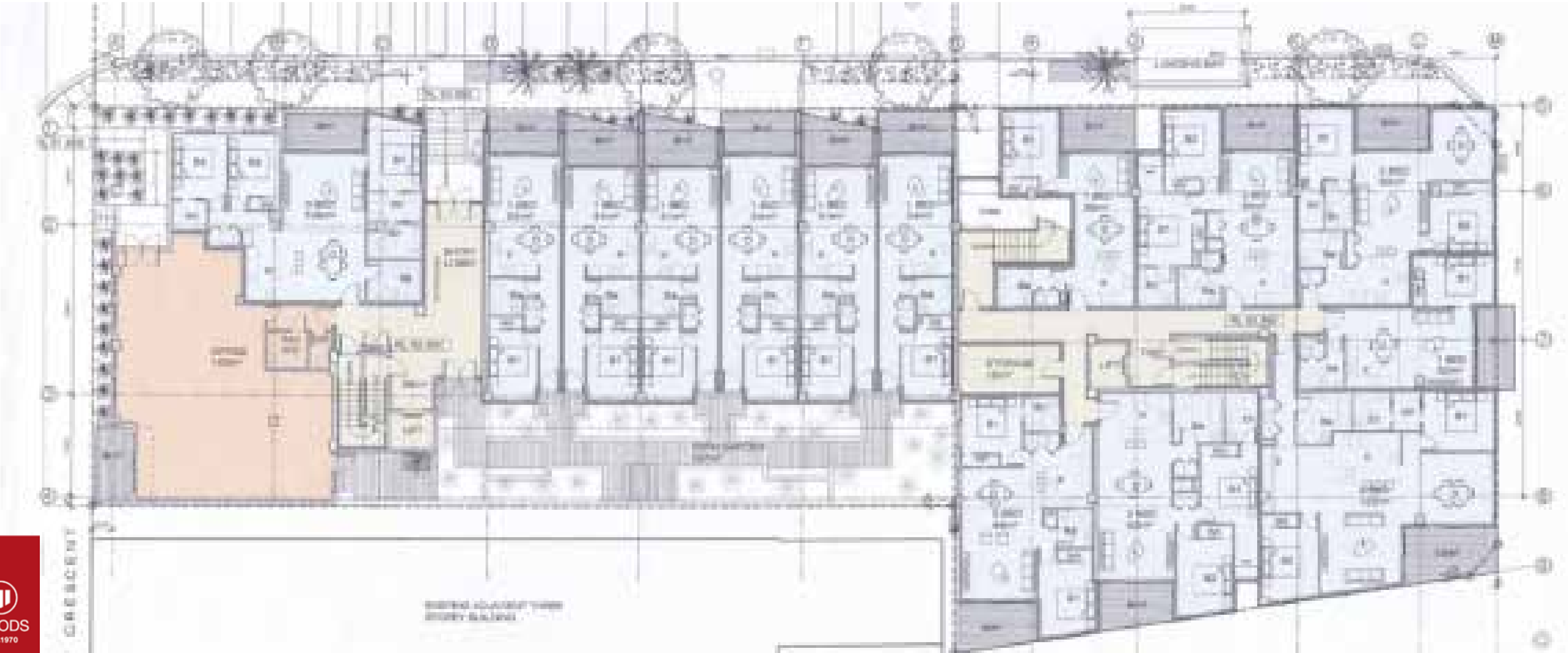
2 bedroom apts- 78m² to 123m²

3 bedroom apts- 109m² to 163m².

NET DENSITY 300 DWELLINGS/HA

REQUIRES 16m HEIGHT LIMIT

PARKING: 2 levels of basement parking, 1 space for
1 bed, 2 for 2 & 3 bed, plus visitor & for commercial
tenancies. 153 car parks provided



APARTMENTS - 211 DPH

EXAMPLE 5:

TERRACE HOUSE & APARTMENT ZONE
4 STOREY SINGLE-ASPECT APARTMENTS:
2 & 3 bedroom apartments
OVERALL BLOCK AREA: 15,122m²

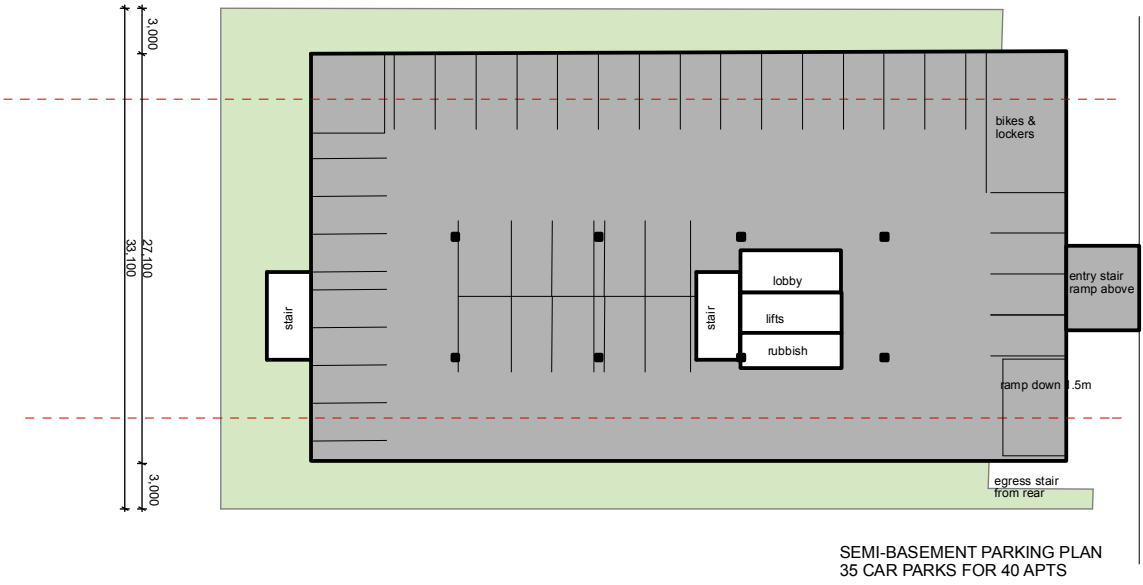
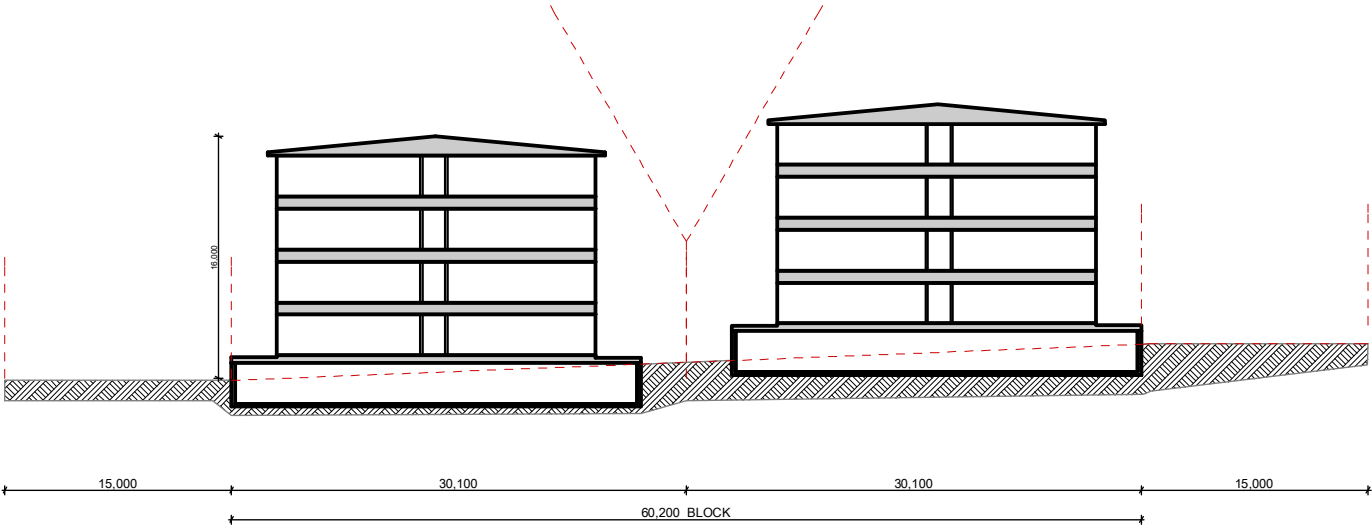
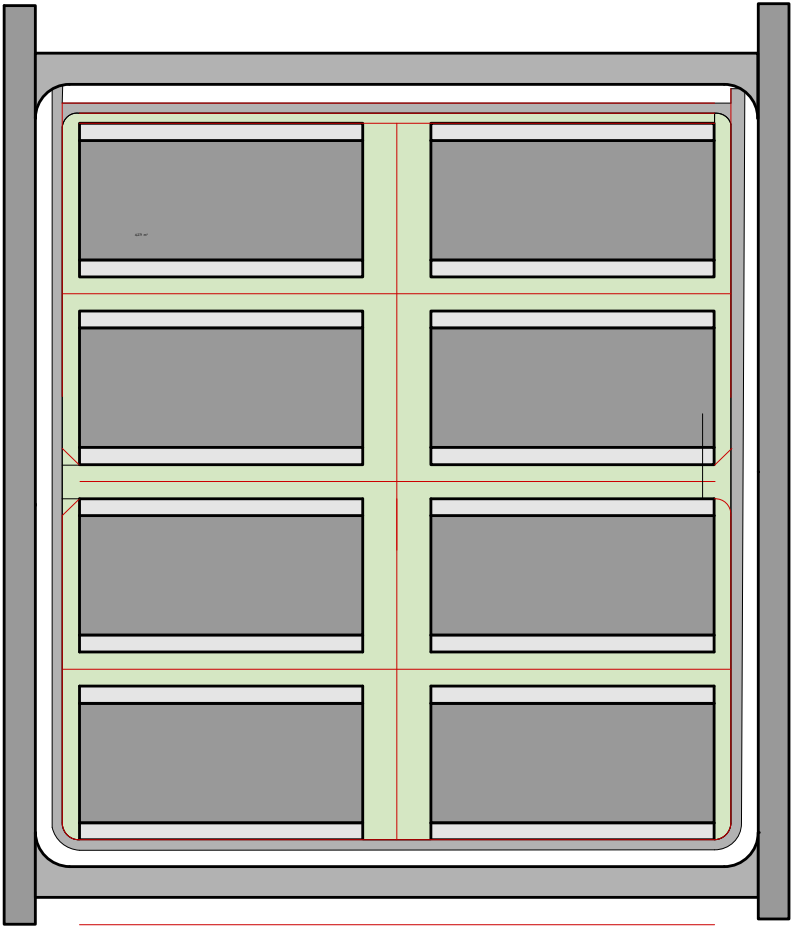
NUMBER OF UNITS: 320, note substituting 2 x 2-bedroom apartments for 3 x one-bedroom apartments will increase yield.
GFA: 5759m² including basement

DWELLINGS PER HECTARE: 211
BEDROOMS PER HECTARE = 422

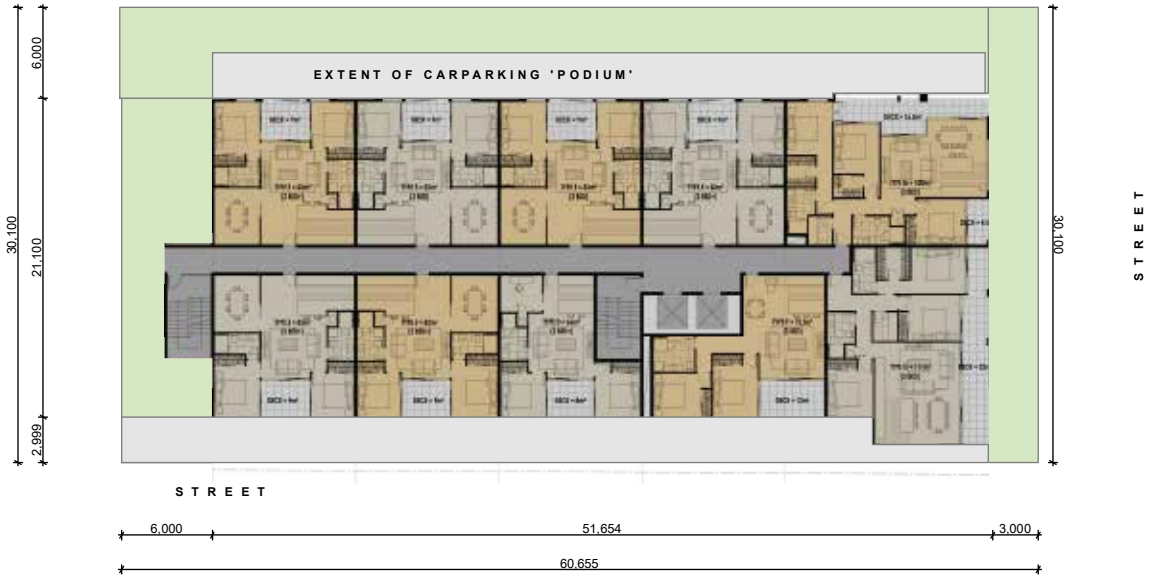
1 LEVEL OF BASEMENT CARPARKING - 35 SPACES PER BLOCK FOR 40 APARTMENTS
280 SPACES FOR 320 APARTMENTS

DISADVANTAGES:
Basement parking extends beyond apartment line above. 14% of units don't have carparks.

ADVANTAGES
12m between apartments/ decks, 17m between living room glazing faces.
Avoids surface parking and has reasonable level of landscaping. 8m plus 60° HIRB allows relatively close distances between buildings.



SEMI-BASEMENT PARKING PLAN
35 CAR PARKS FOR 40 APTS



APARTMENTS - 172 DPH

EXAMPLE 6:
TERRACE HOUSE & APARTMENT ZONE
5 & 6 STOREY SINGLE-ASPECT APARTMENTS
WITH EXTERNAL BREEZE-WAY ACCESS & SURFACE PARKING
1 & 2bedroom apartments
OVERALL BLOCK AREA: 5,000m²

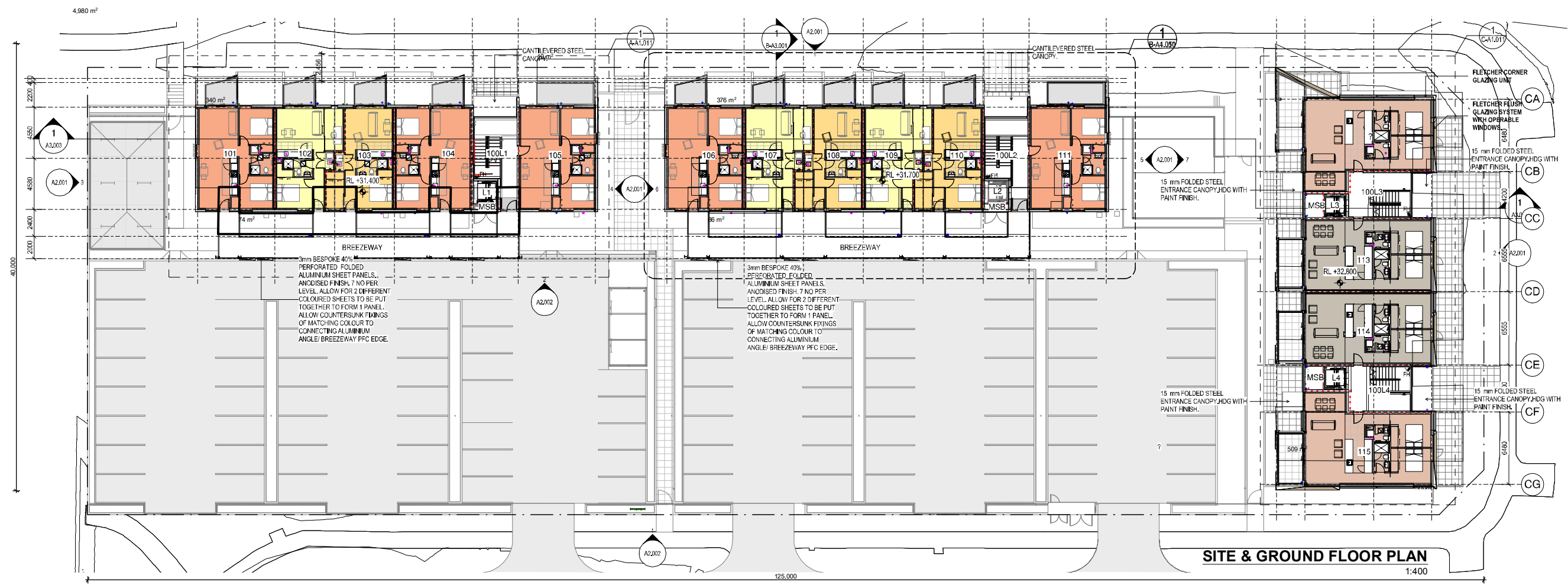
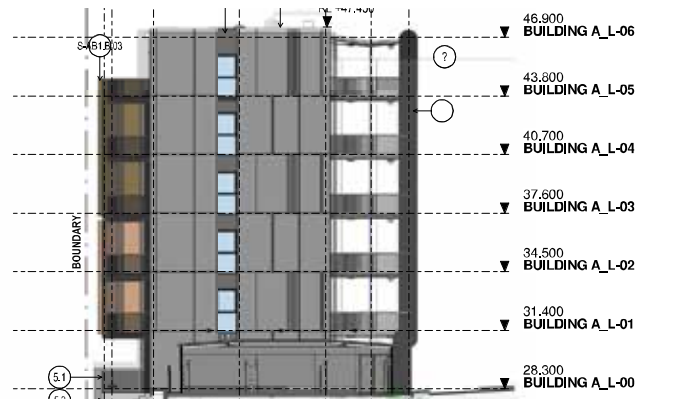
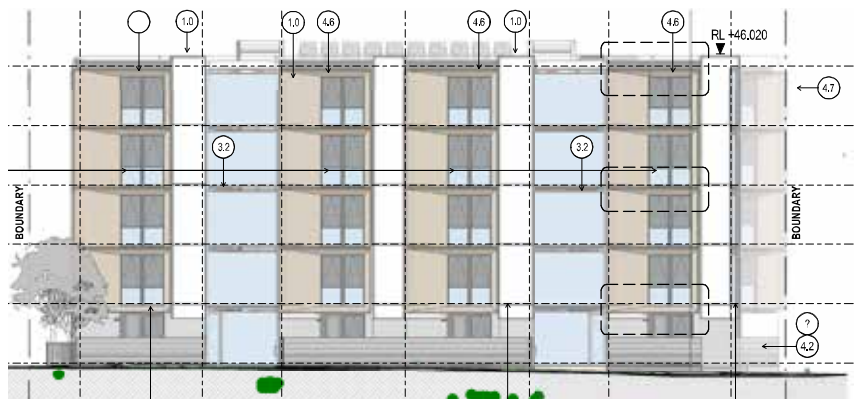
NUMBER OF UNITS: 86, 50 2-bedroom (58%)& 36 1-bedroom (42%)
GFA: 6965m² including decks & breezeways

DWELLINGS PER HECTARE: 172
BEDROOMS PER HECTARE = 272

SURFACE PARKING
86 SPACES FOR 86 APARTMENTS, NO VISITOR PARKING

DISADVANTAGES:
Although low figure for building coverage, very high % of surface parking.
77.8% impermeable area, 22.2% landscaping.
Privacy issues from walkways looking into bedrooms.
Small unit sizes- 67 sq.m two bedroom units, 50 sq.m one bedroom units.

ADVANTAGES
Apartments have glazing both sides, so natural through ventilation. Central enclosed walkways avoided, external walkways serve no more than 6 units per floor.



APARTMENTS - 127 DPH

EXAMPLE 6:
TERRACE HOUSE AND APARTMENT ZONE
4 STOREY APARTMENT WITH SURFACE CARPARKING

NET DENSITY 127 DWELLINGS/HA
(Ground floor retail provides parking and reduces yield figures).

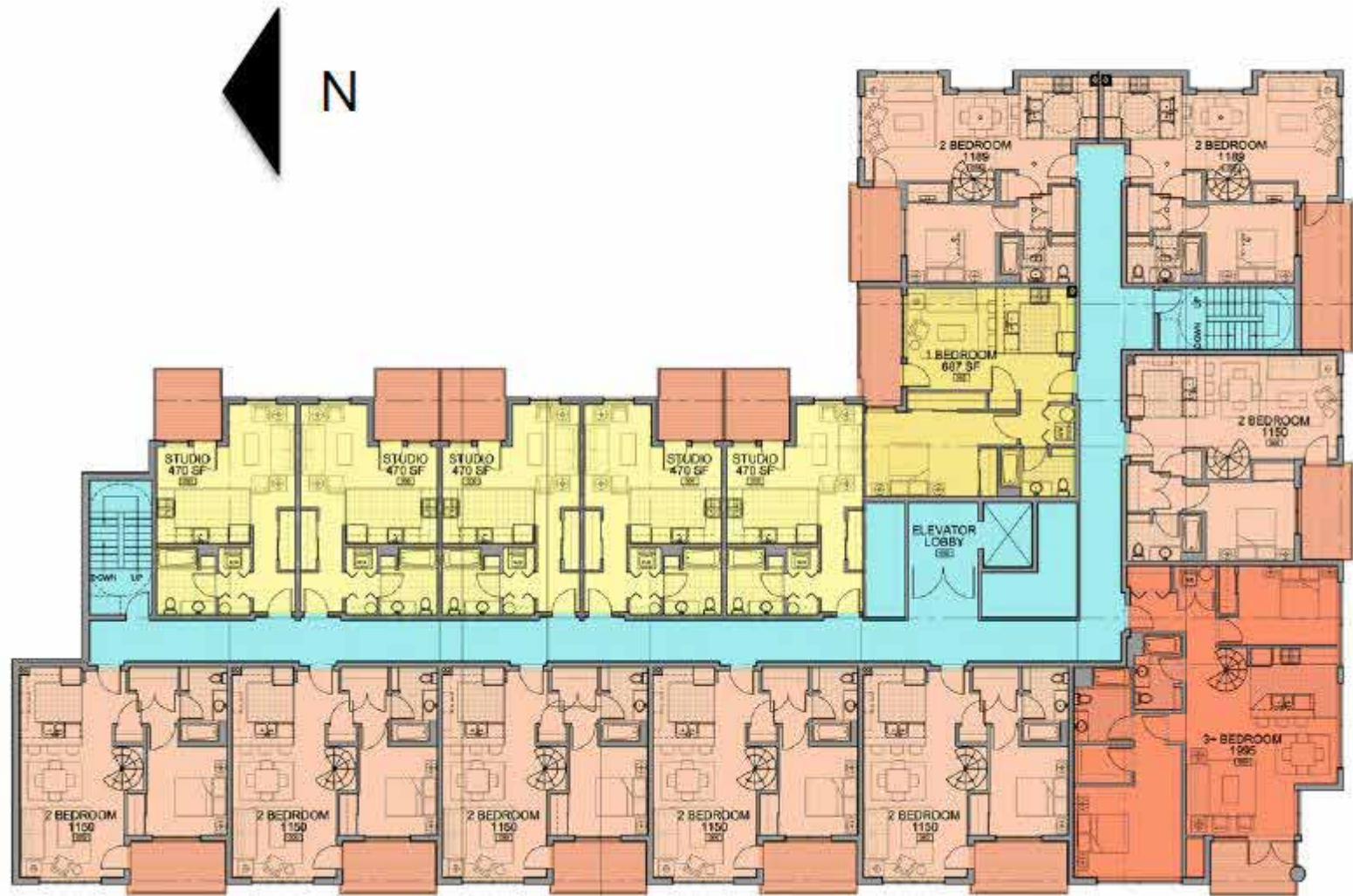
Requires 16m height limit



View of a rear of the building from the service lane providing access to NE 3rd Street.



View of the building from the corner of NE 3rd Street and NE Hood Ave, Gresham



APARTMENTS - 130 DPH

EXAMPLE 7;

TERRAE HOUSE & APARTMENT ZONE
3-5 STOREY APARTMENT COMPLEX INCLUDING:

- 3 BUILDINGS WITH GROUND LEVEL RETAIL + 3 STOREYS OF RESIDENTIAL APARTMENTS
- 1 BUILDING WITH 3.5 STOREY APARTMENTS

SITE AREA: 4620m2

NUMBER OF UNITS: 60
GFA: 1000M2

DWELLINGS PER HECTARE: 130 (THIS COULD BE MORE IF THERE WAS NOT GROUND FLOOR RETAIL ON HALF THE GROUND FLOOR).
BEDROOMS PER HECTARE = 260

AT GRADE CARPARKING - 70 SPACES (INCLUDING TANDEM)

DISADVANTAGES:
No Private or communal open space / garden. Visually dominant central parking area with inconvenient tandem parking.



APARTMENTS - 122 DPH

EXAMPLE 8;

MIXED HOUSING URBAN ZONE
3 STOREY WALK-UP APARTMENTS:
1 & 2 bedroom apartments
SITE AREA: 1612M2

NUMBER OF UNITS: 19, 4 x 1B, 15 x 2B
GFA: 2141m² including decks

DWELLINGS PER HECTARE: 122
BEDROOMS PER HECTARE = 210

AT GRADE CARPARKING - 23 SPACES, 19 RESIDENTS- 4 VISITOR OR
SECOND CARPARK

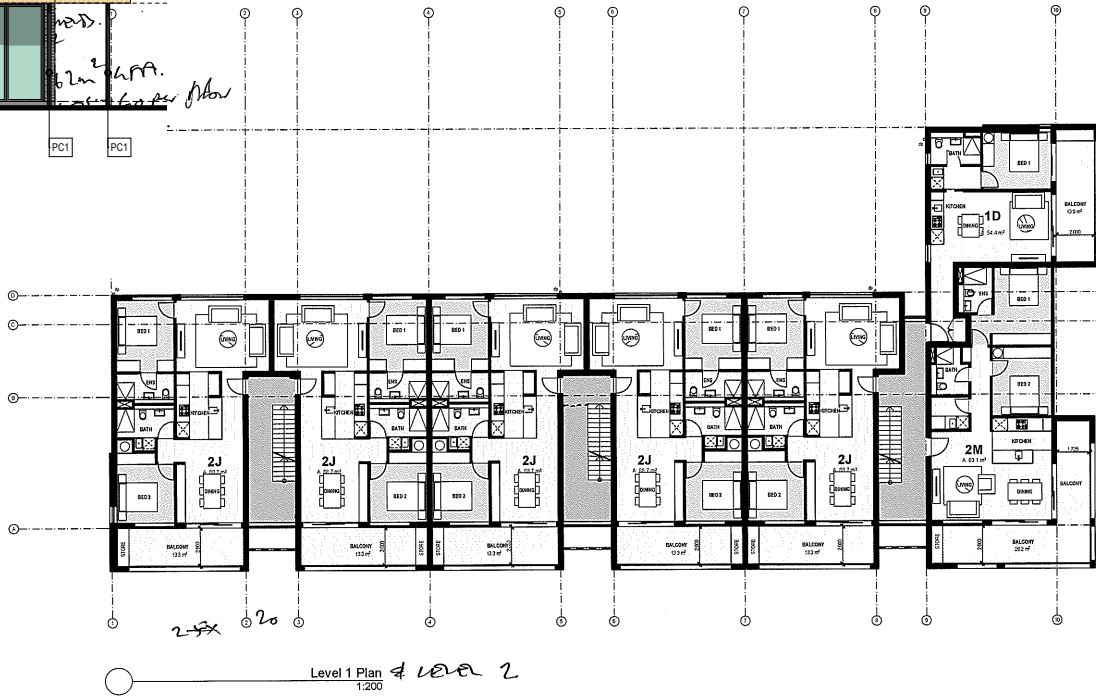
DISADVANTAGES:
As the design avoids basement parking, surface parking is maximised, and this dominates the internal court, with first floor apartments overhanging the carparking.
Impermeable area = 85%, so only 15% landscaping.
Ground floor apartments have solid walls facing the carparking, with open space facing the street.
ADVANTAGES
The most dense 3-storey walk-up model, and can still hide parking behind buildings. Avoids lifts, and 3 stairs serves all units.



SITE & GROUND FLOOR PLAN 1:400



STREET ELEVATION



LEVEL 2 & 3 FLOOR PLAN 1:400

EXAMPLE 9;

MIXED HOUSING URBAN ZONE

3-STOREY WALK-UP APARTMENTS COMPLEX INCLUDING:

- 4 BUILDINGS WITH 3 STOREYS OF RESIDENTIAL APARTMENTS

SITE AREA: 2908m²

NUMBER OF UNITS: 24

GFA: 1800 sq.m plus STAIRWELLS & LOBBIES

DWELLINGS PER HECTARE: 82

164 BEDROOMS/ HECTARE

Provides remote group parking
High-quality landscaped grounds, low impermeable coverage %



**PRELIMINARY DESIGN
CONCEPT: 3 STOREY WALK-UP
APARTMENTS
UNITARY PLAN**

Site Description
The 2,908m² site has a relatively square shape with its west boundary on Dominion Road, south of the South Western Motorway. The north boundary abuts the off ramp from the motorway. The south boundary abuts existing residential detached housing and the east boundary abuts the Akarana Golf Club.
Mt. Roskill reserve is located on the west side of Dominion Road, and until taking this reserve into consideration, although this reserve is across the road where Dominion Road becomes the town side.

Proposed Unitary Plan Zone: Mixed Housing Urban
Site Area: 2,908m²

Details: There is no density control for this site.

Site Layout: As there has been a substantial amount of fill placed on the site, the high point would be located off and on a roadway and parking area located at the south boundary, with existing units to avoid proposed buildings adjacent to existing houses at a lower level. The parking area proposes 1 car park per unit.
The proposed 3-storey building comprises 2 x 2 bedroom apartments per floor, with a central stair and entry. The 4 blocks thus have 8 apartments each, giving a total of 32 apartments or approx. 50 sqm each.

Height: 10m/11m plus allow for 4m sloping roof height, which is 3 stories. The design is 3 stories.

Private Open Space: The unitary design complies with providing the minimum 50 square metres, with a 4 metre minimum dimension, to the site ground floor units. All upper floor units have a minimum open area of 5 square metres.

Outlook: All units comply with the 4m x 4m outlook from primary living areas, and 3m x 3m outlook areas from first floor bedrooms (primary bedrooms).

Building coverage: The scheme complies with 20% maximum allowable building coverage (20% building coverage) over the whole site.

Impermeable coverage: The scheme complies with a contained building impermeable coverage of 50%, dependent on the amount of outdoor paving to the units. Currently the scheme shows 20% impermeable area and 20% building coverage - a total of 40%.

The scheme includes traffic engineering assessment, relating to traffic generation and vehicle parking. The scheme generates 8 vehicle parking, and usually 4 car parks must be provided. There is limited parking available on Dominion Road due to the intersection, off-ramp and a bus-stop.

3 STOREY TERRACES - 71 DPH

Internal configurations

Figure 12: Example of an internal layout plan



Source: Wellington City Council.

Site context and layout

Figure 3: Site plan



Copyright: Boffa Miskell.
— The Altair.

EXAMPLE 10;
MIXED HOUSING URBAN

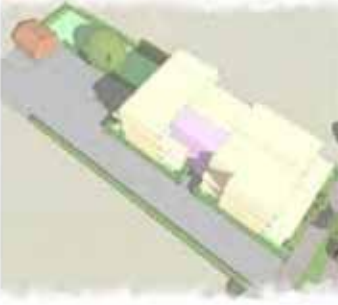
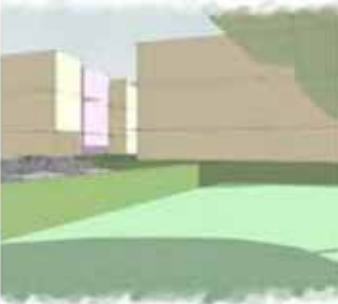
SITE AREA: 10,000M2, (100m x 100m)

NUMBER OF UNITS: 71

DWELLINGS PER HECTARE: 71
213 BEDROOMS/ HECTARE
ASSUME 1.5 PERSONS/ BEDROOM = 320 PERSONS/HECTARE
Average unit size : 142 sq.m

PARKING: 11 units with lock-up garages- 2 car spaces/ unit
58 units with lockup garages- 1 car/ space per unit
2 units with 1 car space
13 visitor parking spaces (1 per 5.46 units)





what can this offer as a place to live?

- Apartment living in a small building rather than a large complex.
- A choice of unit sizes, all with well proportioned private outdoor space.
- Outlook to the street or over the rear garden from main living areas.
- Bedrooms and other private areas are located to protect privacy.
- Orientation for sunlight access to all living rooms.
- Potentially low maintenance costs, with no lifts and large communal areas.
- A well-formed communal garden area at the rear of the site.

what can this do for our city?

- A model for apartments which does not require expensive lifts.
- Apartments at a scale which could fit into existing neighbourhoods.
- Creates a positive street frontage, with good overlooking of the street.
- Rear parking does not dominate the site, and supports good street frontage.

success factors

- Limit the building to three storeys to avoid needing a lift.
- Location of the stairs and arrangement of adjacent individual units should allow the living spaces of apartments to face the sun.
- The stairs and landings should be fully internal to create a quality environment in the approach to people's homes.
- The building form should be articulated to provide access to sunlight for units on the potentially shady side of the building.
- Generous main balconies should overlook the street and communal garden and should be provided with shutters or screens to enable uses to modify privacy and avoid inappropriate overlooking of neighbours.
- Use of finishes and planting in the driveway between the street and the stair entrance must be high quality, and ensure that drivers move slowly.
- Bins and cycle storage should be located in a fully enclosed service building, near the drive but away from the apartments.
- All apartments should have generous internal storage spaces.



alternative layout option

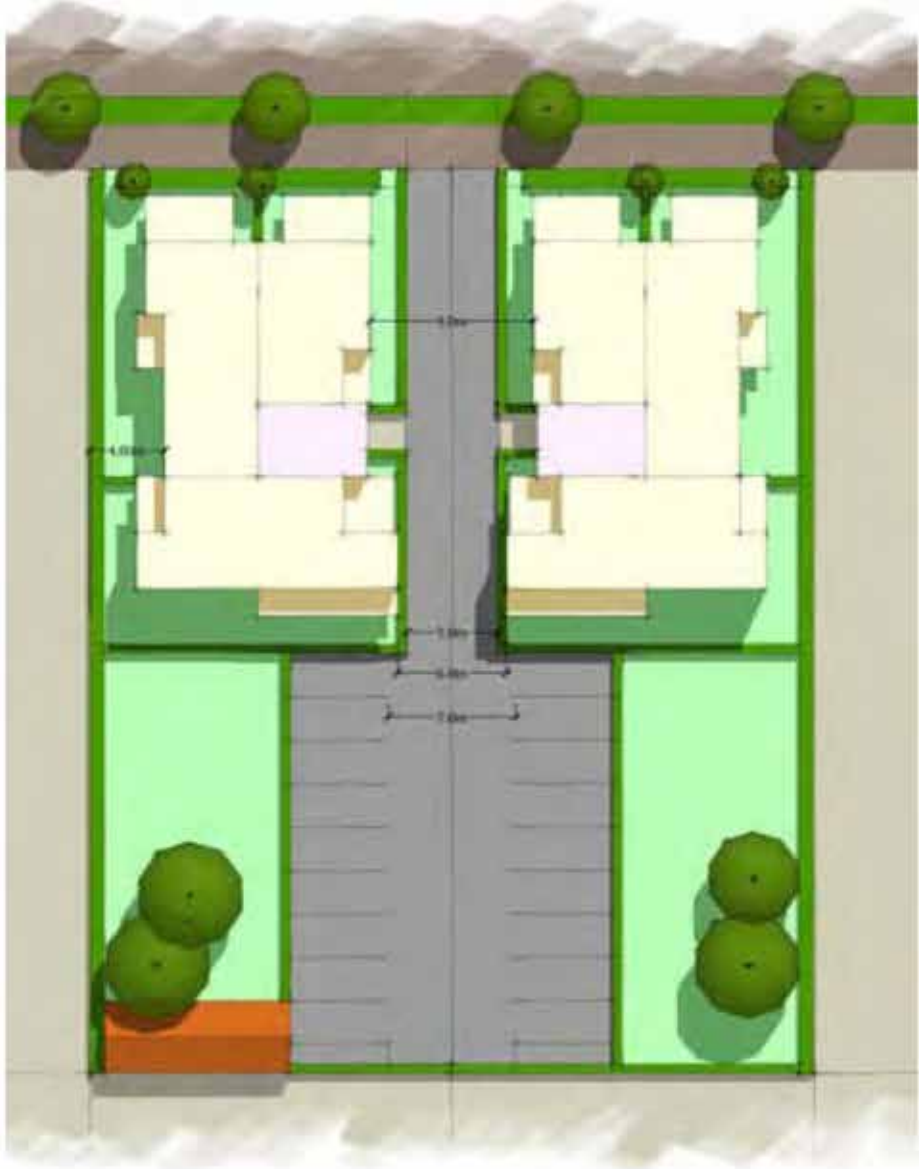
The view on the left shows an alternative layout, requiring only one section. This demonstrates that the same typology can be used in situations where two sections cannot be assembled for development. However, it should be noted that the inefficient use of space for the driveway will necessitate less efficient and attractive internal layouts within the building. In more central areas it may be possible to reduce the amount of parking provided, or to locate the parking in a semi-basement to release more space for the building on the site.

outlook

On a standard mid-block site three apartments on a floor is the limit for achieving good outlook. Orientate living areas towards the street and rear garden for good outlook, and to encourage positive interaction between public and private areas.

sunlight access

Articulating the building form with steps and recesses, especially along the side elevations, can enable sunlight access to units which are otherwise on the shady side. These forms can also enhance privacy, avoiding living spaces that look into adjacent bedrooms.



illustrated example

This typology relies on creating an attractive entrance space between the buildings. The relationship to neighbouring properties should be assessed carefully, and the layout of elevations and rooms along the outer sides of the building adjusted to suit.

L4 district plan zone 72 households per hectare

Site: two sections 20 x 50m
18 homes, six 1-bedroom and twelve 2-bedroom: 0.74 Floor Area Ratio
1-bedroom apartments: 55m² + 1 outside car park
2-bedroom apartments: 80m² + 1 outside car park
Communal stairs and external bin store building

EXAMPLE 11;
MIXED HOUSING URBAN
3 STOREY WALK-UP APARTMENT COMPLEX INCLUDING:

- 2 BUILDINGS 3 STOREYS OF RESIDENTIAL APARTMENTS
- Six one-bedroom @ 55m² & 12 2-bedroom @ 70

SITE AREA: 2000M2

NUMBER OF UNITS: 18
GFA: 1300M2

DWELLINGS PER HECTARE: 72
150 BEDROOMS/ HECTARE

AT GRADE CARPARKING AT REAR - TAKES 25% OF SITE

DISADVANTAGES: No private outdoor space, no lifts (but saves capital cost).

ATTACHED HOUSES - 57 DPH

EXAMPLE 12;
MIXED HOUSING URBAN
TERRACE HOUSES - REAR ACCESSED

SITE AREA, EXCLUDING INTERNAL VESTED ROAD, INCLUDING PRIVATE
ROADS AND POCKET PARK: 16,457m²

NUMBER OF UNITS: 95
2,3 & 4 BEDROOM UNITS.
19 UNITS @ 2 STOREY, 76 UNITS @ 3 STOREY
NET DENSITY , INCLUDING REAR LANES, POCKET PARK:
57.6 DWELLINGS/HECTARE
177 BEDROOMS/ HECTARE (DUE TO HIGHER NUMBER OF 3 & 4 BEDROOM
UNITS).
ASSUME 1.5 PERSONS PER BEDROOM= 265 PERSONS/ HECTARE

DISADVANTAGES: 3 STOREY UNITS HAVE LIVING ON FIRST FLOOR WITH ONE
BEDROOM & BATHROOM

4 BRM UNITS HAVE 2 BEDROOMS ON GROUND FLOOR WITH BALANCE OF
BEDROOMS ON THIRD LEVEL.



HOBSONVILLE DEVELOPMENT
AERIAL VIEW FROM CORNER OF MEMORIAL PARK LANE AND MOTORWAY BOUNDARY

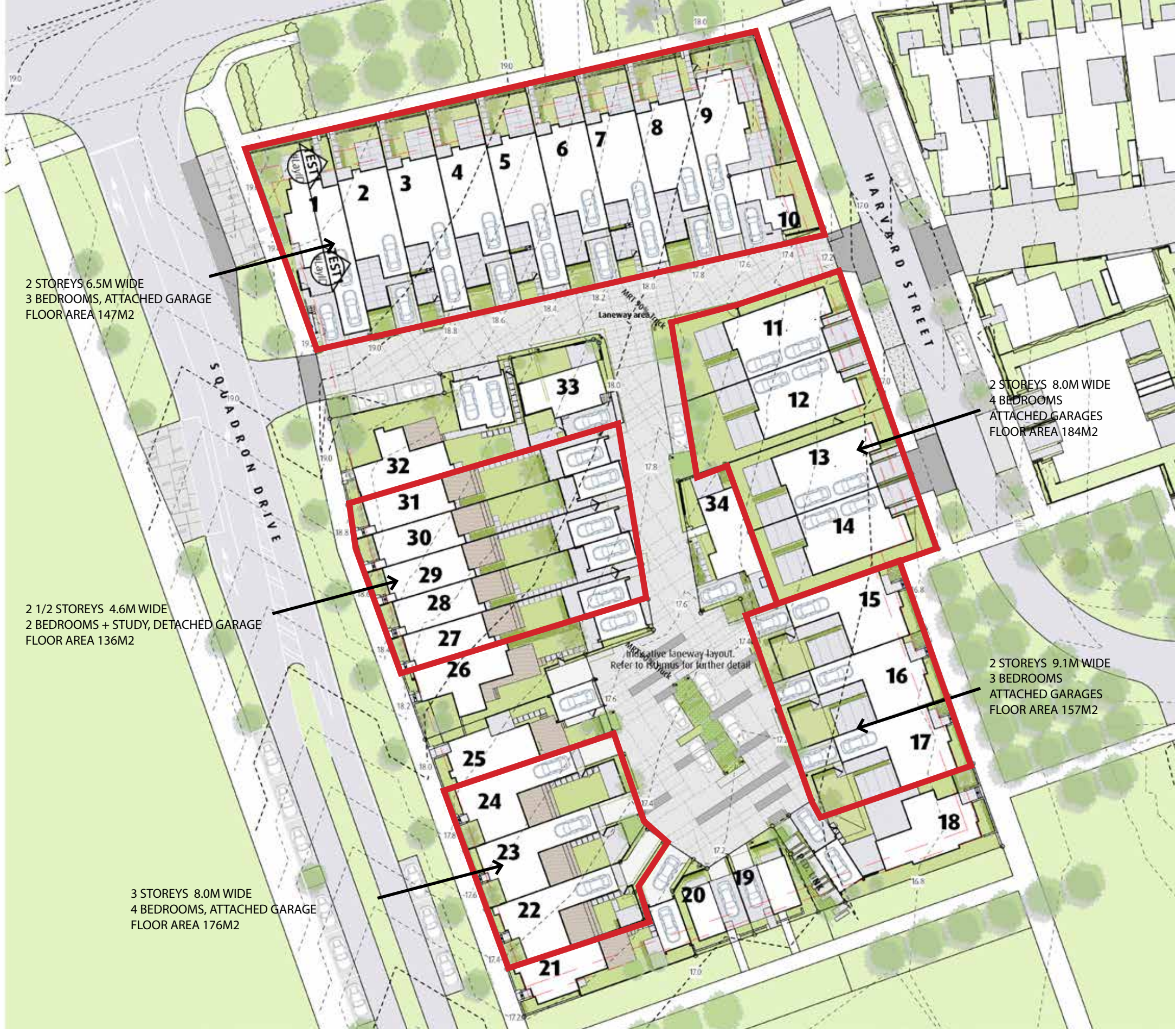


ATTACHED HOUSES - 45 DPH

EXAMPLE 13;
MIXED HOUSING URBAN
COMBINED TERRACE HOUSES AND DUPLEX HOUSES, 2 & 3 STOREY -
REAR ACCESSED

SITE AREA: 7530M2
NUMBER OF UNITS: 34
AVERAGE NET LOT AREA: 180m²
MIXTURE OF 1B SINGLE STOREY UP TO 3 -STOREY 4B UNITS.
13 UNITS @ 3 STOREY, 19 @ 2 STOREY, 2 @ SINGLE STOREY
NET DENSITY , INCLUDING REAR LANES:45 DWELLINGS/HA
133 BEDROOMS/ HECTARE

ADVANTAGES: DIVERSITY OF TYPOLOGY, STOREY HEIGHTS AND
MATERIAL. GARAGING GENERALLY CONFINED TO LANE, PROVIDING
CONTINUOUS STREET FACADES.



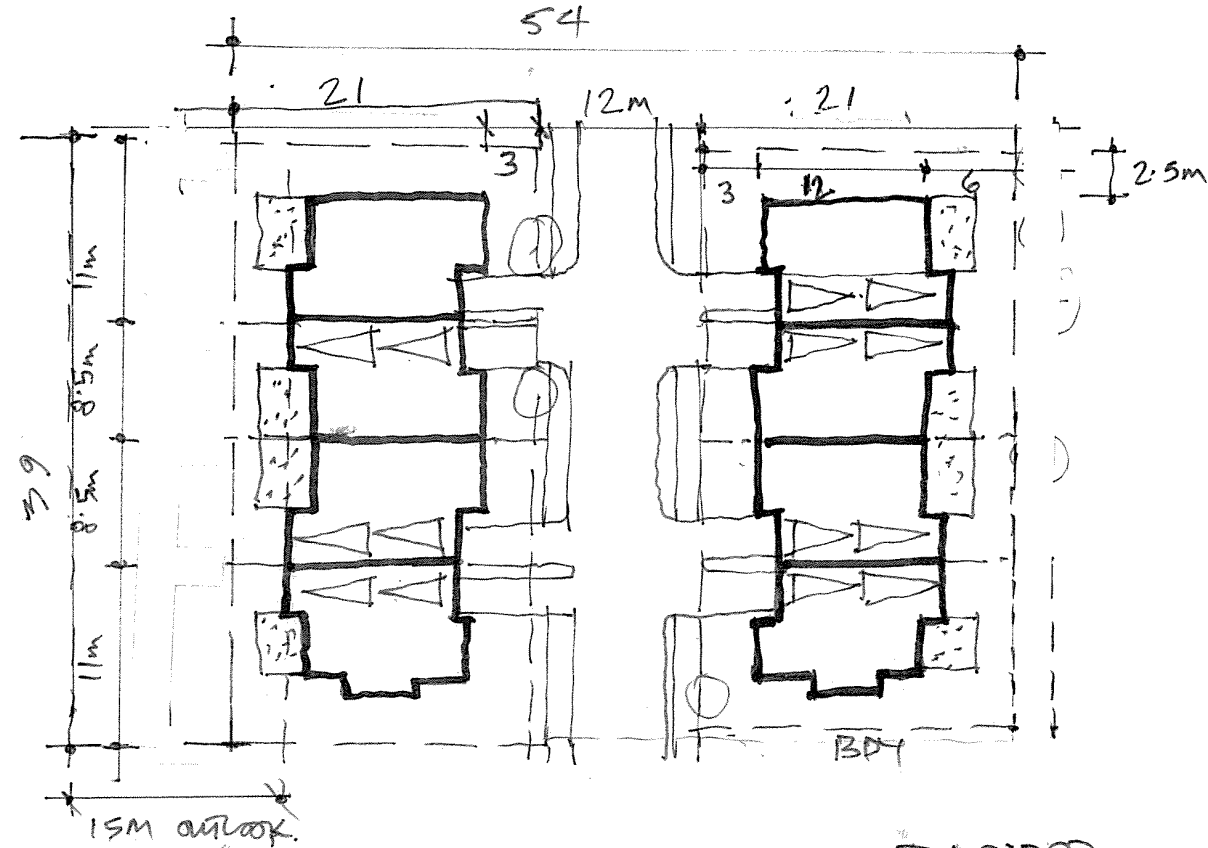
ATTACHED HOUSES - 38 -41DPH

EXAMPLE 14;
MIXED HOUSING SUBURBAN
TERRACE HOUSES - REAR ACCESSED

SITE AREA: 2100m²
NUMBER OF UNITS: 8
MIDDLE LOT AREA: 188m²

4 BEDROOM TERRACES WITH ATTACHED
GARAGING

NET DENSITY 38 DWELLINGS/ NET HA
CAN INCREASE TO 41 WITH 8m MIDDLE LOT
WIDTHS & 10m END LOTS



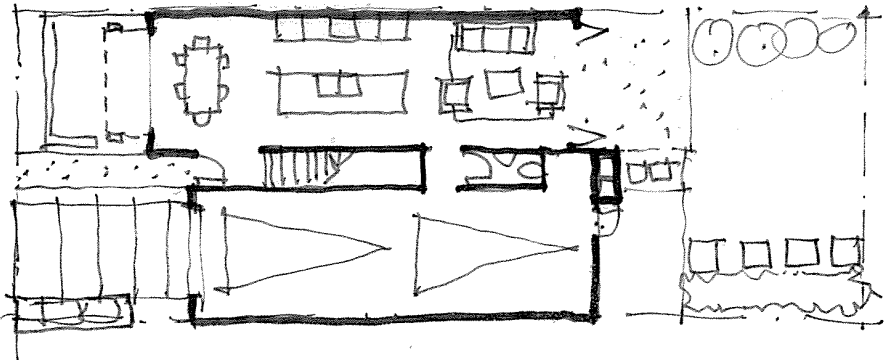
SITE PLAN

- FRONT LOADED
TERRACES.

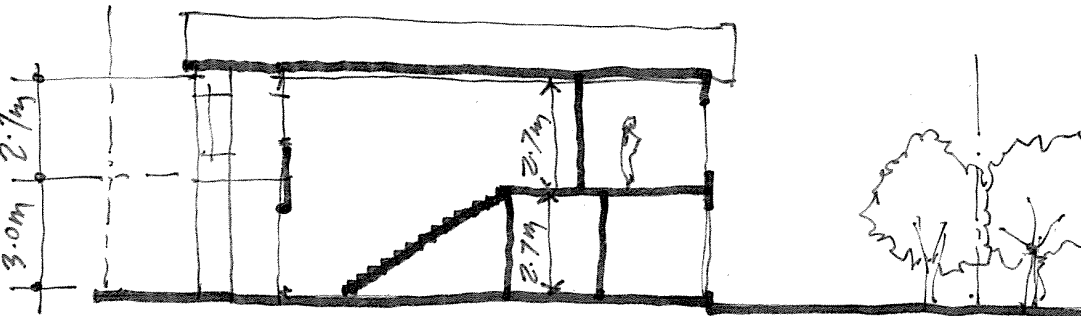


FIRST FLOOR PLAN

GROUND LIVING	57.6
GARAGE	39.0
FIRST FLOOR	97
	<u>193 m²</u>



GROUND FLOOR PLAN



CROSS SECTION



STREET ELEVATION

DETACHED HOUSES - 35 DPH

EXAMPLE 15
MIXED HOUSING SUBURBAN
STAND-ALONE HOUSES

SITE AREA: 8,688m²
NUMBER OF UNITS: 31
5 X 2B, 10 X 4B, 16 X 3B
LOT AREA RANGE: 250-320m²

NET DENSITY: 35 DWELLINGS/ NET HA
113 BEDROOMS/ HECTARE.



1. SITE STUDY Scale: 1:1000