

Engineering Assessment

Project Name:	Kingseat Village
Client:	Kingseat Village Limited
CP Project No:	2217
CP Document No:	ER01v1 - Final
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Reviewer:	Mat Richards – CBD Engineering Manager

1. Introduction

This engineering assessment report has been prepared to support fast track referral application for the proposed Kingseat Village development. The Kingseat Village development is proposed to include approximately 1,900 - 2,300 dwellings. Ranging in density from Large Lot Residential (approximately 560 dwellings), Standard Residential (approximately 1,120 dwellings) to Medium Density Residential (approximately 140 dwellings). For the purpose of this assessment, we have assumed approximately 2,120 dwellings with 300 within the Retirement Village.

The overall purpose of this report is to outline the engineering aspects of the development and how effects will be managed.

Adherence to the Auckland Council Unitary Plan, Precinct specific rules, Technical Publications and Guidance Documents as relevant to sediment and erosion control, stormwater management and wastewater management has been undertaken in the preliminary engineering assessment.

2. Site Description

The subject site is made up of multiple parcels of land, these are listed in the table below and will be referred to as 'site' further in this assessment:

Address	Legal Description	Reference Title	Ownership	Area (ha)
956 Linwood Rd	Lot 2 DP 337090	151786	Karaka Centre Limited	215.6400
996 Linwood Rd	Lot 2 DP 441714	550213	Karaka Centre Limited	5.2430
1012 Linwood Rd	Lot 1 DP 500236	744109	Karaka Lakeview Limited	13.9100
1016A Linwood Rd	Lot 1 DP 537875	895783	Kingseat Village Limited	31.3840
1016B Linwood Rd	Lot 3 DP 400117	895785	Kingseat Village Limited	25.0000
1023 Linwood Rd	Lot 1 DP 417814	468657	Kingseat Village Limited	2.0000
1030 Linwood Rd	Lot 2 DP 537875	895784	Kingseat Village Limited	2.6208
1039 Linwood Rd	Sect 2 SO 544696	998294	Kingseat Village Limited	3.5756
			Total	299.3734

The masterplan will be developed in two Stages. Stage 2 comprises 956 and 996 Linwood Road (220.883ha) with the remainder of the parcels above in Stage 1 (78.4904ha).

Stage 1 includes land within the AUP Kingseat Precinct which is zoned Residential – Single House Zone, Residential – Mixed Housing Suburban Zone, Business - Local Centre Zone and Open Space – Sport and Active Recreation Zone.

Stage 2 includes the land that is immediately to the east of the Kingseat Precinct and is zoned as Rural – Mixed Rural Zone.

The parcel at 956 Linwood Rd is primarily an arable farm and the remainder of the land making up the site is in pasture and used for farming activities. There are a number of existing dwellings, sheds and buildings associated with the current land use. To the west of the site there are groupings of existing residential lots ranging in size from 500m² to 2500m², along with larger lot lifestyle blocks. Southeast of the site is a communal living property at 60/833 Kingseat Road. Properties to the south, east and north are a mixture of lifestyle blocks and larger farm blocks.

Te Hiji creek flows from south to north through the site with all of stage 2 and approximately half of stage 1 falling within the Te Hiji Creek catchment, the remainder of stage 1 falling to the Whatapaka Creek located to the west of the site.

Overall, the site is characterised as flat to rolling terrain with a number of perennial and ephemeral streams across the site.

3. Project Description

The overall project seeks to provide a residential community across the site including land within the Kingseat Precinct and the adjoining farm at 956 & 966 Linwood Road. Local and neighbourhood centres will be positioned to best service the community, a 300 dwelling retirement village is to be incorporated into stage 1 of the master planned community. Land within the Kingseat Precinct village has already been set aside for a new Kingseat school and local sports park.

Works to facilitate the above, include earthworks, widening and urbanisation of Linwood Road corridor, internal roading network with pedestrian and cycling facilities and associated service infrastructure.

The residential component of the community is approximately 1,900 – 2,300 dwellings. Ranging in density from Large Lots Residential (approximately 560 dwellings), Standard Residential (approximately 1,120 dwellings) to Medium Density Residential (approximately 140 dwellings). For the purpose of this assessment, we have assumed approximately 2,120 dwellings with 300 within the Retirement Village.

The overall Kingseat Precinct, which includes Stage 1 of the site has been estimated to yield 1842 dwellings, being the basis for a recently approved wastewater discharge consent catering for the Kingseat Precinct.

4. Earthworks

Bulk earthworks across the site would be staged and would form topography suitable for building platforms, roading networks, Stormwater management devices and overland flowpaths where required.

The extent and volume of earthworks is unknown at this stage and will be contingent on the final make up of lot typologies and locations.

4.1.1 Geotechnical

All final ground slopes will be geotechnically stable, typically no steeper than 1in3. All slopes / Retaining walls / geotechnical parameters will be assessed by a geotechnical engineer and designed in accordance with their recommendations.

4.1.2 Sediment and Erosion Control

A number of erosion and sediment control measures will be implemented for the duration of the site works to generally accord with the Auckland Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region Guideline Document 2016/005 (GD05). The proposed measures include:

- A stabilised construction entrances.
- Clean water diversion bunds will intercept and direct clean water away from the proposed works area (sized in accordance with GD05).
- Silt fences, runoff diversion channels and topsoil diversion bunds will control sediment runoff.
- Sediment retention ponds with rainfall driven chemical treatment to reduce the suspended sediments, these will treat runoff from the majority of the earth-worked area. The treated water will discharge into existing drainage features on the site that will remain undisturbed.
- If required, chemically treated decanting earth bunds will be used to treat any earth-worked areas that cannot be directed to the main silt pond. The decanting earth bunds will be sized in accordance with GD05, being 3% volume with 10% forebays and a cloth lined forebay spreader bar, with floc treatment.
- All measures will continue to treat water and remain in place for the duration of the works until the catchment is fully stabilised.

- Clean water diversions and silt fences will be constructed around stockpiled materials.

All erosion and sediment controls will be constructed prior to any bulk earthworks commencing. Sediment and Erosion Control monitoring will be undertaken by the contractor's project supervisor, the site Engineer and Council representative. Sediment and Erosion Control monitoring will be undertaken on a weekly basis with increased monitoring during times of heavy rainfall. Visual checks will be conducted to ensure the quality of water in the receiving environment(s) is not compromised.

4.1.3 Wind Erosion and Dust Monitoring

If earthworks are undertaken during dry periods there may be the potential for dust generation and erosion by wind from un-stabilised site areas. Accordingly, it is proposed to implement measures to control wind erosion and to minimise the spread of airborne dust, and any nuisance created by it through construction management plans to be prepared by the contractor for the works.

5. Stormwater

The subject site is located within existing residential and rural zoning in Kingseat. There are no existing stormwater management plans covering this portion of the catchment. The receiving environment for the subject site is the Manukau Harbour via the Whatapaka and Te Hihi Creeks located to the west and within the eastern side of the site respectively. There is no existing public stormwater network servicing the site.

The subject site is split into two stormwater catchments. The majority of the site drains east to the Te Hihi Creek with the remaining flowing west towards the Whatapaka Creek.

Extensive wetland redevelopment and restoration of Te Hihi Creek is proposed in eastern portion of the 956 Linwood Road. Historically parts of the land was a Coastal Marine Area (CMA) before a dam was constructed north of the site that reduced the area of CMA within the subject site. The outflow from the dam is controlled by a flood gate. Overtime the sediment on the Manukau Harbour side of the dam has built up to an elevation higher than the level of Te Hihi Creek.

Stormwater Management techniques for onsite management aligning with the Kingseat Precinct rules include;

- Treatment of all high contaminant-generating impervious areas (all roads, parking and accessways >50vpd) by a water quality device designed in accordance with GD01 for the relevant contaminants (except where roof water is captured for re-use, the roof water will not be required to be treated);
- Retention (volume reduction) of a minimum of 10mm rainfall event from all impervious areas 25m² of larger. Roof run-off to discharge to a tank for non-potable re-use; a planted infiltration trench; permeable paving, or a combination;
- Where discharge is not direct to the CMA, Detention (temporary storage) is to be used with a drain down period of 24 hours for the difference between the pre-development (grassed state) and post development runoff volumes from the 95th percentile, 24 hour rainfall event minus the retention volume from impervious areas;
- Piped network to cater for stormwater runoff associated with the development in a 10% AEP+cc event.

- Management/mitigation of 1% AEP+cc peak flow to match pre development flow rates.
- Overland flow paths to be via roads or well defined channels covered by easements where in private land.
- Design so that the pre development flow within each existing catchment is at least maintained and will not water short circuit the catchment.

The substantive application will detail how the above will be applied to the development to mitigate any effects.

The proposed stormwater management approach will adhere to the following documents;

- Auckland Council Code of Practice for Land Development and Subdivision. Chapter 4 – Stormwater (SWCoP).
- Auckland Council GD01 - Stormwater Management Devices in the Auckland Region.
- Auckland Regional Council TP108 – Guidelines for Storm Water Runoff Modelling in the Auckland Region.
- Auckland Council TR2013/018 – Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices.

5.1.1 Stormwater discharge

Based on the zoning across Stage 1 of the proposal the stormwater discharge is covered by the Council's regionwide Network Discharge Consent (granted October 2019)

Stage 2 however will require a its own Stormwater discharge consent application to be made. This will form part of the substantive application.

5.1.2 Primary Stormwater Network

A primary stormwater pipe network shall be constructed with all reticulated networks to outfall to either Te Hihi Creek or Whatapaka Creek following treatment onsite via existing tributaries. Drainage reticulation will not encroach on the existing creek beds.

Stormwater pipes are proposed to be located within road reserves. Each development site will be provided with one connection to the stormwater network at the time of their creation.

5.1.3 Secondary Stormwater Network (Overland Flow) & Flood modelling

Detailed flood modelling showing the pre and post development scenarios indicating the proposed development's influence on the catchment flooding, this will be undertaken for the substantive application.

The secondary stormwater network will be designed to manage overland flows from the site and upstream catchment for the 1% AEP rain event including for the potential effects of climate change.

In general, overland flow paths will be within the road reserve areas and be designed for safe conveyance of overland flows with minimal risk to road users and the local community. Final details will be provided as part of the design and consenting process.

5.1.4 Stormwater Management Devices

Hydrology mitigation (retention and detention) and treatment is to be provided for roads and future development "at source".

Generally retention is anticipated to be provided for the first 10 mm runoff depth from impervious areas via underground and/or above ground tanks to reuse water within the lot areas, detention storage is to be calculated considering a runoff depth of the difference between the pre-development and post development runoff volumes of the 95th percentile, 24hours rainfall event minus the retention volume, and is to be discharged into the primary stormwater network over a period of 24 hours via orifice controlled flow from tanks.

Stormwater treatment will be provided by communal rain gardens or treatment wetlands with gross pollutant traps (GPT) at entrances to the reticulated network or prior to discharge to the treatment devices.

Attenuation for the Te Hihi Creek catchment is not deemed necessary given the remainder of the upstream catchment is large and the site is located near the downstream end of Te Hihi Creek.

5.1.5 Stream Enhancement

Significant land has been set aside in stage 2 for wetland redevelopment and restoration. Of the 220.883ha, the masterplan has set aside over 81ha for this purpose including restoration of streams and wetlands already within the site, recognition of culturally significant landforms identified through a close relationship with local iwi, these features will be restored and enhanced including provision for walking tracks for public access.

6. Wastewater

There is currently no reticulated wastewater network in the Kingseat Precinct or the site. Watercare operates a wastewater treatment plant at Clarks Beach, this would be where the site and the Kingseat Precinct would need to discharge to if alternative options are not available.

The applicant has undertaken design and obtained a discharge consent for a wastewater treatment plant consisting of an MBR and associated constructed wetland.

The plan in appendix 2 shows the location of the onsite wastewater treatment plant and associated constructed wetland. The MBR plant will be containerised and easily expanded to cater for the roll out of the development site and the wider Kingseat Precinct. The constructed wetland indicated on the plan is approximately 2ha in size and is used to polish the discharge from the treatment plant.

6.1.1 Treatment plant demand

The proposed water demand for the site is 754m³/day, the volume of wastewater generated from each household is assumed to be 78.5% of the water consumption.

On this basis, the average daily flowrate of wastewater will be 592m³/day. The MBR plant is capable of treating and discharging 885m³/day in accordance with the discharge consent. As the full build

out of the site and the Kingseat Precinct is completed, additional demand on the of the MBR can be managed by increasing the plant's capacity should the realised flows exceed the design and consent allowances. Accordingly, the discharge consents will be varied to account for any increases over and above the consented discharge.

6.1.2 Existing Wastewater Discharge Consent

Auckland Council have issued the following consents to Kingseat Village Limited relating to the discharge of water and air and earthworks required to establish the treatment plan and wetland:

BUN60424241: LUC60424243 (s9 land use consent), DIS60424242 (s15 discharge to air permit), DIS60424543 (s15 discharge to water permit)

The above provides for up to 885m³/day of treated wastewater from an MBR plant treating waste from 1842 dwellings, associated air discharge from the plant and earthworks to establish a constructed wetland consisting of three areas, 1: 6,600m², 2: 7,400m² and 3: 4,500m².

6.1.3 Primary Wastewater Network

Option 1: Drainage networks consisting of gravity wastewater mains are an option for areas of the site that fall towards the proposed treatment plant, areas that cannot fall directly to the WWTP would require pumping stations in low points that transfer wastewater to the WWTP locations. Non-pressurised gravity networks are widely used throughout the Auckland region.

Option 2: A LPS (low pressure system) is likely to be better suited to this development with a Utility company providing operation and maintenance of the network. Consisting of small diameter pressurised PE pipe network fed by small efficient grinder pumps within each lot in the development that will send wastewater to the WWTP location. This type of network along with smart metering enables the Utility company to implement technologies to monitor discharge from each lot including identify leaks, infiltration, illegal connections and allows quick and easy remediation of issues.

An LPS network could be extended to the wider Kingseat Precinct without the need for multiple pumping stations associated with gravity networks.

7. Water

The servicing of the site and the wider Kingseat Precinct will be via a reticulated network, installed and managed by a Utility company setup by the applicant. The water is to be extracted using three production bores drawing from the Franklin Te Hihi North Waitemata Aquifer and is expected to meet Drinking Water (2028) health criteria with treatment required for aesthetic criteria exceedances.

Collection and storage of roof runoff (from inert materials) for purpose of retention and re-use for non-potable uses will be implemented across the site and the wider Kingseat Precinct. It is estimated non-potable water use makes up to 30% of a household's water use.

7.1.1 Existing Consents

There are three existing water take consents issued to Kingseat Village Limited by Auckland Council, these relate to three bores (KV1, KV2, KV3), all located within the site. These consents under BUN60357784 (WAT60356927, WAT60357795, WAT60357796) approve a total water take of 260,610 m³ pa.

Additional volume is available by combining other existing water take consents which include Karaka Centre Limited that has three water take consents, 47195, 47196 and WAT60331654 approved to take 160,000 m3 pa and Pulin Investments Limited has a water take consent, 444752, to take 84,500 m3 pa.

The potential total existing water take consents when combined can provide up to 505,110 m3 pa.

7.1.2 Existing reticulation

There is no publicly reticulated water network within the Kingseat Precinct or the site.

Watercare have extended a trunk watermain to Clarks Beach and provided for an extension to cater for the Kingseat Precinct. This pipeline currently terminates 1.2km from the precinct boundary and approx. 2.7km to the site boundary.

Should additional public reticulation supply be required this can be sourced from an extension to the existing OD315 PE pipeline.

7.1.3 Proposed Population and demand

The Masterplan provides for approximately 2,120 dwellings across Stages 1 and 2. These figures include provision for a 300 unit retirement village and 560 dwellings sited on larger (>1500m2) lots.

The anticipated population over the site used for this assessment is 5910. This is calculated as follows:

Typology	No. Dwellings	Multiplier	Population
Stage 1			
Retirement Village	300	1.5	450
Residential Dwellings	820	3.0	2460
Stage 2			
Residential Dwellings	1000	3.0	3000
Totals	2120		5910

The 3.0 multiplier has been adopted based on Watercare's current design standard and is more conservative than Auckland Council's report "Auckland Dwellings and Households – Initial Results from the 2013 Census Survey" which suggests a multiplier of 2.7 for Kingseat.

It is noted that in outer-lying areas such as Franklin and Rodney, census data suggests that home occupancy is lower than average at 2.8 household members per dwelling. As such, the likely occupancy rate for Kingseat is lower than 3.0.

Although WSL's current design codes of practice specify 220 litres/person/day is to be used to calculate water supply demand, this figure is too conservative and a lower, more realistic water demand assumption is recommended for the proposed Kingseat development. Approximately 30% of this is used for non-potable purposes, leaving 154 litres per person per day of potable demand. Recent information supplied by a private network operator suggests that daily flows of 81-112 litres per person per day are observed in recent developments. This is very relevant to the Kingseat context.

The Utility company will require the use of modern technology such as smart meters, ensuring wastage and leaks are detected and rectified easily and quickly. Low water use fittings and fixtures, re-use of harvested rainwater for non-potable use for outdoor hose taps and toilet cisterns suggests a daily flow of 120 litres/person/day for the site development is an achievable target demand.

As such, the recommended demand assumption to be adopted is 120 litres per person per day. We have conservatively used the Watercare recommended demand for the retirement village setting.

Typology	Population	Demand L/p/d	Total Demand		
			L/day	m3/day	m3/pa
Retirement Village	450	220	99,000	99	36,135
Residential Dwellings	5460	120	655,200	655.2	237,148
Totals	5910		754,200	754.2	275,283

The proposed demand for the site is approximately 55% of the total annual allowable consented volume of water take, leaving 45% of the possible available water for the remainder of the Kingseat Precinct. This confirms the site is able to be served by the proposed Utility company with the supply of water coming from the existing aquifer.

8. Utilities

Electricity and telecommunication services will be extended underground along all roads at the time of construction. Each of the proposed development areas can then be provided with an underground connection to the reticulated electricity and telecommunication networks.

APPENDIX 1

Masterplan



KINGSEAT VILLAGE ILLUSTRATIVE MASTERPLAN

Legend

- Stage 1
- Stage 2
- Potential Retirement Village Location (9.7ha)
- ① Kingseat School
- ② Kingseat Sports Park
- ③ Kingseat Local Centre
- ④ Waste Water Treatment Plant Site
- ⑤ Proposed Neighbourhood Centre
- ⑥ Wetland Redevelopment and Restoration
- ⑦ Potential Papakainga Location
- ⑧ Potential additional cafe / community amenity
- ⑨ Indicative Water Treatment Plant Location

Yields

Stage 1 - ca. 1,145 (including the Retirement Village)
 Stage 2 - ca. 810

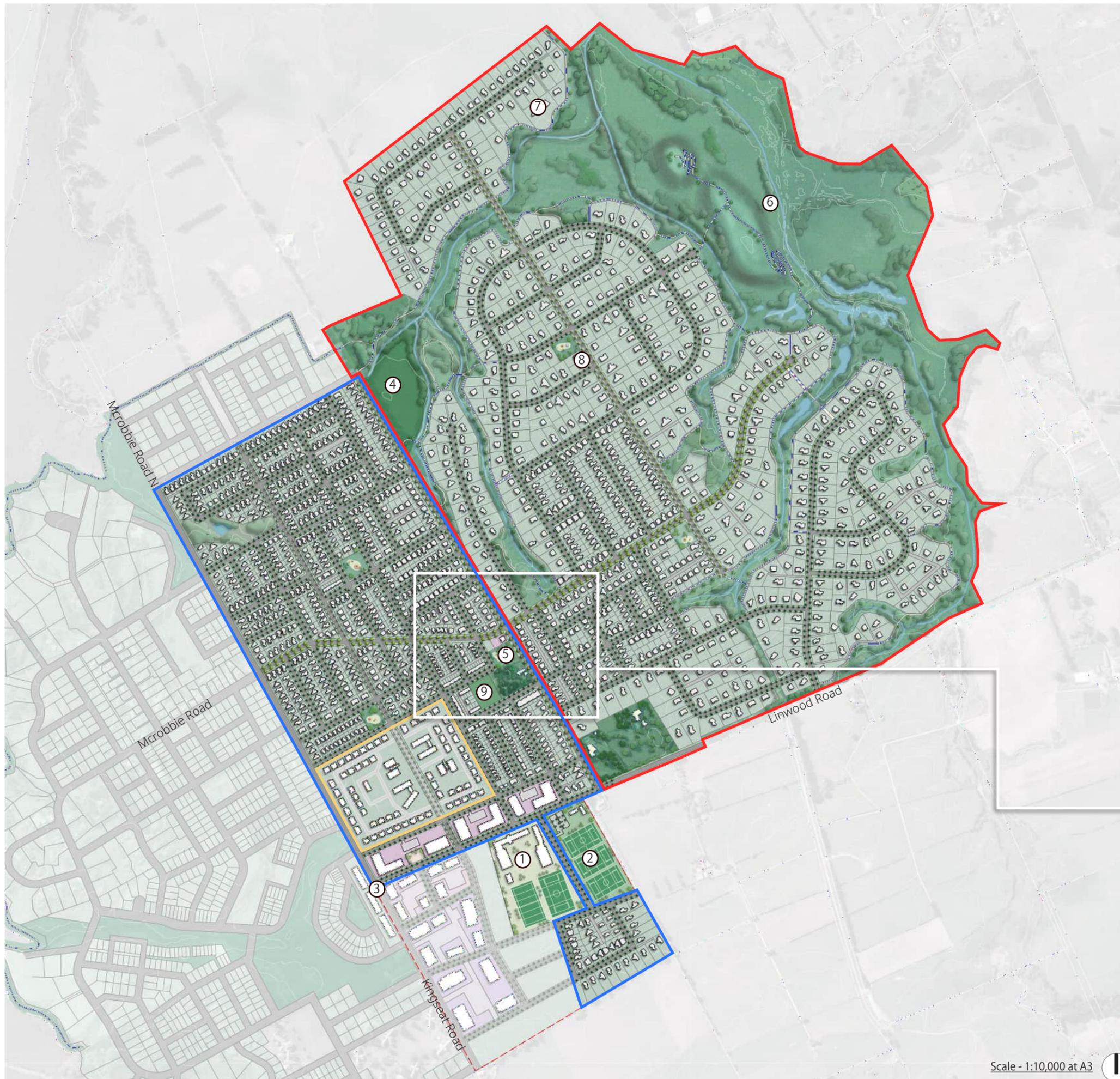
Typology Breakdown

Retirement Village - 300 dwellings
 Medium Density (ca. 300m²) - 125 dwellings
 Standard Density (ca. 500m²) - 1,020 dwellings
 Large Lot (>1500m²) - 510 dwellings

Indicative Layout Neighbourhood Centre / Community Hub



Scale - 1:5,000 at A3



Scale - 1:10,000 at A3

APPENDIX 2

MBR and Constructed Wetland Location





	Stage 1
	Stage 2
	PROPOSED MBR
	PROPOSED CONSTRUCTED WETLAND

