# Civil & Stormwater Engineering Report

JOB NUMBER: 23-1883

## Waikato Greenfield Racing Hub

PROJECT

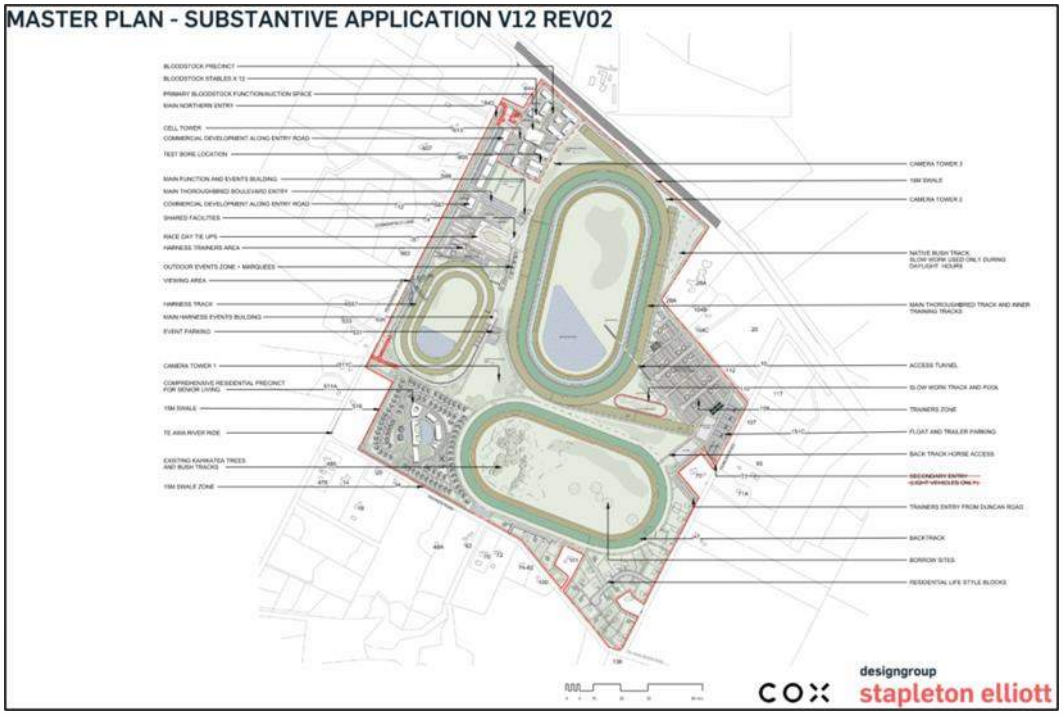
## Waikato Thoroughbred Racing Inc

CLIENT

**SUBSTANTIVE APPLICATION – REV 1**
**1 October 2026**

# Civil & Stormwater Report

**23-1883** **Waikato Greenfield Racing Hub** **Pencarrow Road, Waikato**




**Prepared for:** Waikato Thoroughbred Racing Inc **Project no:** 23-1883

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| Revision | Date | Status | Authorised by: |
|---|---|---|---|
| 1 | 30/09/2026 | Substantive Application | [redacted] Callum Davison \| Senior Civil Engineer |
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## EXECUTIVE SUMMARY

Waikato Thoroughbred Racing Incorporated (WTR) proposes to develop a purpose-built greenfield equine racing hub that consolidates the existing regional racing and training facilities from Te Rapa, Cambridge and Te Awamutu, into one site. The proposed hub includes thoroughbred and harness racing and training tracks, stables, race-day facilities, commercial and bloodstock buildings. Rural residential allotments and a senior living precinct also forms part of the wider development.

BCD Group Limited (BCD) has been engaged to provide civil engineering services for the proposed development. This report summarises the civil engineering assessment, intended design approach, key assumptions, and matters requiring further confirmation, and has been prepared to support WTR's substantive resource consent application to the Environmental Protection Authority (EPA) under the Fast Track Approvals Act 2024 (FTAA).

| | Item | Comments |
|---|---|---|
| **Proposed Development** | Overview | The subject site covers a total area of 163.9126 hectares and covers multiple addresses and legal descriptions detailed below:<br>• 636 Pencarrow Road – 37.6439 ha<br>  ○ Section 49 SO 457609, RT: 632409<br>• 592 Pencarrow Road – 23.8694 ha<br>  ○ Lot 1 DP 471383, RT: 650205<br>• 536 Pencarrow Road – 18.5194 ha<br>  ○ Lot 2 DP 471383, RT: 650204<br>• 37 Hooker Road – 69.6678 ha<br>  ○ Section 2 SO 547526, RT: 1027516<br>• 90 Duncan Road – 14.2121 ha<br>  ○ Lot 2 DP 16925, RT: SA383/181 |
| | Natural Hazards | Site-specific flood modelling has identified localised flood risks that are proposed to be managed through swales, attenuation ponds, appropriately designed/compliant finished levels, and drainage infrastructure.<br>The geotechnical assessment also identifies liquefaction which is appropriately mitigated within the geotechnical report included as part of this application. |
| | Boundary Conditions | The Te Awa River Ride cycleway is located along the southern and western boundary of the site. Crossing over this cycleway is to be kept to a minimum.<br>State Highway 1 borders the northern boundary of the site. |
| **Water Supply** | Existing Infrastructure | The site is not currently connected to the council reticulation network. |
| | Proposed System | A deep bore with appropriate treatment facilities will be established onsite and will provide the development with potable and irrigation water. Roof water will also be collected, treated (when required) and used for both potable and non-potable use as required. |
| **Storm water** | Existing Infrastructure | The site is currently a working dairy farm with artificial drains established to ensure adequate drainage of farm paddocks. |

| | | |
|---|---|---|
| | Site Constraints | The groundwater has been actively monitored since December 2025 with levels varying between 0.9m to 2.8m below existing ground level.<br><br>The subject site straddles 4 overland flow catchments. All 4 enter the site from the east (Duncan Road). The northern catchment exits the site near the expressway, the central/main drain catchment exits the site along the western boundary opposite 607 Pencarrow Road, and the southern and western catchment exits the site in the south-western boundary opposite 20 Hooker Road.<br><br>The site is relatively flat and therefore swales are preferred as primary stormwater conveyance. |
| | Proposed System | The swales and ponds through the site have been sized to store (where required) and convey the post development 1% AEP storm event whilst ensuring that downstream flows do not exceed the historical pre-development flows<br><br>The proposed swales, ponds and pipework will convey stormwater generated from the 10% (and less) and 1% AEP storm events.<br><br>Stormwater captured from the development will be directed towards ponds onsite and will be re-used for irrigation purposes where possible. |
| **Wastewater** | Existing Infrastructure | The site is not currently connected to the council reticulation network. |
| | Site Constraints | Large changes in wastewater flows between typical daily use and race day events requires buffer/equalisation tanks to ensure peak flows can be accommodated.<br><br>Shallow groundwater (0.9m-2.8m bgl) is considered as part of the design. |
| | Proposed System | A centralised MBBR system to provide primary and secondary treatment of wastewater with standard disposal beds for land application.<br><br>Gravity mains/pressure mains to connect to the MBBR treatment system.<br><br>Solid equine waste will be manually removed from the stables and transported off site to an appropriate facility. Senior living and the lifestyle sections will manage wastewater on lot. |
| **Earthworks** | Summary | Infill of existing farm drains.<br><br>Grading of horse tracks and associated swale drainage.<br><br>Excavation for stormwater and irrigation ponds along with swales.<br><br>Establishing building platforms to enable viewing of racecourses and ensuring adequate freeboard from flood levels (if required). |

| | | |
|---|---|---|
| | Effect on other property | Existing site boundary conditions will be maintained to ensure upstream and downstream effects are less than minor.<br>Overland swales to be constructed prior to the filling of the existing drains to ensure upstream effects are kept to a minimum.<br>Erosion and sediment control measures to be established prior to earthwork commencing onsite. |
| **Transport** | External considerations | Traffic report as per Hughes Traffic & Transportation outlines in more detail the transport effects.<br>Where possible, crossing of the Te Awa River Ride cycle path have been kept to a minimum and works will ensure appropriate detours are in place to ensure ongoing access.<br>The upgrade of the existing Hooker/Duncan Road intersection is to be completed as part of this development. |
| | Internal considerations | Rural residential road to be vested along with right of ways and cul-de-sac head to be built to RITS standards.<br>Sealed internal roads to meet expected vehicle demand. Limestone farm access tracks to provide suitable material for equine movements. |
| | Pavement | Various pavements are proposed throughout the site depending on proposed use. Asphalt pavement is expected to be laid for all new roads constructed, with chip seal to be installed as part of the Duncan Road upgrade works. Farm tracks where horse movements are the priority will be formed with crushed limestone. |

Overall, the proposed development can be serviced through a combination of private three-waters infrastructure, internal roading, flood conveyance swales, attenuation ponds, on-site water supply, and on-site wastewater treatment. Several components remain subject to detailed design, specialist confirmation, approval processes, and value engineering.

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# 1 INTRODUCTION

Waikato Thoroughbred Racing (WTR) proposes to construct a purpose-built greenfield equine racing hub that consolidates existing regional racing and training facilities into one site. The proposed development includes thoroughbred and harness training and race-day tracks, stables, race-day facilities, rural residential lifestyle allotments, and a comprehensive senior living precinct. This report summarises the civil engineering assessment, design intent, and recommendations for the proposed development.

The subject site is a collection of parcels and titles and is legally described as:

1. *Section 49 SO 457609 (636 Pencarrow Road) – RT: 632409, 37.6439 ha*
2. *Lots 1 DP 471383 (592 Pencarrow Road) – RT: 650205, 23.8694 ha*
3. *Lot 2 DP 471383 (536 Pencarrow Road) – RT: 650204, 18.5194 ha*
4. *Section 2 SO 547526 (37 Hooker Road) – RT: 1027516, 69.6678 ha*
    - *Lot 2 DP 16925 (90 Duncan Road) – RT: SA383/181, 14.2121 ha*
    - *In total, the subject site covers an area of 163.9126 hectares of existing farmland. The site within the jurisdiction of Waikato Regional Council (WRC) and Waikato District Council (WDC).*

This report has been prepared in support of the application by WTR for a resource consent to the Environmental Protection Authority (EPA) under the Fast Track Approvals Act 2024 (FTAA) and is to be read in conjunction with the Engineering Drawings, Calculations and all relevant documents related to the application.

## 1.1 Revision History

No current revisions issued to date.

## 1.2 Statement of Experience

I am a Chartered Professional Engineer (NZ) in both Civil and Water Engineering. I have 12 years working experience in engineering consulting in New Zealand and have led the design on land development projects, public infrastructure and private developments. Carrying out civil design, reviewing civil design work, managing construction works have all been the primary components of my role. I also lecture and teach Civil Engineering at the University of Waikato School of Engineering and am a Producer Statement Author with Auckland Council. I have visited the subject site and am familiar with the site and the surrounding environment; and understand the ethical obligation as a Chartered Professional Engineer completing this work.

## 1.3 Project Description

The purpose of the project is to create a unique, world class greenfield equine hub designed for thoroughbred and harness racing, training and other equine related activities, while bringing the expertise and strength of the local racing fraternity together in a centralised location.

This enables the local racing industry to be more streamlined, competitive, sustainable and future focused while bringing potential international investment and creating a 'destination' for horse racing in New Zealand, also increasing tourism opportunities for the wider region.

A key driver behind the proposed greenfield equine hub and racecourses is enabling the consolidation of four separate racecourse facilities (Te Rapa, Te Awamutu and Cambridge thoroughbred courses, and the Cambridge harness track).

These facilities duplicate assets and resources and, given their current condition require significant levels of upgrades and investment to provide fit-for-purpose facilities that meet the higher standards of the modern-day racecourse experience. The retirement of these areas also frees up significant tracts of land within existing urban areas for future development, increasing housing supply.

To support the development's financial viability and enhance the site's long-term vibrancy as a racing, entertainment, commercial and community precinct, the proposal includes a range of complementary activities on the remaining land. These include a bloodstock precinct, hospitality and commercial buildings, equine support services, rural residential lifestyle allotments and a comprehensive senior living precinct.

The master plan included in Appendix A, outlines the location of the thoroughbred and harness race and training tracks, along with the race day function and event facilities, bloodstock precinct, commercial and hospitality buildings, harness and thoroughbred training zones including stables, float parking etc, comprehensive senior living precinct and rural residential allotments.

Other significant features shown on the master plan are the stormwater attenuation and irrigation ponds, internal roading layout, the existing kahikatea trees and known borrow pit locations.

## 1.4 Project Staging

The proposed development will be completed in multiple stages as indicated in the staging plan as provided by the architect, a quick overview is highlighted below:

5. *Thoroughbred racing track and race day facilities, including commercial and hospitality area, access off Pencarrow Road.*
6. *Harness racing track and facilities.*
7. *Thoroughbred training tracks and facilities off Duncan Road.*
8. *Rural residential allotments to be developed at any stage to provide capital investment into racing hub development.*
    - *Strategic partnership with senior living developer to provide capital investment into completing racing hub development.*

# 2 SITE DESCRIPTION

The site is located in the Tamahere area, approximately 7km southeast of the urban boundary of Hamilton City and 5km northwest of Cambridge.

The site is zoned rural and is primarily used as a dairy farm. Several farm buildings are present across the site. Vegetation cover across the property is predominantly pasture with medium sized trees scattered predominantly across the southern half of the site. The vegetation includes a patch of existing Kahikatea trees that the proposed development will maintain. Farm tracks generally following the boundaries of the properties and points between buildings. Farm drains are scattered throughout the properties.

The site has several existing access locations from Pencarrow Road, Hooker Road and Duncan Road. The site is relatively level to very gently rolling. However, there is approximately four metres of fall from south-east to north-west. The toe of a rolling hill typical of the Waikato basin is present adjacent to Pencarrow Road.

The site appears quite flat with only 7m of elevation change from its southern high points (≈58m RL) and northern low points (≈51m RL), resulting in an average grade of 0.4% across the site, see attached Topographical Plan in Appendix A (Combined Calculations).

As the site does not have a connection to the council reticulation for potable water, stormwater or wastewater, new private infrastructure will be constructed.



Figure 1: Aerial view of site and surrounding area

# 3 NATURAL HAZARDS

As noted in the referral application, BCD has checked the Waikato DC Council GIS system and the Waikato Regional Council Hazard Maps, and no relevant council-mapped hazards were identified.

A site-specific flood assessment has been completed, which identified localised flooding in areas of the site. Design work mitigates this risk per standard practice and compliance; these measures will include local drainage swales, swales designed for large flood events, attenuation ponds, contouring the surface towards these swales, and sumps at low points of roads.

Further detail of the flood assessment can be found in the Flood Model Assessment Report which is provided as part of the Substantive Application.

The geotechnical assessment report also notes that the site is susceptible to liquefaction, however as noted in the geotechnical assessment report, this can be addressed through implementation of detailed geotechnical design and construction methodologies.

# 4 EARTHWORKS

## 4.1 Existing Topography

The site currently consists of two working dairy farms. The site is generally flat in nature with general fall towards the northwestern corner of the site towards Pencarrow Road. As shown on the attached topographical plans, the site currently has multiple open farm drains providing drainage to the farm paddocks. As further detailed in the flood modelling report, the site can be broken into 4 separate overland flow catchments being the northern, main central, western and southern catchments.

These catchments convey overland stormwater through the site and in the main driver in the existing landform of the site. The northern catchment discharges in the northwestern corner of the site towards the Waikato Expressway. Then main central catchment discharges to the existing culvert across Pencarrow Road located opposite #605, #607 and #613 Pencarrow Road. The southern catchment discharges to the existing open grassed swale along Duncan Road outside #536 Pencarrow Road

## 4.2 Geotechnical Inputs

BCD Group has also been engaged to complete the geotechnical investigation of the site, and the geotechnical assessment report forms part of this application. The soil profile of the site is described in further detail in the geotechnical assessment report but is briefly summarised in the table below.

Table 1: Soil Profile (Approximate)

| Unit | Depth to top of layer | Depth to bottom of layer | Material |
|---|---|---|---|
| 1 | 100mm | 300mm | Topsoil |
| 2 | 300mm | 800mm | Stiff to very stiff silts |
| 3 | 800mm | 2000mm | Lose to dense interbedded sands and silts |

Groundwater has been measured over the course of a year and varies across the site as outlined in the geotechnical report. Its depth is variable due to seasonal variations with the minimum depth recorded being 0.9m below existing ground level.

Based on the geotechnical investigation undertaken to date it is believed that a CBR value of at least 3% is thought to be available throughout the site and an ultimate (geotechnical) bearing capacity of 300kPa is available from the existing ground. Any areas of fill would be designed per appropriate geotechnical methodology.

## 4.3 Design Methodology

The site levels have been designed to achieve the following:

- *Post development overland flow as per the existing landform*
- *Required access gradients and cross falls*
- *Cut / fill balance*
- *Minimise earthworks*

To achieve the design requirements cuts up to 5m (approx.) below and fills up to 3m (approx.) above the existing ground level will be required. Infilling of existing effluent ponds may require localised areas of fill up to 7m (7m to account for approximate lifting of the proposed ground over existing) as we have been provided information that these ponds are approximately 6m deep.

Earthworks have been designed to ensure suitable overland flow for stormwater, to ensure flood waters post-development can be adequately managed onsite. Flood modelling has been undertaken on the proposed landform to assess potential upstream and downstream effects. Subject to the assumptions and mitigation measures described in the Flood Model Assessment, the modelling indicates that residual effects are manageable through design.

While ensuring overland flow paths are adequately designed, earthworks have been designed to result in a balanced cut and fill volume as much as possible given the design requirements of the proposed infrastructure and the site constraints. Existing ground levels on the surrounding properties have been maintained to ensure that effects caused by this development are kept to a minimum.

Generally, the site can be split into three zones representing each of the existing overland flow paths. The northern and central catchments are generally graded in a northwestern direction to match the existing landform and to ensure that the existing overland flow paths and outlet locations are maintained. The southern catchment is generally graded in a westerly direction towards the intersection of Hooker and Pencarrow Road. Again, this aligns with the existing landform and outlet location enabling earthworks to be kept to a minimum and upstream and downstream effects can be effectively managed.

### 4.4 Drains and Swales

The existing farm drains on site will be filled in with appropriate works undertaken to ensure the fill in these areas is completed in accordance with best practice and geotechnical inputs. These drains will only be filled in once the new proposed conveyance swales are constructed and stabilised.

These flood conveyance swales ensure that the existing upstream overland flow during large (1% AEP) storm events will be able to be conveyed through the site and exit at the existing discharge locations.

The proposed flood conveyance swales have been sized to ensure that during large storm events, the flood waters are fully contained within the swales, and any upstream effects are kept to a minimum.

### 4.5 Earthworks Staging

Bulk earthworks of this development are proposed to be undertaken in several stages over multiple years in summer months to reduce the area of worked area to a minimum, reducing the impact on the environment from earthworks. It is expected that the flood conveyance swales will be constructed and stabilised as part of the first stage of bulk earthworks. This will ensure that the site is protected during any large stormwater events, and the stabilisation of the swales also provides a location for sediment laden stormwater to be pumped into to be adequately treated prior to leaving site.

Disturbed areas will be stabilised as soon as practicable with grass or other measures as outlined in the ESC report to protect the soils.

### 4.6 Construction Traffic

Where possible the existing accessways to the site will be maintained to be used as a stabilised access way during construction. If required, these sites entrances will be upgraded to meet Waikato Regional Council requirements. More detail on the expected construction traffic movements and how this is to be managed can be found in the construction traffic report.

### 4.7 Stockpiles

Temporary stockpiles formed during bulk earthworks will be protected by clean water diversion channels to reduce erosion risks and will be stabilised as soon as practicable. Dust mitigation in the form of sprinklers, water carts and other means will be utilised to ensure minimal disturbance to the surrounding neighbourhood.

Topsoil is to be stripped before starting stockpiles of clean earth fill to avoid contamination of material to be used for engineered fill. Topsoil temporarily stockpiled onsite during bulk earthworks operations will be re-spread on the site after completion of cut/fill operations and testing and will be sown with grass seed to stabilise it.

# 5 ROADING AND PAVEMENTS

## 5.1 Existing Roads

The existing roads surrounding the development are Pencarrow Road to the west, Hooker Road to the south and Duncan Road to the east. The Waikato Expressway is to the north of the site, however, direct access off the expressway is not proposed.

All surrounding roads consist of approximately 6m wide sealed carriageways with 0.5m unsealed shoulders. Pencarrow Road and Hooker Road also include a 3m wide concrete shared path (Te Awa Cycleway) directly adjacent to the site's boundary. The Te Awa Cycleway path varies between 1.5m offset from the carriageway and being directly adjacent to it.

The current roads are rural in nature with the current speed limit being 100km/hour. The site currently has 6 existing formed access points off the surrounding roads.

## 5.2 Design Standards

All roads have been designed to accommodate the development and with consideration towards RITS and the Austroads design guidelines, along with recommendations provided by Hughes Traffic & Transportation consultants.

The design of the internal roads supports a low-speed environment for the proposed development with an emphasis on shared space whilst ensuring adequate manoeuvring for the large vehicles that are expected to frequent the site being horse floats, commercial trucks, rubbish collection and on large race days, busses.

## 5.3 Integrated Transport Assessment

An Integrated Transport Assessment (ITA) of the proposed development and concludes that the proposed roading design and shared space philosophy provides for a safe environment for all users. They note that with the additional event traffic management in place during the large race day events any conflicts can be adequately managed. Refer to the ITA as part of the application for more detailed information.

## 5.4 Proposed Access

Due to the variety of proposed activities and expected traffic movements associated with this development, there are several entrances to the site. The main entrance to the site will be off Pencarrow Road on the northwestern side of the site, with a secondary access provided off Pencarrow Road near the southwest corner of the site. These access points are expected to receive the majority of traffic flows on race days and will be the most public facing for the equine racing hub. As such landscaping and lighting surrounding these will be developed to create a sense of arrival to the site. Vehicle tracking of these intersection designs has been undertaken to ensure that busses can enter and exit the site as these are expected to the largest vehicles visiting the site.

The entrance to senior living precinct shown provides an indication of how access to this precinct could be achieved. We understand that as this development progress the location and character of this entrance may change.

Access to the trainers' zone off Duncan Road, will be constructed to a similar standard as a rural access way as outlined in RITS. However, due to size of the horse floats expected to use this entrance, the entrance way may be widened to ensure that when vehicle tracking is completed the wheel tracks stay wholly within sealed areas.

## 5.5 Proposed Road Typology

The proposed development will require the formation of multiple different roads of various widths, formation with the majority being private roads except for the proposed cul-de-sac road servicing the rural residential allotments in the southeast corner of the site. Table 2 below provides a summary of the roads to be constructed as part of the development.

Table 2: Summary of Proposed Roads

| Road Name | Road Type | Location | Length (m) | Width (m) | Kerb Type | Surface Finish | Footpath |
|---|---|---|---|---|---|---|---|
| Main Access Road | 1 | Adjacent to Pencarrow Road | 868 | 6m dual lane | Kerb & Channel | 45mm AC10 | Yes 1.8m concrete |
| Race Day Boulevard | 5 | Provides access to Thoroughbred race day facilities | 408 | 4m single lane | Kerb & Channel Flush Edge | 35mm DG10 | Yes 1.8m concrete |
| Bloodstock Access Road | 3 | Access to Bloodstock | 43 | 6m dual lane | Kerb & Channel | 35mm DG10 | Yes 1.8m concrete |
| Bloodstock Loop Road | 2 | Access around Bloodstock buildings | 797 | 6m dual lane | Kerb & Channel Flush Edge | 35mm DG10 | No |
| Commercial Private Road | 2 | Provides service access to commercial buildings | 402 | 6m dual lane | Kerb & Channel Flush Edge | 35mm DG10 | No |
| Harness Carpark Access Road | 3 | South of Harness Track, provides access to carpark and facilities | 590 | 6m dual lane | Kerb & Channel | 35mm DG10 | Yes 1×1.8m concrete |
| ROW 1 | 9 | Hooker Road | 200 | 4m single lane 9m legal | Kerb & Channel Flush Edge | 35mm DG10 | No |
| Road 1 | 6 | Rural Residential | 265 | 6m dual lane 20m legal width | Kerb & Channel | 35mm DG10 | Yes 2×1.8m concrete |
| Duncan Road Upgrade | 4 | Duncan Road | 587 | 20m legal width | 0.5m unsealed shoulder | Chip seal | Yes 1×1.8m concrete |
| Trainers Entry | 2 | South of #70 Duncan Road | 900 | 6m dual lane | Kerb & Channel Flush Edge | 35mm DG10 | No |
| Trainers Road 1 | 2 | Trainers zone | 172 | 6m dual lane | Kerb & Channel Flush Edge | 35mm DG10 | No |
| Trainers Road 2 | 2 | Trainers zone | 172 | 6m dual lane | Kerb & Channel Flush Edge | 35mm DG10 | No |
| Thoroughbred Racing Access Track | 8 | Horse movements between race day tie ups and trainers' zone | 1125 | 4m | Drainage swale | Limestone | - |
| Thoroughbred Backtrack Access Track | 7 | Horse movements between trainers' zone and backtrack | 465 | 6m | Drainage swale | Limestone | - |
| Trainers Lane 1 | 7 | Trainers zone | 134 | 6m | Drainage swale | Limestone | - |
| Trainers Lane 2 | 7 | Trainers zone | 151 | 6m | Drainage swale | Limestone | - |
| Bush Track Access | 7 | Northeastern corner of site | 560 | 6m | Drainage swale | Limestone | - |

Road formations alter between dual and single crossfall with a mixture of kerb and channels and flush concrete edge constraints depending on the use case of the proposed roads. Where traffic volumes are expected to be higher, dual crossfall roads typical of a standard public road are proposed, with dedicated footpaths ensuring pedestrians and vehicles are separated. Where the traffic volumes are expected to be lower, single crossfall roads are proposed and it is expected that these roads will be mixed use and as such no footpaths will be provided.

This enables a clear distinction between use cases with the public. Dual crossfall roads provide separate vehicle and pedestrian access, whereas single crossfall roads are expected to be a mixed-use road where vehicle and

pedestrians will share the same space. This enables a clear distinction between the road types and helps ensure a safe environment for all users.

The width of the roads has been determined based on the expected use case of the road. The Main Access Road is the only road with AC10 surfacing as this road is expected to be subject to the largest traffic movements and heavy vehicles such as horse floats, commercial trucks, rubbish trucks etc.

## 5.6 Parking

As outlined on the master plan, sealed onsite parking areas will be provided for race day spectators, those visiting the commercial precinct and bloodstock precinct. Overflow parking on grassed areas has also been set aside to ensure adequate parking is available during large race day and bloodstock events. No parking has been provided for within the carriageway of the proposed roads.

## 5.7 Pedestrian and Cyclist Access

As the site is bound by the Te Awa Cycleway along the south and western boundaries of the site, consideration has been taken to ensure that vehicle crossings over this path is kept to a minimum to reduce conflicts between pedestrian/cyclists and vehicles.

As part of the community consultation that has been undertaken to date as part of this development, a key takeaway for the surrounding community was ensuring that access to the proposed commercial/hospitality buildings be made from the Te Awa cycleway. As such, the proposed development has provided for extending the 3m wide shared path into the site to the commercial/hospitality buildings.

Pedestrian access throughout the site will be provided by a mixture of 1.8m wide concrete footpaths adjacent to the roads, or via limestone paths as outlined in the landscape plans. These footpaths will ensure that pedestrian access to the various precincts will be readily accessible. In some locations, designated footpaths are not proposed because the carriageway is intended to operate as a low-speed mixed-use environment. This mixed-use area will ensure that vehicle speeds are kept to a minimum which in turns supports the creation of a safe environment for all users of the site.

## 5.8 Public Transport

As part of the operation of the site, it is expected that there will be multiple events per year that will see a substantial number of spectators arrive on site as broken down in the table below (information provided as approximate from the WTR).

Table 3: Events on Site

| Event Type | Duration of event | Number of events per year | Attendance |
|---|---|---|---|
| Thoroughbred Medium Raceday | 1 day | 10 | 2,415 |
| Harness Large Raceday | 1 day | 2 | 3,157 |
| Thoroughbred Large Raceday | 1 day | 1 | 6,330 |

During the above race day events, it is expected that public transport will be made available to the public and that specific site traffic management will be implemented.

## 5.9 Preliminary Pavement Design

Considering the likely traffic loading generated by the proposed development and the strength of the subsoils tested, BCD recommends the following pavement construction (Subject to detailed design):

### 5.9.1 Main Road - Asphalt Pavement

- 45mm thick AC10 Asphaltic Concrete on single coat chipseal
- 200mm thick GAP40 – Basecourse (CBR 80%)
- 250mm thick GAP65 – Subbase (CBR 40%)
- Subgrade to be minimum of CBR 3% with geotextile bidim A29 or similar
    - Geogrid may be used subject to detailed design

### 5.9.2 Internal Road - Asphalt Pavement

- 35mm thick DG7 Asphaltic Concrete on single coat chipseal
- 180mm thick GAP40 – Basecourse (CBR 80%)
- 200mm thick GAP65 – Subbase (CBR 40%)
- Subgrade to be minimum of CBR 3% with geotextile bidim A29 or similar
    - Geogrid may be used subject to detailed design

### 5.9.3 Horse Farm Track

- 100mm crushed Lime chip
- 200mm thick GAP40 – Basecourse (CBR 80%)
- Subgrade to be minimum of CBR 3% with geotextile bidim A29 or similar

### 5.9.4 Footpath

- 100mm thick 20MPa concrete with SE62
- 200mm thick GAP40 – Basecourse (CBR 40%)
- Subgrade to be minimum of CBR 3%

## 5.10 Intersection Upgrades

As part of the integrated traffic assessment, it was found that one existing intersection surrounding the site will need to be upgraded due to the increased traffic movements that the development is likely to generate. The intersection outlined in the report is the Hooker Road / Duncan Road and requires the installation of right-turn bay to facilitate the increased demand for right turn movements from trainers travelling to the site.

We understand affected Councils are aware of work to improve Hooker/Cambridge/Racecourse Road which is outlined in the relevant Integrated Transport Assessment.

## 5.11 Vehicle Tracking

Vehicle tracking has been undertaken to ensure access to the site is achievable for the anticipated vehicles.

## 5.12 Fire and Emergency New Zealand Access Standards

The vehicle tracking undertaken to date indicates that access for Fire and Emergency appliances is expected to be achievable, subject to confirmation during detailed design and ongoing consultation with FENZ.

Access requirements to each separate building have not been undertaken to date as this will progress with detailed design as the development progress to engineering acceptance stage.

# 6 STORMWATER MANAGEMENT

The proposed stormwater management plan aligns with the requirements of the Waikato District Council and Waikato Regional Council and has been developed in accordance with relevant planning instruments. The proposed stormwater management system has been designed to provide;

- *Capture and conveyance of all flows from hardstand areas within the site during the 10-year ARI storm events through downpipes, catchpits & swales.*
- *Conveyance of stormwater flows above the 10-year ARI storms via short pipe runs and surface outlets or overland sheet flows towards the grassed swales to ensure building areas are free of flooding.*
- *Reuse of captured stormwater for irrigation and non-potable or potable reuse (with appropriate treatment) is to be prioritised where possible.*
- *Grassed swales to convey all flows up to and including the 100-year ARI storm events through the site and towards the central attenuation ponds.*
- *Limit post-development outflows from the site to the historic pre-development outflows.*
- *Preserve existing discharge locations and existing flow paths where possible to avoid introducing new hydrological impacts.*
- *Account for external inflows and upstream catchments to ensure downstream impacts are not worsened under post-development conditions.*
- *Support future maintenance, accessibility and ecological enhancement through features such as internal roads and landscaping planting to be adjacent to swales where appropriate. Safe fish passage design will also be incorporated into the design.*

Several design aspects of the proposed stormwater infrastructure will require further refinement during the detailed design stage to confirm compliance requirements, optimise constructability, and support value engineering. Subject to those refinements and the outcomes of detailed hydraulic and water quality design, the proposed stormwater management approach is intended to provide an integrated framework for flood mitigation, stormwater reuse, water quality treatment, ecological protection, and long-term sustainability.

The project site is divided into five precincts, each with a specific end use and stormwater management approach, as outlined in Table 4.

Table 4 Precinct Areas (approximate)

| Precinct | Area (Ha) | Stormwater Management Principles |
|---|---|---|
| Bloodstock Precinct | 5.66 ha | Capture for re-use and direct excess to grassed swales and ponds |
| Commercial Precinct | 2.99 ha | Capture for re-use and direct excess to grassed swales and ponds |
| Racing Precinct | 132.18 ha | Capture for re-use and direct excess to grassed swales and ponds |
| Senior Living Precinct | 11.47 ha | Capture for re-use and direct excess to onsite swales and ponds |
| Rural Residential Precinct | 11.24 ha | Capture for re-use and direct excess to onsite swales and ponds |

**Error! Reference source not found.** below provides a generalised connectivity chart of the stormwater within the site and how the stormwater principles for this development are interlinked.

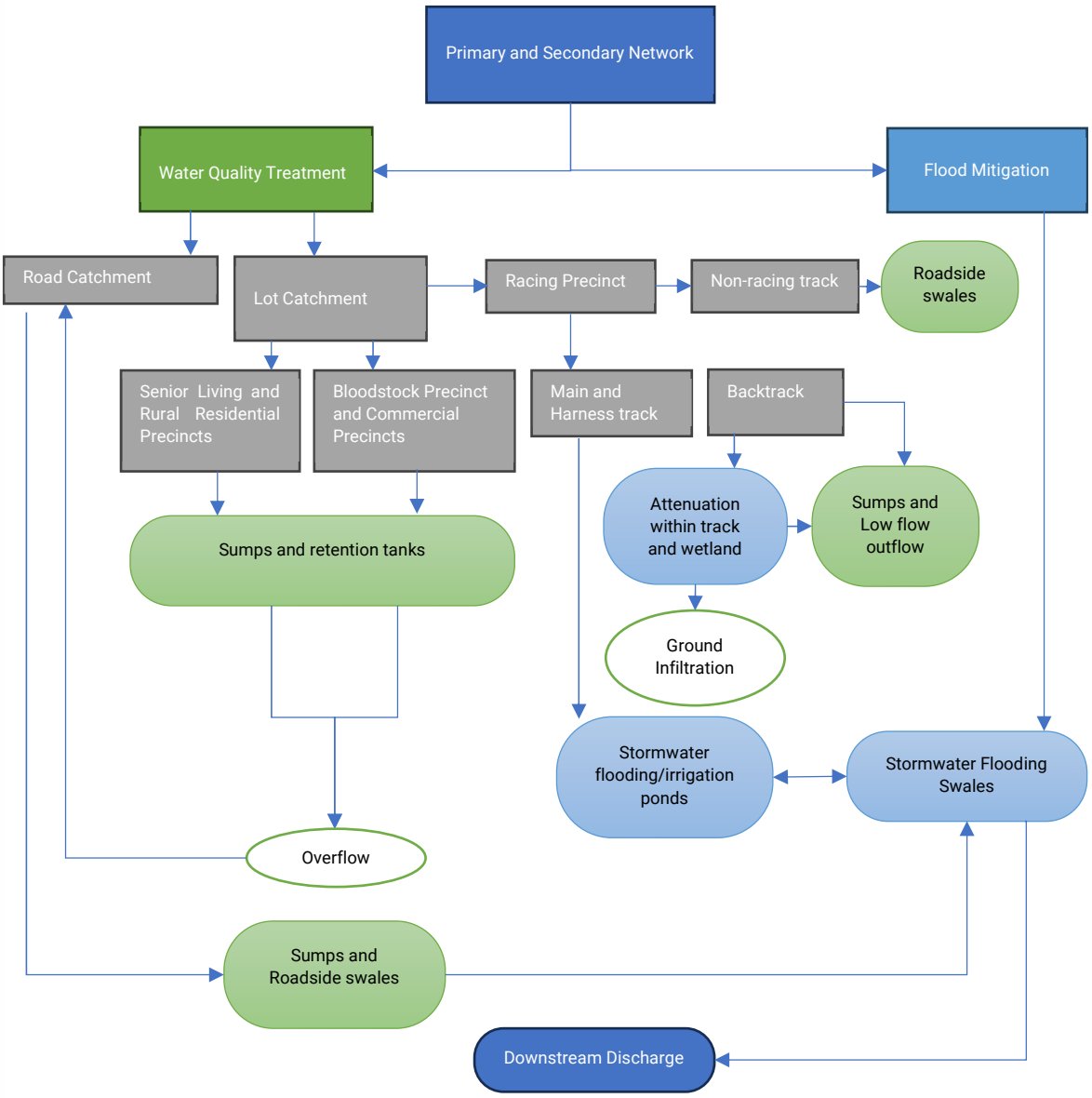



Figure 2 Hydraulics Connectivity Chart

## 6.1 Staging

The proposed development is to be undertaken in stages, with each stage designed to comply with the principles and requirements outlined in this stormwater section contained within the report. Interim measures such as temporary conveyance routes and swales, will be implemented to ensure ongoing mitigation throughout the construction of the development

## 6.2 Costs, Funding, and Vesting Assets

The construction of the proposed stormwater management devices will be undertaken by the consent holder. The proposed stormwater infrastructure includes swales, weirs, culverts, attenuation ponds, stormwater re-use tanks, and piped reticulation network

As the development progresses, public assets will be vested in council (at the appropriate time). Where necessary, legal instruments will be established to ensure ongoing operation and maintenance responsibilities are outlined and clearly defined for all current and future owners of the infrastructure. Discussions will be undertaken with

council as to the design of the infrastructure, location, and purpose, with all public infrastructure subject to the Engineering Approval process.

### 6.3 Operation, Maintenance, and Monitoring Plan

Operation and maintenance plans will be provided for all stormwater management devices that are to be vested in Council at the Engineering Design Phase.

### 6.4 Existing Infrastructure

As per the attached topographical plan (Appendix B) and confirmation with Waikato District Council GIS system has determined the following is true of the site:

- *There is no council reticulated stormwater within the site.*
- *Farm drains have been constructed to adequately drain the land due to the flat nature of the site and the high groundwater.*
- *There is an existing Ø200mm culvert crossing Pencarrow Road in the northwestern corner of the site*
- *An existing grassed swale along Hooker Road in the southwest corner of the site that provides for drainage of the site. This ultimately crosses Hooker Road and the intersection with Pencarrow Road via an existing culvert*
- *Existing swales have been constructed along the northern boundary with the Waikato Expressway which aid in effectively draining the site paddocks*

### 6.5 Existing Site Description

The existing site covers approximately 164 ha. The site appears quite flat, with only 7 m of elevation change from its southern high points (~58 m RL) and northern low points (~51 m RL), resulting in an average ~0.4% gradient across the 2 km distance. However, the site does appear to have some quite notable ridgelines, splitting the site into four catchments as shown in Figure 3 below.

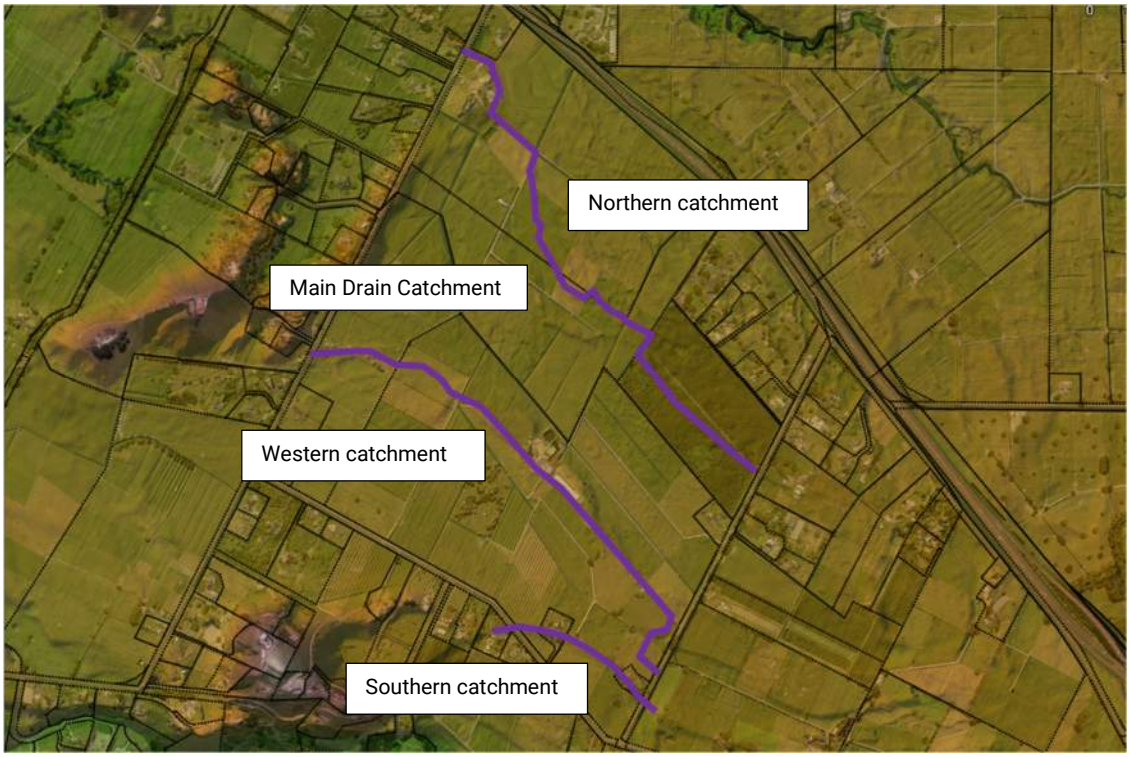



Figure 3 Catchment Location

Vegetation cover across the property is predominantly pasture with medium sized trees scattered predominantly across the southern half of the site. The vegetation includes a patch of existing Kahikatea trees that the proposed development will maintain, with earthworks and associated development will be kept to a minimum. Farm tracks generally following the boundaries of the properties and points between buildings. Farm drains are scattered throughout the site.

Based on BCD Survey data (17th of November 2025), the existing site is crossed by a series of drainage channels, most of which collect into either a main channel running westward through the site centre or collect into a drain running alongside State Highway 1 (SH1). The main existing central drain begins on the site, near to Duncan Road. After crossing the site, it runs under Pencarrow Road via a 200mm culvert and continues to flow westward (through a series of low-lying hills) before turning north, connecting with the Mangaonua Stream.

## 6.6 Existing Calculation Parameters

As outlined in the stormwater modelling report, BCD simulated rainfall using the nested storm event described in the Waikato Storm Runoff Modelling Guidelines. The rainfall inputs are based on a 24-hour storm duration, with historical and climate-change-adjusted datasets used for the relevant hydraulic assessments.

The pre-development flood modelling used both the unmodified NIWA historical rainfalls (from checking the hydraulic neutrality of outflows and inflows from the site) and the climate change adjusted rainfalls (for comparing upstream and downstream depths). The latter was required to isolate the impact of the site from the impact of non-site associated runoff. To account for the impact of small (multiple events per year), BCD extrapolated the NIWA rainfall data. Table 55 and 6 below summaries the parameters used to establish the pre-development stormwater runoff for the site.

Table 5 Existing land use design parameters

| Land Use Type | Manning's N | Imperviousness | Curve Number (Soil type C) | Initial Abstraction Ratio |
|---|---|---|---|---|
| Agricultural | 0.03 | 0% | 86 | 0.05 |
| Roadway | 0.016 | 100% | 98 | 0.05 |

Table 6 NIWA Rainfall Intensities

| Rainfall Event | Historical | Climate Change Adjusted |
|---|---|---|
| 12 times each year (average monthly) | 1.48 mm/hour | 1.93 mm/hr (adjusted as per RITS v2) |
| 50% AEP | 2.65 mm/hour | 3.41 mm/hr (adjusted as per RITS v2) |
| 10% AEP | 4.04 mm/hour | 5.35 mm/hr (adjusted as per RITS v2) |
| 1% AEP | 6.22 mm/hour | 8.36 mm/hr (adjusted as per RITS v2) |

## 6.7 Catchment Overview

As noted above, the site can be split into 4 catchment areas which all extend upstream from the site, with flows originating from across Duncan Road. Table 7 below provides a brief overview of the existing catchments and the predevelopment outflows. The pre-development flow rates serve as a baseline for checking overall flowrate pre vs post development to ensure historical downstream flows are retained and any additional flows generated by this development are attenuated onsite.

Table 7 Predevelopment catchment flows

| Catchment | Catchment Area within the site | Catchment Area upstream of site | Total Area | 10-year ARI Flow ($m^3/s$) | 100-year ARI Flow ($m^3/s$) |
|---|---|---|---|---|---|
| Northern | 40 ha | 43 ha | 83 ha | 0.20 $m^3/s$ | 0.75 $m^3/s$ |
| Main | 79 ha | 54 ha | 133 ha | 1.50 $m^3/s$ | 3.35 $m^3/s$ |
| Western | 41 ha | 7 ha | 48 ha | 1.32 $m^3/s$ | 3.14 $m^3/s$ |
| Southern | 4 ha | 7 ha | 11 ha | 0.09 $m^3/s$ | 0.39 $m^3/s$ |

### 6.7.1 Northern Catchment

The northern catchment encompasses an area of 40 ha within the site and is comprised of predominantly open pasture. The catchment extends upstream from the site and includes an additional 43 ha of open pasture.

Multiple small inflows occur both directly from Duncan Road or from the properties sitting between the site, Duncan Road, and SH1. The catchment is generally flat, with existing flows running in an east-nor-east direction while existing drains servicing to control and direct the flow towards existing swales running along SH1.

### 6.7.2 Main Catchment

The main catchment encompasses an area of 79 ha within the site and is comprised of predominantly open pasture. The catchment extends upstream from the site and includes an additional 54 ha of open pasture.

Although the site's main catchment has multiple small inflows across Duncan Road, there are two main overland flow paths that form upstream before entering the site. The first forms along the driveway to 71A Duncan Road and passes through 70 Duncan Road before entering the site. The second forms along a farm track and enters the site north of 18 Duncan Road, as shown in Figure 4 below.

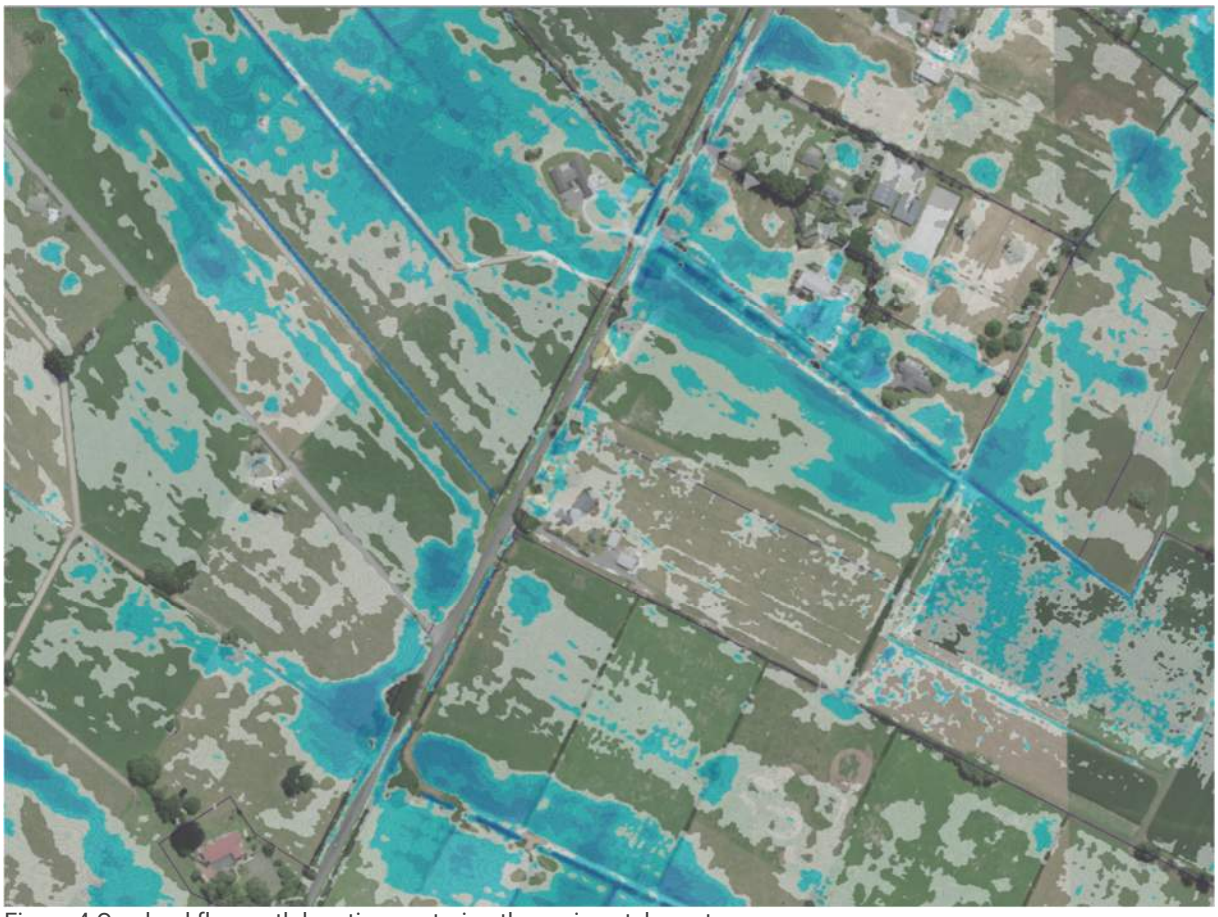


Figure 4 Overland flow path locations entering the main catchment

The main catchment is generally flat, with existing flows running in an east-nor-east direction while existing drains servicing to control and direct the flow to a 225mm culvert located between 605 and 613 Pencarrow Road.

The residential area immediately downstream of this culvert sits within a series of rolling hills. These hills have a notable impact on the downstream section of the main catchment, as they act as a flow restriction on the main catchment drain. This results in a floodplain within this area as shown in Figure 5 below.

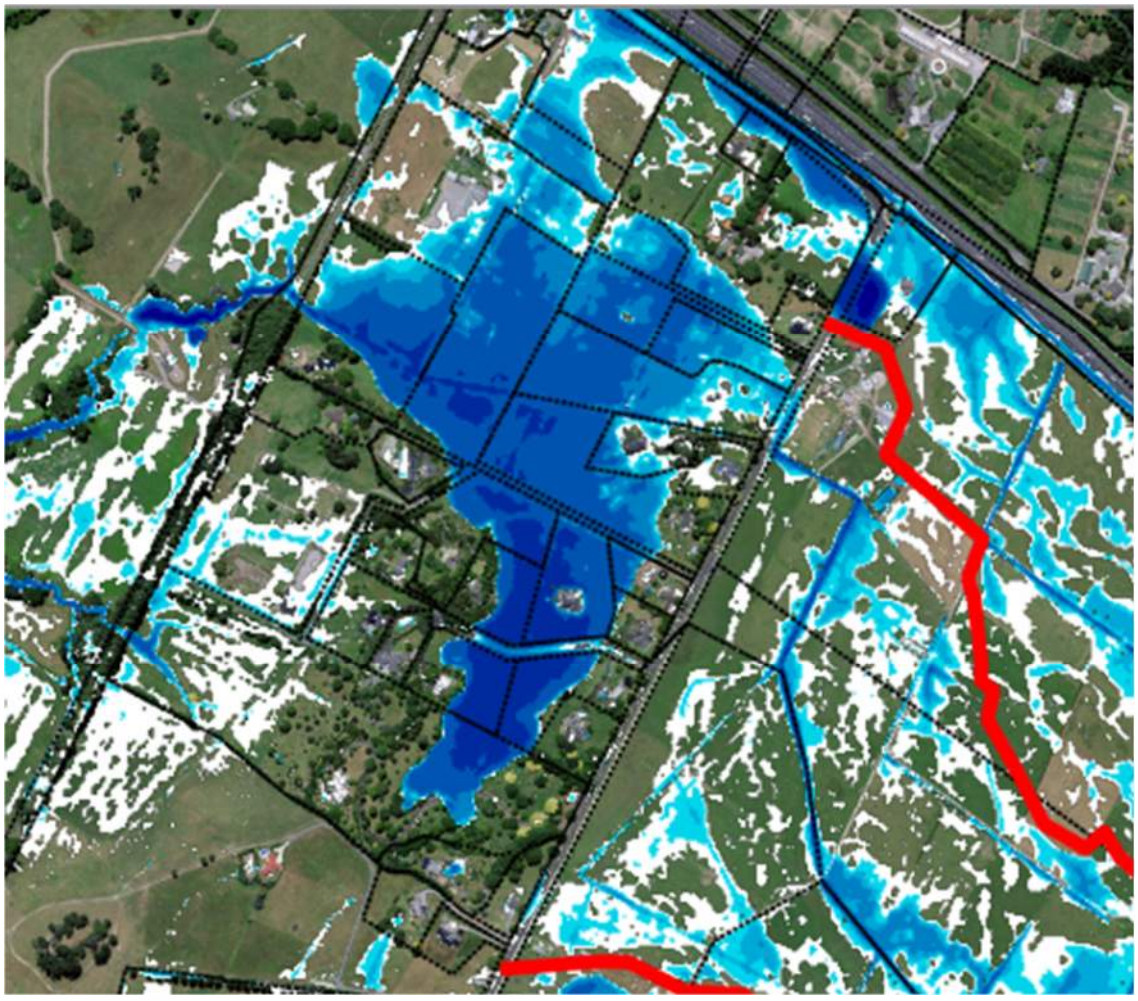


Figure 5 Main catchment downstream floodplain

### 6.7.3 Western Catchment

The western catchment encompasses an area of 41 ha within the site and is comprised of predominantly open pasture with the exception of the Kahikatea stand located towards the centre of the catchment. The catchment has little upstream extents, with the main inflows being an overflow from the main catchment.

The western catchment is generally flat. While the western catchment does have an existing drain running along its southern boundary with Hooker Road, the catchment's main overland flow runs through the centre of the catchment and through 516 Pencarrow Road as shown in Figure 6 below.

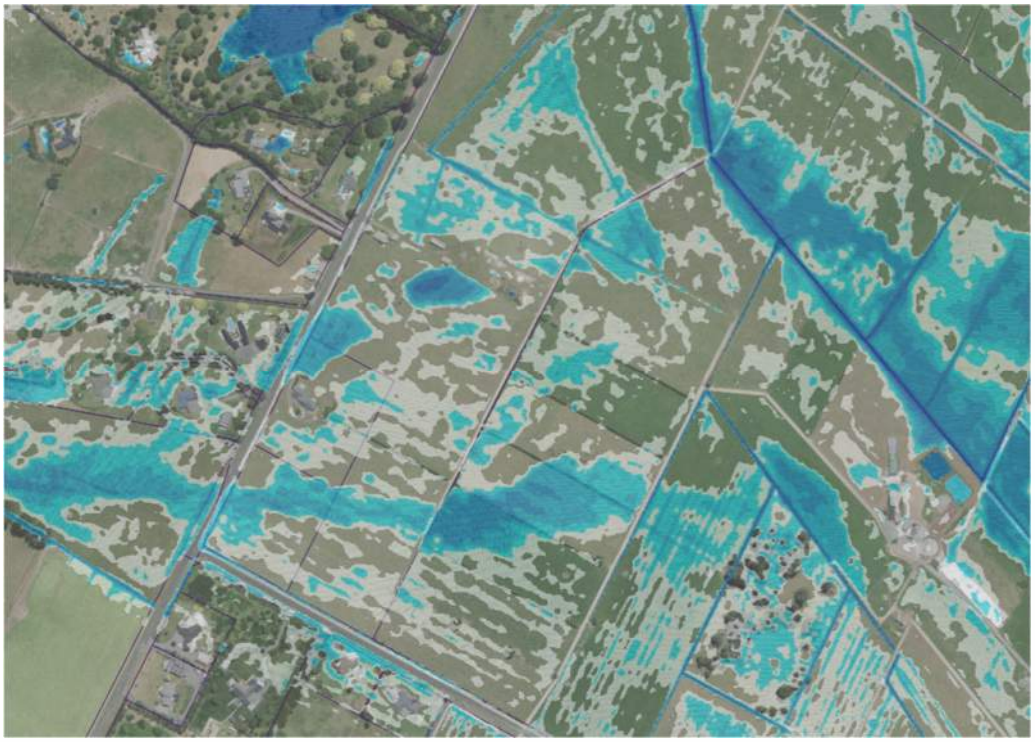


Figure 6 Western catchment outfall location

### 6.7.4 Southern Catchment

The southern encompasses an area of 4 ha within the site and extends upstream from the site and includes an additional 7 ha of open pasture. Existing modelling indicates that the southern catchment has negligible outflow under the assessed conditions, with runoff largely contained within an on-site depression as shown in Figure 7 below.

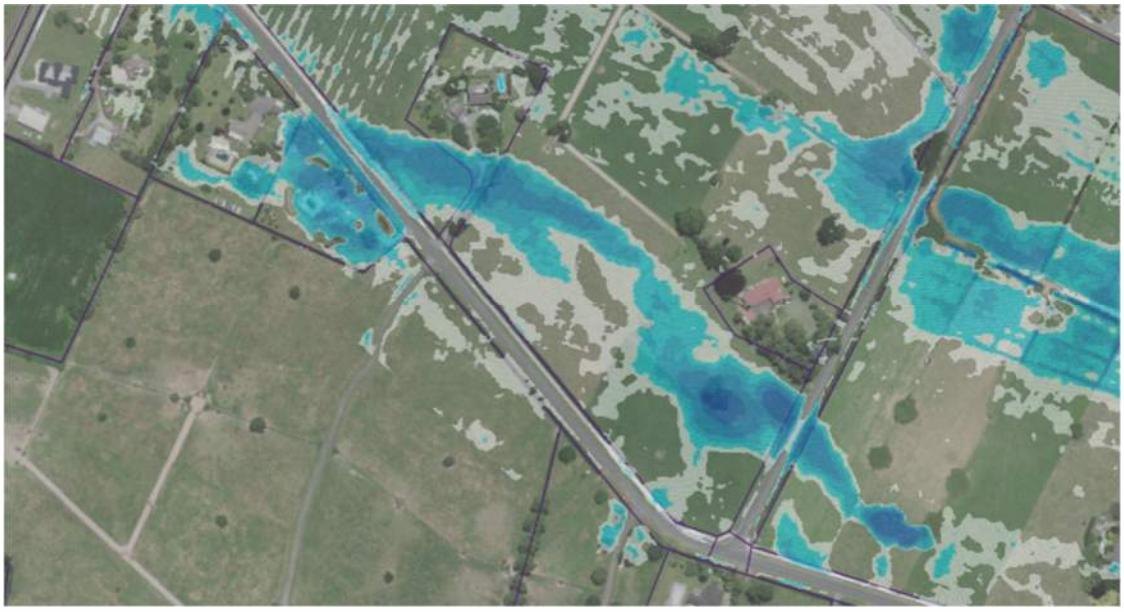


Figure 7 Southern catchment

## 6.8 Stormwater Management Principles

## 6.9 Overview

The proposed development has been designed around maintaining the existing inflows and outflows from the site, as a result, the site's existing points of inflow have all been maintained. The proposed design surface has also maintained the existing points of outflow for the northern, main, and western catchments. As modelling of the existing site showed that outflow from the southern catchment was near non-existent (being contained within an onsite depression) and not contributing to any downstream drain or stream, its 'outflow' was not maintained, with the southern catchment now being directed into the western catchment.

Overland flows through the site are proposed to be controlled via grassed/planted swales, with the stormwater irrigation ponds acting as centralised attenuation buffers to help maintain hydraulic neutrality in comparison to the existing historical flows. The proposed stormwater swales have changed the on-site catchment boundaries; however, each catchment has been analysed for hydraulic neutrality individually.

The overall development is comprised of five precincts which discharge into single or multiple catchments due to the scale of the development and the existing/proposed landform as detailed below. Although each area's stormwater management differs, each method ties into the site wide stormwater swales and irrigation ponds.

Table 8 Precinct catchment contribution

| Precinct | Catchment | Contributing Area |
|---|---|---|
| **Bloodstock Precinct** | Northern Catchment | 4.5 ha |
| | Main Catchment | 1.2 ha |
| **Commercial Precinct** | Main Catch Main Catchment | 1.4 ha |
| **Racing Precinct** | Northern Catchment | 19.2 ha |
| | Central Pond Attenuation<br>*Outflow to northern and main catchment* | 42.3 ha |
| | Main Catchment | 26.2 ha |
| | Western Pond<br>*Outflow to main catchment* | 10.1 ha |
| | Western Catchment | 2.2 ha |
| | Backtrack Wetland<br>*Outflow to main and western catchment* | 32.8 ha |
| **Senior Living Precinct** | Western Catchment | 11.5 ha |
| **Rural Residential Precinct** | Main Catchment | 4.4 ha |
| | Western Catchment | 7.2 ha |

The Bloodstock, Commercial, Senior living, and Rural residential precincts will see an increase in impervious area in comparison to the existing. Within these precincts, the primary stormwater infrastructure will be sized to handle the 10% climate change adjusted event via attenuation and irrigation reuse.

Flows exceeding this on lot infrastructure will overflow to its neighbouring roading area, where it will be conveyed to a roadside swale. These swales will act as conveyance, treatment, and attenuation for both roadside runoff and overflows from neighbouring lots. The roadside swales will drain to the stormwater flooding swales.

The Racing precinct will not see a major increase in impervious area. However, as the surface will be designed to avoid and minimise onsite flooding, the proposed development will have less ponding that then existing development, leading to an increase in runoff and outflow.

To contour this, the main tracks will not directly runoff from the site and will instead drain to either an attenuation pond (in the case of the harness track and main track) or attenuate within the track itself. The attenuation areas will have slow-release pipe to the stormwater flooding swales, allowing them to drain.

The main stormwater attenuation ponds will also allow for inflows from the stormwater swales to help mitigate the impact of climate change on the upstream catchment and to further help the site achieve hydraulic neutrality for each catchment.

As with the roadside swales, the stormwater swales will act as conveyance, treatment, and attenuation.

## 6.10 Principles of Stormwater Management

The site's overall stormwater management focused on the following stormwater management principles

- *Preserving existing inflows and outflows from the developed site to:*
- *help preserve the existing waterways downstream of the site*
- *prevent the proposed development from causing flooding impacts upstream and downstream of the site*
- *Mitigate flooding impacts on site, especially within the area of proposed buildings*
- *Fully mitigate the impacts of climate change on runoff within the site and mitigate, as much as possible, the impacts of climate change on runoff on the upstream catchment*
- *Enhance ecological value within the catchment*
- *Treatment of stormwater runoff from the proposed impervious areas.*
- *Capture and re-use stormwater for irrigation purposes to reduce outflows from the site and reduce demand placed on the bore and associated aquifer/ground water*

## 6.11 Site Wide Stormwater Management

## 6.12 Grassed Swales

The proposed development incorporates three grassed bank stormwater swales that traverse the site to provide conveyance of stormwater through the site, and their locations are based on the existing overland catchments (northern, main and western). The size of the swales have been designed to ensure the capture and conveyance of all storms up to and including the 100-year ARI climate adjusted events. The climate adjusted rainfall events have been applied to the subject site and the upstream catchments, ensuring the proposed design will mitigate the impacts of climate change beyond the site's runoff.

The swales will incorporate weirs and other stormwater structures to allow low flows through the swales unobstructed, while holding back larger flows. Contact time (residence time) within the grassed swales also ensures that stormwater leaving the site is adequately treated.

The existing artificial farm drains are proposed to be filled in as part of this development and replaced with these larger grassed bank swales. While it has been noted in the ecological report that the existing farm drains provide low ecological values to the surrounding environment, however as part of the low impact design principles applied to this development, safe fish passage design elements in relation to culvert crossings will be implemented to ensure that should any aquatic fauna enter the grassed swales, their passage through the site will not be impeded by the design. Additional landscape planting is also proposed adjacent to the swales in locations which will improve the ecological values of the drainage system through the site from its current state.

## 6.13 Centralised Stormwater Attenuation / Irrigation Ponds

The proposed stormwater attenuation and irrigation ponds have been designed with a dual purpose, to provide a source of irrigation water supply for the proposed racing precincts and to provide flooding storage as a means of achieving hydraulic neutrality.

The ponds have been designed to capture the full runoff from the respective racing track and the additional storage required to match the historical existing outflows for each catchment, based on a 24-hour nested storm event, further explained in the stormwater modelling report. Figure 8 below provides a general overview of the proposed grassed swales and attenuation / irrigation ponds.

## 6.14 Irrigation Re-use

The proposed horse racing tracks are anticipated to incorporate a subsoil drainage system within the track formation to maintain suitable surface and subsurface drainage conditions during periods of elevated rainfall. The subsoil drains will capture excess water that is not retained within the turf profile and convey it to the central irrigation ponds for storage and subsequent reuse. In addition to managing natural groundwater and rainfall infiltration, the system will also recover excess irrigation water, providing an opportunity for recirculation and reducing the overall volume of water required to be abstracted from the on-site bore and underlying aquifer.

A further benefit of the proposed subsoil drainage network is its ability to intercept and retain water containing residual nutrients associated with track maintenance activities. By directing this water to the irrigation storage system, these constituents can be retained and reused within the site irrigation cycle, thereby reducing the potential for off-site migration and minimising the risk of adverse effects on surrounding receiving environments.

Given the substantial irrigation demand required to maintain the horse racing tracks in optimal conditions, it is proposed that rainwater harvesting measures be incorporated where practicable. Subject to appropriate treatment and water quality requirements, runoff collected from building roofs and hardstand areas will be directed to the irrigation ponds for storage and reuse. This approach will provide an additional non-potable water source, reduce stormwater discharges from the site, and further decrease reliance on groundwater abstraction from the on-site bore.

Collectively, the integration of subsoil drainage water recovery, irrigation water recirculation, and rainwater harvesting will contribute to a more sustainable site water management strategy by maximising water reuse

opportunities, reducing potable and groundwater demand, and enhancing environmental outcomes through improved containment of nutrients and other operational contaminants.

### 6.15 Rural Residential Primary Stormwater Management

Stormwater generated by roofs and hardstand areas within the rural residential precinct will be captured by downpipes and directed to reuse tanks. During events greater than the 10-year storm events, excess flows will sheet flow over the allotments and towards the southern swale directing stormwater towards the southern stormwater basin. Refer below for general swale plan.

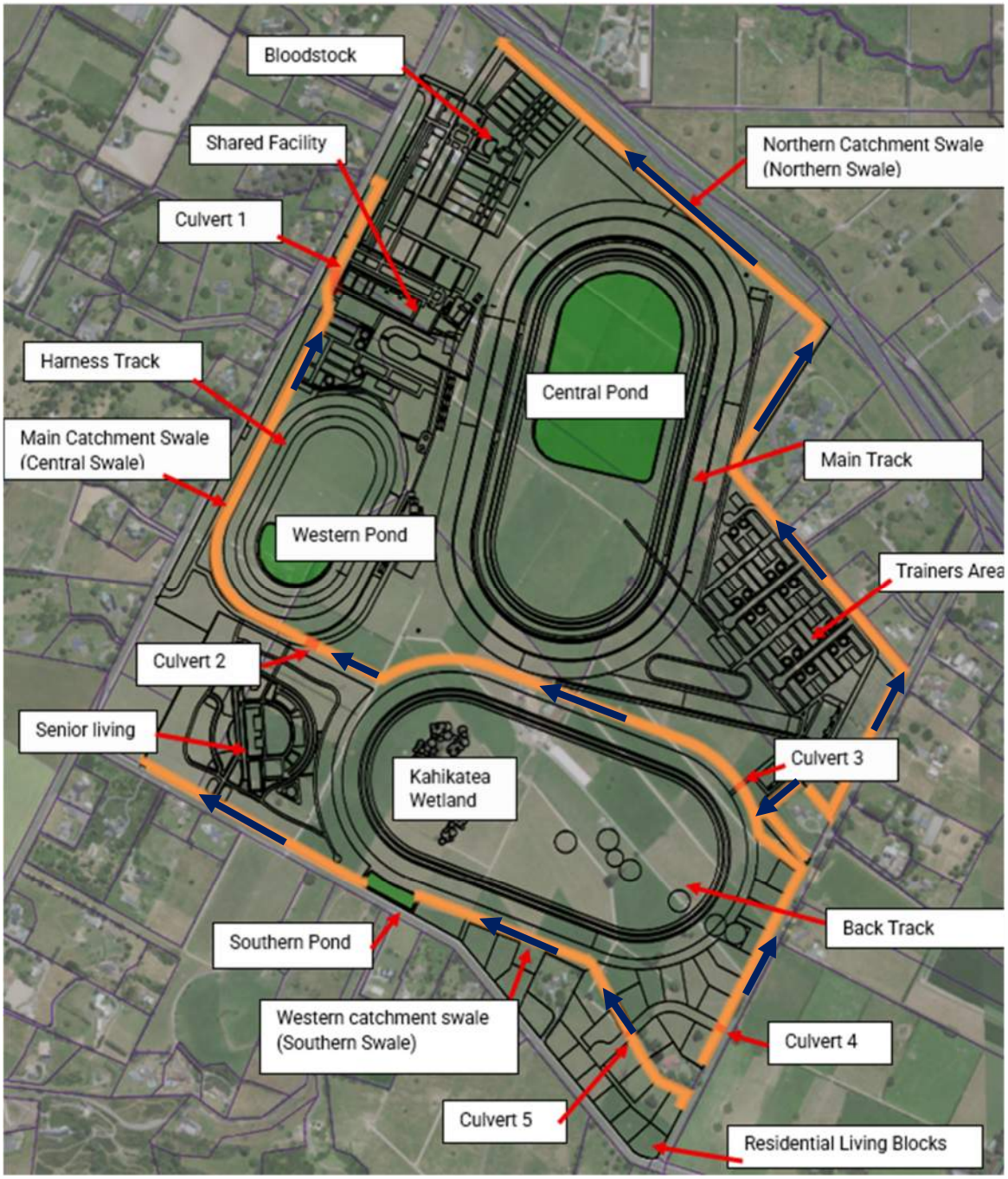



Figure 8 General overview of grassed swales and ponds

## 6.16 Proposed Overall Catchments and Flooding Swales

A catchment analysis was undertaken in Autodesk Storm and Sanitary Analysis (SSA) for the proposed development area to check the capacities of the swales in the 10% AEP.

Peak flow rates for the upstream catchment (as they entered the swales) were obtained from the GeoHECRAS model (discussed above). Peak runoff from the site's internal catchments were derived in SSA using the same curve number used in GeoHECRAS.

Table 9: Curve Numbers

| Curve Number – Soil C | |
|---|---|
| **Pervious** | **Impervious** |
| 86 | 98 |

Note: SSA uses an unchangeable Initial Abstraction Ration of 0.02 (rather than 0.05); however, as the pervious curve number is already considered conservative (86 is for poorly maintained pasture, chosen to account for the possibility of low maintenance) it is not considered to have a significant impact on the model outputs. SSA used the 10% AEP RCP 8.5 rainfall (as showed in Table 10).

The tables below show the catchments contributing to each swale, the catchment's peak runoff, the peak flow in each swale section. The tables below display the sub-catchments and swales from upstream to downstream, with upstream being at the top, resulting in swale sections further down the table including flow from prior swale sections and all prior catchments.

It should be noted that, while approximately cumulative, the SSA model accounts for attenuation within the swales and detention (flow) time within the swales (i.e. sub-catchment runoffs reach the swale simultaneously; however, each runoff runs into a different section of the swale). As a result, the flow in each swale segment is not simply a summation of the prior peak flows.

Table 10: Northern Catchment: Sub-Catchment Runoff and Northern Swale Flows

| Catchment | Sub-catchment | Area | Curve Number | 10% AEP Runoff | Northern Swale Section | Peak Flow | Depth |
|---|---|---|---|---|---|---|---|
| **North** | North Upstream Sub-Catchment 1 | | | 1,260 l/s | | | |
| | | | | | NS-6 | 1,201 l/s | 320 mm |
| | North Upstream Sub-Catchment 2 | | | 320 l/s | | | |
| | Trainers Area | 15.45 ha | 96.8 | 4,506 l/s | | | |
| | | | | | NS-5 | 5,601 l/s | 800 mm |
| | North Upstream Sub-Catchment 3 | | | 360 l/s | | | |
| | Racing Precinct 7 | 2.33 ha | 86 | 601 l/s | | | |
| | | | | | NS-4 | 6,115 l/s | 750 mm |
| | Racing Precinct 8 | 4.47 ha | 86 | 1,202 l/s | | | |
| | | | | | NS-3 | 6,434 l/s | 830 mm |
| | Bloodstock 2 | 3.70 ha | 94 | 1,113 l/s | | | |
| | | | | | NS-2 & 1 | 6,816 l/s | 860 mm |

Table 11: Main Catchment: Sub-Catchment Runoff and Central Swale Flows

| Catchment | Sub-catchment | Area | Curve Number | 10% AEP Runoff | Central Swale Section | Peak Flow | Depth |
|---|---|---|---|---|---|---|---|
| Main | Main Upstream Sub-Catchment 1 | | | 20 l/s | | | |
| | Rural Precinct 2 | 0.79 ha | 89 | 223 l/s | | | |
| | | | | | MS-17 & 16 | 217 l/s | 100 mm |
| | Main Upstream Sub-Catchment 2 | | | 260 l/s | | | |
| | Rural Precinct 1 | 3.46 ha | 89 | 971 l/s | | | |
| | | | | | MS-15 | 1,254 l/s | 350 mm |
| | Main Upstream Sub-Catchment 3 | | | 200 l/s | | | |
| | Rural Precinct 6 | 7.49 ha | 89 | 210 l/s | | | |
| | | | | | MS-14 | 1,576 l/s | 260 mm |
| | Main Upstream Sub-Catchment 4 | | | 550 l/s | | | |
| | Racing Precinct 1 | 0.69 ha | 86 | 185 l/s | | | |
| | | | | | MS-13 & 12 | 2,211 l/s | 410 mm |
| | Racing Precinct 1 | 1.47 ha | 86 | 396 l/s | | | |
| | | | | | MS-11 | 2,425 l/s | 430 mm |
| | Racing Precinct 3 | 2.66 ha | 86 | 717 l/s | | | |
| | | | | | MS-10 | 2,714 l/s | 460 mm |
| | Racing Precinct 4 | 7.43 ha | 87.2 | 2,033 l/s | | | |
| | | | | | MS-09, 08, & 07 | 3,540 l/s | 550 mm |
| | Racing Precinct 5 | 2.13 ha | 89.6 | 604 l/s | | | |
| | | | | | MS-06 & 05 | 3,828 l/s | 550 mm |
| | Shared Facility 1 | 4.61 ha | 96.8 | 1,394 l/s | | | |
| | | | | | MS-04 & 03 | 4,536 l/s | 620 mm |
| | Shared Facility 2 | 7.35 ha | 94 | 2,181 l/s | | | |
| | | | | | MS-02 | 5,387 l/s | 690 mm |
| | Bloodstock 1 | 4.26 ha | 94 | 1,262 l/s | | | |
| | | | | | MS-01 | 6,249 l/s | 730 mm |

Table 12: Western Catchment: Sub-Catchment Runoff and Southern Swale Flows

| Catchment | Subcatchment | Area | Curve Number | 10% AEP Runoff | Southern Swale Section | Peak Flow | Depth |
|---|---|---|---|---|---|---|---|
| West | South Upstream Sub-Catchment 1 | | | 260 l/s | | | |
| | | | | | SS-07 | 261 l/s | 110 mm |
| | Rural Precinct 6 | 3.17 ha | 89 | 892 l/s | | | |
| | | | | | SS-06 & 05 | 1,078 l/s | 260 mm |
| | Rural Precinct 4 | 2.45 ha | 89 | 772 l/s | | | |
| | | | | | SS-04 | 1,775 l/s | 350 mm |
| | Rural Precinct 5 | 2.81 ha | 89 | 792 l/s | | | |
| | | | | | SS-03 | 2,318 l/s | 400 mm |
| | Wetland | 0.62 ha | 92 | 179 l/s | South Pond | | |
| | | | | | SS-02 | 1,912 l/s | 360 mm |
| | Senior Living | 12.90 ha | 90 | 3,672 l/s | | | |
| | | | | | SS-01 | 4,985 l/s | 610 mm |

The SSA model assumed that runoff from each track was self-contained and did not contribute to the any of the swales. For the Main Track and Harness Track, the GeoHECRAS model confirmed that the track runoff would be contained within their track's respective irrigation and stormwater attenuation pond. These ponds were modelled within the SSA model. Both ponds were given a realistic minimal infiltration rate, based on Soil Group C. This rate was also applied to the South Pond, which forms part of the Southern Swale.

The GeoHECRAS model confirmed that a large portion of the runoff from the Back Track would pond on the Back Track northern raceways. Due to uncertainty on how the Track's formation will impact minimum infiltration rates, an infiltration of 0 mm/hr was assumed

The table below shows catchment, the pond infiltration, peak catchment runoff, and peak pond volume for each track

Table 13: Racing Track Catchments and Pond Volumes

| Catchment/Pond | Infiltration | Catchment Area | Curve Number | Peak Runoff | Pond Volume |
|---|---|---|---|---|---|
| **Main Track (Northern) Pond** | 3 mm/hour | 40.0 ha | 88 | 11,113 l/s | 51,951 $m^3$ |
| **Harness Track (Western) Pond** | 3 mm/hour | 10.0 ha | 87 | 2,730 l/s | 13,206 $m^3$ |
| **Back Track** | 3 mm/hour | 27.7 ha | 86 | 7,445 l/s | 37,453 $m^3$ |

The Flood Model Assessment Report noted that the Back Track ponding is presently overflowing into the Main Swale and states that some form of masonry wall should be installed to ensure flooding is retained with the Back Track. Part of the reason is that the Back Track's location is within the Western catchment, meaning this overflow contributes additional flow to the Main Catchment, which cannot be offset by the existing flows. In turn, resulting in a higher attenuation requirement.

The SSA model (stated in this report) assumed that this wall was is in place and that the Back Track flooding is fully contained. However, the SSA model results in the appendix include a scenario with the Back Track overflow (obtained from GeoHECRAS).

The graph below shows the two results side by side, showing the impact the Backtrack overflow has on both the peak flow in and total volume through the Main Flooding Swale.

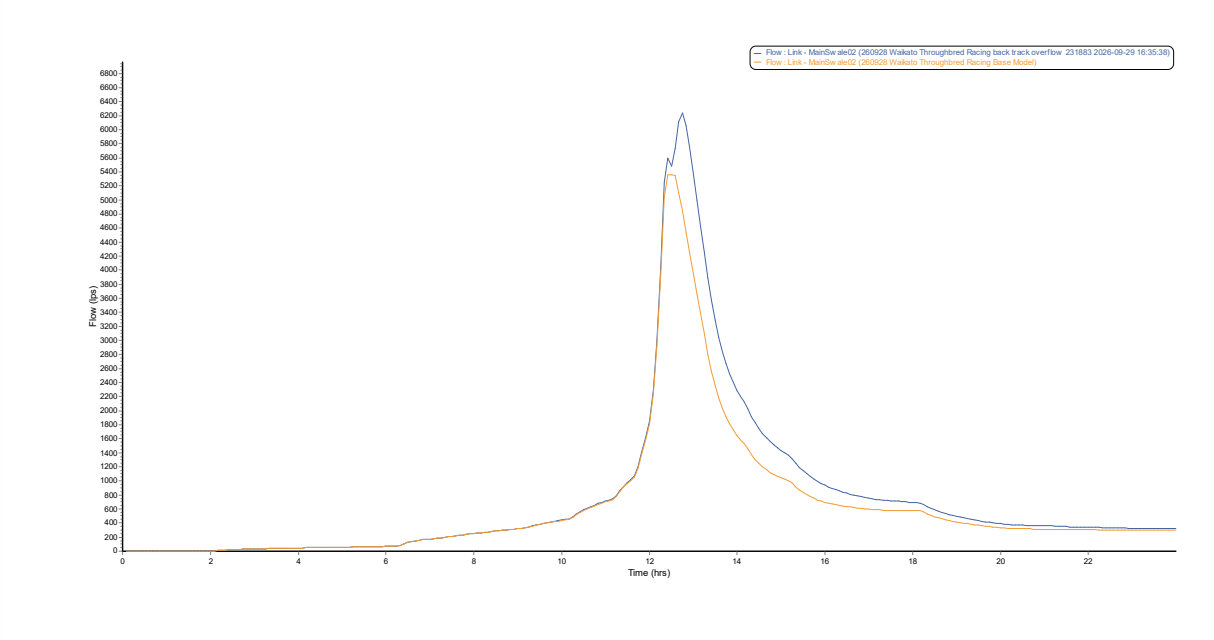



Figure 9: Flow in Main Swale with and without the Back Track Overflow

## 6.17 Precinct Specific Stormwater Management

## 6.18 Bloodstock Precinct

The bloodstock precinct has been modelled to ensure that all overland flows are directed to the nearby grassed swales. The majority of the precinct is graded towards the northern grassed swale, with the southwestern section of the precinct graded towards the main catchment outflow.

Rainwater harvesting tanks are proposed for each of the buildings within this precinct to allow for the capture and re-use of the rainwater. Runoff from hardstand areas within the precinct will be captured via appropriately located sumps and will discharge this runoff into the grassed swales for conveyance. Where possible this runoff will also be directed towards the attenuation / irrigation ponds.

It is expected that the rainwater tanks will provide retention for flows up to and including the 10-year ARI events, events greater than this will be directed directly towards the grassed swales for conveyance and will be directed to the northern and main catchment outlets. Provided that the events up to and including the 10-year ARI events are retained, the peak outflows from the bloodstock precinct are detailed in Table 13 below.

Table 13 Bloodstock precinct outflow volumes

| Rainfall Event | Northern Catchment Outflow | Main Catchment Outflow |
|---|---|---|
| 10% AEP | 0.88 m³/s | 0.38 m³/s |
| 5% AEP | 1.05 m³/s | 0.45 m³/s |
| 2% AEP | 1.20 m³/s | 0.56 m³/s |
| 1% AEP | 1.22 m³/s | 0.65 m³/s |

Hardstand runoff will flow to the proposed catchpits that will be installed with silt traps/sumps to allow for settlement of courser suspended solids. Baffle plates within the catchpits will ensure gross pollutants will be retained within the sump prior to discharge into the grassed swales for additional treatment. Treatment from runoff captured via roofs is typically not needed as this is defined as clean water.

## 6.19 Commercial Precinct

A similar approach for stormwater management has been applied to the commercial precinct, with the proposed surface grading towards the main catchment grassed swale providing for overland flow.

Rainwater harvesting tanks are proposed for each of the buildings within this precinct to allow for the capture and re-use of the rainwater. Runoff from hardstand areas within the precinct will be captured via appropriately located sumps and will discharge this runoff into the grassed swales for conveyance. Where possible this runoff will also be directed towards the attenuation / irrigation ponds.

It is expected that the rainwater tanks will provide retention for flows up to and including the 10-year ARI events, events greater than this will be directed directly towards the grassed swales for conveyance and will be directed to the northern and main catchment outlets. Provided that the events up to and including the 10-year ARI events are retained, the peak outflows from the commercial precinct are detailed in Table 14 below.

Table 14 Commercial precinct outflow volumes

| Rainfall Event | Inflow | Outflow |
|---|---|---|
| 10% AEP | 1.18 m³/s | 1.25 m³/s |
| 5% AEP | 1.40 m³/s | 1.48 m³/s |

| | | |
|---|---|---|
| 2% AEP | 1.71 m³/s | 1.78 m³/s |
| 1% AEP | 1.96 m³/s | 2.06 m³/s |

Hardstand runoff will flow to the proposed catchpits that will be installed with silt traps/sumps to allow for settlement of courser suspended solids. Baffle plates within the catchpits will ensure gross pollutants will be retained within the sump prior to discharge into the grassed swales for additional treatment. Treatment from runoff captured via roofs is typically not needed as this is defined as clean water.

## 6.20 Racing Precinct

The racing precinct covers the majority of the site and covers areas related to each of the three post-development catchments. The landform is generally graded towards each of the proposed grassed swales to ensure localised flooding within the site, especially near proposed buildings/structures is kept to a minimum. Generally, the stormwater can be split into stormwater that falls within the track areas (main thoroughbred, harness and training tracks) and stormwater that falls outside of the track areas.

Stormwater that falls within the main thoroughbred track and harness track areas is directed towards the respective stormwater attenuation/irrigation pond. Both ponds will have a base attenuation for use in irrigation along with additional temporary attenuation (with low flow outflows) for the storage of additional stormwater during larger events. Due to the presence of the existing kahikatea stand and borrow pit locations, the back tack will not have an irrigation / attenuation pond. However, the tracks formation will provide for attenuation within the track itself during large storm events. As there is little infrastructure proposed within this area, flooding of predominately grassed areas during large storm events has been deemed as an acceptable outcome.

Stormwater that falls outside of the tracks is directed towards the grassed swales that traverse the site. Runoff from hardstand areas within the racing precinct will be captured via appropriately located sumps and will discharge this runoff into the grassed swales for conveyance. The stormwater within the swales will be directed towards the attenuation / irrigation ponds within the main thoroughbred and harness tracks via high-level flow connections such that the northern and main catchments achieve hydraulic neutrality.

Hardstand runoff will flow to proposed catchpits that will be installed with silt traps/sumps to allow for settlement of coarser suspended solids. Baffle plates within the catchpits will ensure gross pollutants will be retained within the sump prior to discharge into the grassed swales for additional treatment. Treatment from runoff captured via roofs is typically not needed as this is defined as clean water. Rainwater harvesting tanks are proposed for each of the buildings within this precinct to allow for the capture and re-use of the rainwater.

Due to the scale of the racing precinct and the fact that flows are directed to be multiple catchment swales, a better representation of the flows through the site has been determined to be shown via the culvert flows, tabled below.

Table 15 Culvert flows within the racing precinct

| Rainfall Event | Culvert 1 | Culvert 2 | Culvert 3 | Culvert 4 | Culvert 5 |
|---|---|---|---|---|---|
| 10% AEP | 3.91 m³/s | 3.36 m³/s | 1.37 m³/s | 0.40 m³/s | 0.63 m³/s |
| 5% AEP | 5.53 m³/s | 4.81 m³/s | 1.77 m³/s | 0.49 m³/s | 0.86 m³/s |
| 2% AEP | 8.06 m³/s | 7.10 m³/s | 2.84 m³/s | 0.58 m³/s | 1.13 m³/s |
| 1% AEP | 9.85 m³/s | 8.69 m³/s | 3.65 m³/s | 0.71m³/s | 1.40 m³/s |

## 6.21 Senior Living Precinct

The senior living precinct has been modelled such that overland flows are directed towards the nearby western catchment grassed swale along Hooker Road, a secondary swale has also been modelled along the boundary with 516 & 502 Pencarrow Road to excess flows entering these properties is kept below existing predevelopment levels.

The grading of this precinct is general in nature as the final design of this precinct is be confirmed at detailed design stage with input required from a future operator to determine the best outcome for this precinct.

Stormwater is intended to be retained for reuse with, flows from larger events will be directed overland towards the grassed swales and directed towards the proposed attenuation / irrigation ponds within the racing precinct.

The use of catchpits with silt traps / sumps to allow for settlement of courser suspended solids. Baffle plates within the catchpits will ensure gross pollutants will be retained within the sump prior to discharge. Additional stormwater treatment devices such as rain gardens or similar may be required to meet water quality requirements, however this will be determined at the detailed design stage of this precinct.

Assuming that the sub-10% AEP events are retained, the peak inflows and outflows for the senior living precinct are:

Table 16 Senior living precinct outflow volumes

| Rainfall Event | Southward Flow | Westward Flow |
|---|---|---|
| 10% AEP | 0.28 m³/s | 0.90 m³/s |
| 5% AEP | 0.33 m³/s | 1.09 m³/s |
| 2% AEP | 0.42 m³/s | 1.44 m³/s |
| 1% AEP | 0.55 m³/s | 1.72 m³/s |

## 6.22 Rural Living Precinct

The rural living precinct proposed surface has been designed such that overland flows are directed towards both the main and western grassed swales. As with the senior living precinct, the proposed ground levels for this precinct are general in nature as additional input from an established residential developer is expected to determine the best outcome for this precinct.

Stormwater is intended to be retained for reuse with, flows from larger events will be directed overland towards the grassed swales and directed towards the proposed attenuation / irrigation ponds within the racing precinct.

The use of catchpits with silt traps / sumps to allow for settlement of courser suspended solids. Baffle plates within the catchpits will ensure gross pollutants will be retained within the sump prior to discharge. Additional stormwater treatment devices such as rain gardens or similar may be required for runoff captured within the road corridor to meet water quality requirements, however this will be determined at the detailed design stage of this precinct.

As outlined in the flood modelling report, the north-eastern corner of precinct does experience minor flooding (100-200 mm) during large storm events; however, localised landscaping the building FFLs will ensure that this does not pose an issue.

The precinct contains two culverts that may contribute to flooding if they become blocked. The stormwater design for these culverts will confirm that they are sized appropriately to reduce blockage risk, and operation and maintenance plans will be implemented to keep the culverts clear.

## 6.23 Summary of Proposed Stormwater Management

The stormwater management solutions for each post-development precinct are summarised in Table 17 below.

Table 17: Summary of stormwater management

| Precinct | Runoff Source | Water Quality | Flood Management |
|---|---|---|---|
| **Bloodstock** | Roof | Inert roof material<br>Rain harvest tanks to be provided capture and storage of rainfall for reuse<br>Excess flows directed to grassed swales | 10-year ARI events to be captured for irrigation reuse. Larger events to be directed to grassed swales |
| | Hardstand | Catchpits with silt traps and baffle plates<br>Discharge to grassed swales for treatment | Flow directed to grassed swales for conveyance |
| **Commercial** | Roof | Inert roof material<br>Rain harvest tanks to be provided capture and storage of rainfall for reuse<br>Excess flows directed to grassed swales | 10-year ARI events to be captured for irrigation reuse. Larger events to be directed to grassed swales |
| | Hardstand | Catchpits with silt traps and baffle plates<br>Discharge to grassed swales for treatment | Flow directed to grassed swales for conveyance and where possible directed to attenuation ponds |
| **Racing** | Roof | Inert roof material<br>Rain harvest tanks to be provided capture and storage of rainfall for reuse<br>Excess flows directed to grassed swales | 10-year ARI events to be captured for irrigation reuse. Larger events to be directed to grassed swales |
| | Hardstand | Catchpits with silt traps and baffle plates<br>Discharge to grassed swales for treatment and conveyed to attenuation / irrigation ponds for reuse | Flow directed to grassed swales for conveyance and directed to attenuation / irrigation ponds |
| | Rainfall within tracks | Stormwater is directed towards internal attenuation / irrigation ponds to allow for settlement of sedimentation. Stormwater is to be reused for irrigation purposes on the tracks | Flows captured by internal swales, as area within the tracks are largely clear of infrastructure, minor flooding is deemed as acceptable |
| **Senior Living** | Roof | Inert roof material<br>Collected and stored for reuse | Overflow of larger events to be directed to grassed swales |

| | | | |
|---|---|---|---|
| | Hardstand | Catchpits with silt traps and baffle plates<br>Raingardens or similar treatment as required prior to discharge to grassed swales | Onsite attenuation to be confirmed at detailed design stage prior to discharge to grassed swale for conveyance during large events |
| **Rural Residential** | Roof | Inert roof material<br>Collected and stored for reuse | Overflow of larger events to be directed to grassed swales |
| | Hardstand | Catchpits with silt traps and baffle plates<br>Raingardens or similar treatment as required prior to discharge to grassed swales | Flows generated during large events will be directed towards grassed swales for conveyance and attenuation |

# 7 WASTEWATER MANAGEMENT

## 7.1 Existing Infrastructure

Currently the site is not connected to the Council reticulated network. The existing dwellings on site make use of onsite disposal systems, and the effluent captured via the dairy farming infrastructure is directed towards effluent ponds to adequately manage the captured effluent.

## 7.2 Design Standards

The RITS wastewater design standards sets out design and construction standards for wastewater and requires all land development projects to be provided with a suitable means of wastewater disposal. As connection to the council infrastructure is not an option for this site, it is proposed that the development will have its own wastewater treatment plant to manage and treat wastewater on site.

## 7.3 Wastewater Flows

The expected wastewater flow for the proposed development has been assessed in general accordance with Auckland Regional Council Technical Publication No.58 (TP58) along with equine specific information and expected visitor numbers during large race day events. The expected wastewater flows from the site are summarised in 18 below. A more detailed breakdown of these calculations can be found in Appendix B.

Table 18: Average Daily Wastewater Flow Summary

| Source | Occupancy | Average Daily Flows (litres per second) | Comments |
|---|---|---|---|
| **Senior Living Precinct** | 422 people | 1.07 L/s | Treatment plant and disposal field to be wholly within its lot (not the wider site wastewater management). |
| **Bloodstock Precinct** | 1,000 people | 0.29 L/s | Will only occur approximately 9 times per year and will not coincide with Harness or Thoroughbred events |
| **Entry Road Commercial Precinct** | 360 people | 0.10 L/s | |
| **Harness Large Race Day*** | 3000 spectators | 0.94 L/s | Will only occur approximately twice per year and will not coincide with Bloodstock or Thoroughbred events |
| **Harness Training Days** | 90 non-spectators | 0.40 L/s | Trainings to occur Monday to Saturday |
| **Harness Stable Urine** | 205 stabled horses | 0.02 L/s | Urine to be captured via reticulation. 10% to be absorbed by woodchips within stables |
| **Thoroughbred Large Race Day*** | 6000 spectators | 1.75 L/s | Will only occur once per year and will not coincide with Bloodstock or Thoroughbred events. |

| | | | |
|---|---|---|---|
| **Thoroughbred Training Days** | 293 non-spectators | 1.73 L/s | |
| **Thoroughbred Stable Urine** | 900 stabled horses | 0.09 L/s | Urine to be captured via reticulation. 10% to be absorbed by woodchips within stables |
| **Equine Support Services** | 23 people | 0.01 L/s | |

Table 19: Summary of Normal Operations and Specific Event Day Average and Peak Wastewater Flows

| Source | Average Daily Flow | Peak Flow | Comments |
|---|---|---|---|
| **Senior Living Precinct Flows** | 1.07 L/s | 7.20 L/s | Discharges to own onsite system |
| **Normal Operation Flows** | 2.34 L/s | 4.16 L/s | Commercial flows + harness training flows + harness stable urine + thoroughbred training flows + thoroughbred stable urine + equine support flows |
| **Bloodstock Event Flows** | 2.21 L/s | 5.44 L/s | Bloodstock event flows + commercial flows + thoroughbred training + thoroughbred stable urine + equine support flows |
| **Large Harness Event Day Flows*/**** | 2.87 L/s | 8.82 L/s | Commercial flows + large harness event flows + thoroughbred training + thoroughbred stable urine + equine support flows |
| **Large Thoroughbred Event Day Flows*/**** | 3.67 L/s | 14.04 L/s | Commercial flows + large thoroughbred event flows + thoroughbred training + thoroughbred stable urine + equine support flows |

- ** No allowance has been made for event management activities such as the use of portable toilets. Accordingly, actual wastewater flows during large events are expected to be lower than calculated values shown on this basis.*
- *** No peaking factor has been applied to horse wastewater.*

*Table Notes:*

- *Refer to* Table 20 *below regarding treatment type.*
- *A typical 4-bedroom home generates approximate 1,600 litres per day of wastewater. It is the intent that these dwellings have individual OSET systems to treat and dispose of wastewater on lot; therefore, this has not been included in the above table.*

The current design also accounts for all wastewater flows from the peak race days to enter the reticulated system and does not account for the use of portable toilets which could greatly reduce the size of the required system. Further refinement of the proposed WWTP and how wastewater flows will be managed during race day events will be completed as part of the detailed design process.

As expected with this type of development, a considerable volume of waste will be generated by the stabled horses on site, which we understand are to peak at 900 horses once the equine hub is fully developed. Solid equine waste will be manually removed from the stables and transported off site to an appropriate facility.

## 7.4 Design Philosophy

The large variation in expected flows requires careful consideration for the most appropriate wastewater treatment and disposal systems. As such InnoFlow have been engaged to provide WTR with a site-specific system designed to accommodate the large fluctuations in the expected flows.

Due to the distance between the thoroughbred training facilities and equine support services and the rest of the site, combined with these flows being a lot more consistent, compared to the large variations expected during race day events, we have decided that it is appropriate to manage and dispose of the wastewater flows from this area via a typical OSET system.

The design of the senior living precinct is to be progressed at the detailed design stage to enable a more accurate figure can be placed to the number of occupants and staff such that a wastewater treatment plant and disposal system can be accurately sized. A preliminary sized MBBR treatment plant and land application disposal system has been sized based on the preliminary figures provided stated in Table 19 above.

As is typical for rural residential lifestyle lots in the surrounding area, OSET wastewater systems will be required to provide for the treatment and disposal of the wastewater generated wholly within each lot and the size and location of these systems will be confirmed at building consent stage for these lots.

## 7.5 Proposed Wastewater Treatment Systems

As the proposed development covers a range of precincts with various activities expected, several different wastewater treatment systems are proposed throughout the site. The race day facilities will be expected to manage the greatest flows and the largest variation of flows between peak and typical flows. A such InnoFlow have proposed the use of a moving bed bio reactor (MBBR) which is a form of aerated fixed film media process. The key benefit of an MBBR system is the resilience to fluctuating loads which is well suited to this area of the site.

Due to the more consistent flows expected from the thoroughbred trainers' facilities and equine support services, along with the large distance between this area of the site and the race day facilities a typical OSET wastewater system is proposed. Please see the below table outlining the different wastewater treatment systems for the different areas of the site.

As an MBBR is a specialised system, ongoing maintenance will need to be undertaken by an approved service provider. S3 Ltd (Sewage System Services) is the approved service provider for InnoFlow, offering routine servicing and maintenance for residential and commercial wastewater treatment systems and is to be engaged once the system. We understand that S3 Ltd service includes scheduled maintenance, remote alarm monitoring, management of emergency call-outs, compliance, repairs and upgrades.

Table 20: Wastewater Treatment Systems

| Wastewater Flows | Wastewater Treatment | Notes |
|---|---|---|
| Bloodstock, Commercial Precinct and Race Day facilities | MBBR System | As designed by InnoFlow to accommodate for large fluctuations in flows during events on site |
| Senior Living Precinct | MBBR System | The current MBBR system has been sized to accommodate the flows from the Senior Living Precinct however it is expected that as the design progresses, a separate system for this precinct will be designed. |
| Rural Residential Allotments | Typical OSET system | Typical OSET systems to be installed within each allotment |

| | | |
|---|---|---|
| Thoroughbred Trainers Precinct and Equine Support Facilities | Typical OSET system | Typical OSET system to accommodate flows from trainers, equine support buildings and horse washdown water |

## 7.6 Proposed Wastewater Reticulated Network

The wastewater reticulated network for the race day facilities is based on a gravity system with a series of Ø225mm, Ø150mm and Ø100mm pipes servicing the proposed buildings and facilities. Due to the scale of the site and concentrating flows towards the proposed above wastewater treatment systems, a pump station is expected to be required as shown on the attached civil plans. The pump station will pressurise the sewage into a rising main that will discharge into the proposed WWTP. The specification and design of the wastewater pump station and WWTP will be provided at detailed design stage.

The thoroughbred trainers' facilities and equine support services will be connected to a gravity system with a series of Ø225mm, Ø150mm and Ø100mm pipes that will convey the wastewater a typical primary and secondary OSET wastewater treatment system. The final layout and size of this system will be expanded as the design progresses.

While the MBBR WWTP located within the race day facilities has been sized to accommodate flows from the senior living precinct, connect to this WWTP has not currently been shown on the attached plans. If this precinct was to connect to the system, a pump station would be required to pressurise the wastewater and allow it discharge into the WWTP. However, we understand that as the design of the development progresses it is likely that a separate MBBR or equivalent system will be constructed to solely service the senior living precinct. This will be further detailed as the design progresses.

## 7.7 Irrigation of Treated Wastewater

Engagement with Filtec who will provide the treatment plant for the water supply have stated that a specialist treatment plant could be used as part of the wastewater treatment plant to effectively filter the wastewater generated from the site and safely use it as irrigation water. The cost to benefit of this system is currently being investigated to see if it is feasible as this potentially provides multiple benefits to the site. Not only does it ensure that the wastewater generated from the site is treated to a very high level, but it also has the potential to reduce the irrigation demand requirements of the proposed bore onsite and as such will lessen the impact on the aquifer. This system will be further developed as the design progresses.

# 8 WATER SUPPLY MANAGEMENT

## 8.1 Existing Infrastructure

The existing dwellings are currently serviced by a combination of rain harvesting from roof run off and shallow bores located throughout the property. Whilst the site has the potential to connect to the restricted rural water reticulation network located with Pencarrow Road and Hooker Road, currently this is not the case.

## 8.2 Proposed Water Supply

As the site will require a substantial volume of water for both human and equine consumption along with irrigation needs for the various horse tracks, it is proposed this is supplied in part via. bore.

To date, a test bore has been drilled and testing on the water quality been completed and Wallbridge Gilbert Aztec (WGA) have been engaged to provide a detailed hydrogeologist report on the effects of the proposed bore will have on the surrounding aquifers and neighbouring bores.

Initial bore-water testing identified elevated iron and manganese concentrations. On-site treatment will therefore be required before potable water is distributed through the proposed site reticulation network. As such specialist water treatment providers, Filtec have been engaged to provide a suitable treatment plant ensuring that potable water is treated to an acceptable level.

Water drawn from the bore for irrigation purposes is currently proposed to go through a much simpler treatment system that is ultimately about protection of the irrigation infrastructure itself rather meeting drinking standards.

Currently, we have designed and modelled the full development being supplied with water from a single bore. The proposed water supply infrastructure and reticulation layout shown currently meets the sites requirements, however we understand in practice that as the design for the development progresses it is more likely that multiple bores will be established onsite reducing the drawn down in a single location and also reducing the total length of water pipes to be installed.

The table below provides a high-level overview of the currently proposed water supply network for the development.

Table 21: Summary of Proposed Water Supply Infrastructure

| Infrastructure | Description |
|---|---|
| Production Bore | Located within Bloodstock precinct. To be as close as possible to test bore |
| Potable Water Treatment Plant | Specialist water treatment consultant (Filtec) has been engaged to provide an appropriate water treatment plant for the site |
| Potable Booster Pump | Booster pump to be constructed near training facility off Duncan Road to ensure adequate pressure |
| Irrigation Booster Pump | Provided near both irrigations ponds to meet irrigation requirements. Further detail to be provided as the design progresses |
| Potable Water Main | A mixture of Ø180 PE and Ø125 PE watermains throughout the development ensuring adequate pressure and volume needs are meet |

## 8.3 Taumata Arowai

As potable water will be made available for consumption from a bore onsite, WTR or another relevant identity will be classified as a self-supplier for water services. This triggers obligations in regards to drinking water safety, treatment and compliance. As such we have engaged with Taumata Arowai to ensure the proposed network reticulation supplying the separate precincts is appropriate. Filtec have also been engaged to ensure appropriate treatment of the water meets the required guidelines and compliances.

## 8.4 Expected Changes to Water Supply

The calculations we have undertaken to date show that with the one production bore onsite, all water demands can be meet however we understand that as the detailed design of the development progress the following changes are likely to occur and as such, we believe it is prudent to highlight these now.

It is highly likely that the senior living precinct in the southern corner of the site will be serviced with its own private water bore and separate treatment plant. This ensures that potable water will not traverse boundaries and as such is in line with surrounding developments.

We are also of the understanding that the rural residential section in the southeast corner of the site will also be serviced by rainwater tanks and potentially (pending availability and Council approval) connection to the existing council restricted rural water supply reticulation located with Hooker Road.

## 8.5 Potable Water Demand

As the site consists of a range of activities which all have very different water demands, a breakdown of each zone and the calculated potable demand is outlined below.

Table 22: Average Daily Potable Water Demand

| Demand | Daily Flow | Peak Flow | Comments |
|---|---|---|---|
| **Senior Living Precinct** | 1.27 L/s | 6.35 L/s | Potential for separate bore to be drilled within the site to supply required demand |
| **Bloodstock Precinct** | 0.35 L/s | 1.74 L/s | Will only occur approximately 9 times per year and will not coincide with Harness or Thoroughbred events |
| **Entry Road Commercial Precinct** | 0.12 L/s | 0.62 L/s | |
| **Harness Large Race Day** | 1.15 L/s | 5.73 L/s | Will only occur approximately twice per year and will not coincide with Bloodstock or Thoroughbred events |
| **Harness Training Days** | 0.43 L/s | 2.15 L/s | Trainings to occur Monday to Saturday |
| **Thoroughbred Large Race Day** | 2.12 L/s | 10.60 L/s | Will only occur once per year and will not coincide with Bloodstock or Thoroughbred events |
| **Thoroughbred Training Days** | 2.25 L/s | 11.27 L/s | |
| **Equine Support Services** | 0.01 L/s | 0.05 L/s | |

*Table note:*

- *A typical 4-bedroom home uses approximately 1,900 litres per day of potable water. It is the intent that these dwellings will include retention tanks collecting roof water run off within each lot; therefore, this has not been included in the above table.*

Table 23: Summary of Normal Operations and Specific Event Day Average and Peak Potable Water Demand

| Demand | Daily Flow | Peak Flow | Comments |
|---|---|---|---|
| **Senior Living Precinct Demand** | 1.27 L/s<br>110m³/day | 6.35 L/s | Potential for separate bore to be drilled within the site to supply required demand |
| **Normal Operation Demand** | 2.82 L/s<br>244m³/day | 14.10 L/s | Commercial demand + harness training demand + thoroughbred training demand + equine support demand |
| **Bloodstock Event Demand** | 2.74 L/s<br>236m³/day | 13.68 L/s | Bloodstock demand + commercial demand + thoroughbred training + equine support demand |
| **Large Harness Event Day Demand** | 3.53 L/s<br>305m³/day | 17.67 L/s | Commercial demand + large harness demand + thoroughbred training demand + equine support demand |
| **Large Thoroughbred Event Day Demand** | 4.51 L/s<br>390m³/day | 22.55 L/s | Commercial demand + thoroughbred large race day + thoroughbred training demand + equine support demand |
| **Rural Residential Demand** | 0.41 L/s<br>35m³/day | | Each lot to manage their supply individually |

** Rainwater harvesting tanks are to be used throughout the site to capture and reuse rainwater as potable water. Approximately, 25,000 litres of storage has been shown for every 250m² of roof area throughout the development.*

*** Although it is expected that each Rural Residential Lot uses roof water to supply each dwelling, there may be an option of connecting to reticulated supply in the future subject to Council supply and approval.*

Further details on how these flows were calculated are shown on the attached water calculation sheets in Appendix B.

As can be seen from the table above, there is a substantial difference between the race day demand and the typical daily demand. It is worth noting that the peak race day demand is only expected to occur a few times per year.

## 8.6 Irrigation Water Demand

Waikato Thoroughbred Racing have engaged an agronomist to accurately determine the volume of water required to keep the proposed racetracks sufficiently irrigated to meet their requirements. The agronomist calculations are summarised in the below table.

Table 24: Summary of Irrigation Requirements completed by Agronomist (mega litres)

| Track | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grass Tracks | 21.91 | 16.70 | 10.42 | 9.19 | 9.19 | 9.19 | 9.19 | 9.19 | 9.19 | 9.19 | 15.47 | 17.92 |
| Other Tracks | 1.78 | 1.78 | 1.78 | 1.78 | 0.20 | 0.20 | 0.20 | 0.20 | 1.78 | 1.78 | 1.78 | 1.78 |
| Harness Tracks | 3.22 | 3.22 | 3.22 | 1.93 | 1.93 | 1.93 | 1.93 | 1.93 | 1.93 | 3.22 | 3.22 | 3.22 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total** | 26.91 | 21.70 | 15.42 | 12.91 | 11.33 | 11.33 | 11.33 | 11.33 | 12.91 | 14.19 | 20.48 | 22.93 |

To accommodate the irrigation demand, water re-use from hardstand areas such as the roofs and roads/carparks is proposed. The rainwater from these areas will be captured and conveyed via a series of underground reticulation pipes and open swales towards the centralised irrigation ponds located within both the thoroughbred and harness racing tracks. Prior to entering these ponds, the water will be appropriately treated, predominantly via swales. This treatment will be further detailed as the design progresses.

As can been seen in the attached water demand calculations and 24 above, the volume of water captured during winter increases while the volume of water required decreases. The volume of water drawn from the bore will reduce during the winter months and will allow the aquifer time to recover.

The volume of the irrigation ponds has been calculated as shown in B, which accounts for the fluctuations in the irrigation demand and water runoff captured. It has been sized to provide approximately 1 months' worth of irrigation water should there be a prolonged drought in the area. We believe that this is conservative as it is likely that if there is a drought, then irrigation requirements will be reduced to effectively manage the water usage.

It is worth noting that a secondary irrigation only bore is likely to be drilled to a similar depth to reach the same aquifer as the existing test bore; details are included in the Hydrogeologist Report.

Two scenarios have been accounted for in the attached calculations. A maximum irrigation bore take of 725m³ per day for 120 days over summer, with an additional 100m³ in late spring has been assumed. Irrigation demand for the tracks has been provided by the agronomist, which has included provision for irrigation during winter months in case of dry weeks. This scenario results in a net surplus of 800m³ per year.

The hydrologist has assessed the water bore take at a more realistic rate of 337m³ for 120 days over the summer period. This take has been adjusted to account for no irrigation demand on the grass tracks during winter and reduced demand for all tracks during autumn and spring. Using a more realistic take from the bore results in a net deficient of 5,746m³ per year. This is an ongoing operational risk of the development that the operators are aware of and need to account for filling the irrigation pond to the starting volume every 16 years (approximately, based on calculations).

For both scenarios, evaporation-reduction measures have been applied (assumed to reduce evaporation losses by 90%). Some such measures are shade balls, or the use of floating solar arrays such as the He Anga Paneke, floating solar project in Dannevirke.

As the design progresses, the irrigation network including the use of rainwater harvesting tanks will be further developed and the final size of the pond and required take from the bore will be adjusted as necessary.

## 8.7 Water Demand Modelling

Once further testing has been undertaken on the production bore for the site, the bore pressure that we can expect to use will be modelled to ensure that adequate pressure will be made for each proposed building and if required additional booster pumps will be constructed onsite to meet the required pressures.

## 8.8 Firefighting Requirements

Firefighting requirements will be meet in accordance with SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice. As can be seen in the attached civil plans, multiple hydrants are proposed throughout the development to ensure that each building can be adequately serviced by a fire hydrant. At this stage, details regarding the use of sprinkler systems in the buildings is unknown.

Fire and Emergency New Zealand (FENZ) have been engaged as part of this development and their letter or support is attached to this report. They highlight the need for further discussion around the use of sprinkler systems as the design progresses and maintaining clear and compliant access for their firefighting appliances. In their attached letter, FENZ have provided their *in-principal* support for this development.

# 9 INFRASTRUCTURE DURABILITY

As previously noted, areas of the site have been identified as having a high probability of containing acid sulfate soils. As such an acid sulfate soils assessment has been completed by BCD Group which outlines how the soils on the site will be tested, and if the tests come back positive, how the risks associated with the proposed infrastructure can be adequately managed.

# 10 TE TURE WHAIMANA O TE AWA O WAIKATO

## 10.1 Statutory and Design Context

Te Ture Whaimana o Te Awa o Waikato – the vision and strategy for the Waikato River, established the overarching direction for restoring and protecting the health and wellbeing of the Waikato River for future generations. The overall vision of Te Ture Whaimana is *"Our vision is for a future where a healthy Waikato River sustains abundant life and prosperous communities who, in turn, are all responsible for restoring and protecting the health and wellbeing of the Waikato River, and all it embraces, for generations to come".*

## 10.2 Relevance to the Proposed Development

The proposed development has the potential to affect the Waikato River and its catchments through

- *Changes to site hydrology and peak stormwater flows.*
- *Increased impervious surface areas.*
- *Sediment generation during earthworks.*
- *Mobilisation of hydrocarbons, heavy metals, nutrients, litter and other contaminants.*
- *Modification of overland flow paths and flood storage.*
- *Effects on streams, wetlands and aquatic habitat.*
- *Cumulative effects when considered alongside other development within the catchment.*

The proposed design has been developed using an integrated and precautionary approach. In particular, the proposal seeks to avoid further degradation of downstream receiving environments rather than relying on the dilution capacity of the Waikato River. This is consistent with the Te Ture Whaimana objectives concerning integrated catchment management, avoidance of cumulative effects and recognition that the Waikato River should not be required to absorb further degradation.

## 10.3 Relevant Te Ture Whaimana Objectives

The table below summaries how the proposed development responds to the relevant objectives of Te Ture Whaimana.

Table 24: Te Ture Whaimana Objective Response

| Relevant Objective | Civil Design Response |
|---|---|
| Restore and protect the health and wellbeing of the Waikato River | Stormwater treatment, flow attenuation, erosion and sediment controls, and protection of downstream receiving environments reduce the potential for the proposed development to adversely affect the health of the Waikato River.<br><br>The design adopts low impact design engineering principals, including planted swales to treat and convey stormwater in all design storm events, wet ponds to store and treat stormwater. The design aims to retain the existing flows onto the site and flows offsite to best achieve hydraulic neutrality. |

| | |
|---|---|
| Restore and protect the relationships of the Waikato River iwi with the river | The design recognises that water quality, ecosystem health and access to healthy waterways are integral to cultural, spiritual and customary relationships with the river. Protecting the kahikatea trees, borrow pits and providing a native bush track all align with restoring and protecting the relationships of the Waikato River with iwi.<br><br>The wider design uses low impact design and green infrastructure to support this. |
| Support community relationships with the Waikato River | The proposed development provides for safe public access, landscape enhancement, recreational connections, while managing development-related effects on the receiving environment |
| Apply integrated, holistic and coordinated management | Earthworks, stormwater, flooding, ecology, landscape and long-term asset maintenance have been considered together rather than as separate engineering matters |
| Adopt a precautionary approach | The proposed design incorporates treatment and risk-control measures where discharges may otherwise create uncertain or potentially significant downstream effects |
| Recognise and avoid cumulative effects | The proposal does not rely on the Waikato Rivers remaining capacity to absorb contaminants. Treatment and attenuation are proposed at source to minimise the proposed development's contribution to catchment wide effects. |
| Recognise that the river should not absorb further degradation | Sediment and stormwater contaminants will be managed in accordance with Waikato Regional Council Erosion and Sediment Control Guidelines before leaving the site. The earthworks will also be completed in stages to further minimise impacts on the receiving environment. |
| Protect and enhance significant sites, fisheries, flora and fauna | Minimal earthworks and development is proposed around the existing kahikatea trees. All proposed stormwater culverts will be constructed to allow for fish passage. Significant landscape planting is proposed as per the landscape master plan which will enhance the area that is currently predominantly grasses paddocks. |

Based on the proposed design measures, the proposed development is considered to be generally consistent with Te Ture Whaimana o Te Awa o Waikato. In particular, the proposed design:

- *Will manage sediment and stormwater contaminates close to source*
- *Limit adverse changes to downstream stormwater flows*
- *Recognises the degraded state of the Waikato River and its limited ability to dilute further contaminants within its catchment*
- *Provides for ecological enhancement*
- *Avoids or minimises the project's contribution to the cumulative degradation of the Waikato River catchment*

Subject to the implementation of the detailed design, construction controls and maintenance obligations, the proposal is expected to protect the receiving environment and contribute to the long-term restoration and protection sought by Te Ture Whaimana.

# 11 SUMMARY AND CONCLUSIONS

Several matters remain subject to confirmation during detailed design and subsequent approval processes. These include final stormwater pond outlet controls, culvert sizing, finished floor levels, wastewater treatment and disposal arrangements, bore yield and drawdown effects, potable water treatment, fire appliance access, construction staging, erosion and sediment control measures, and final asset ownership and maintenance responsibilities.

Based on this engineering report (and other supporting technical reports) we consider that the proposed development can be accommodated at the subject site.

Stormwater drainage can be provided for the development through overland flow paths, stormwater attenuation ponds and re-use of stormwater for irrigation purposes where possible. Overland flow paths will be managed through the development, and it will reduce any potential flooding risk of the proposed infrastructure associated with this development. The overland flow paths and the proposed stormwater attenuation ponds will ensure that both the upstream and downstream environments will not be adversely affected. An overarching stormwater strategy has been developed, and this sets out the high-level, best practice approach for stormwater management within the catchment.

Wastewater management can be provided for the various development precincts though piped networks. A mixture of specialist and typical wastewater treatment facilities will be provided to ensure that the wastewater generated from the development will be appropriately treated prior to discharging to land. A mixture of specialist infrastructure and typical OSET design systems will ensure the development can effectively manage the large fluctuations of expected wastewater flows during the large events.

Potable and irrigation water for the development will be supplied via an on-site bore, supported by storage tanks, ponds and pumps and filtration systems designed to meet the required demand. A test bore has been drilled on-site, with water quality reports completed to ensure treatment for consumption can be undertaken. The Hydrogeologist report confirms the proposed groundwater take, temporary construction dewatering and long-term groundwater take can be managed without unacceptable hydrogeological effects subject to their recommendations.

Additional investigation works and detailed reporting for three waters and earthworks will be required to support further approval processes via standard engineering approvals.

# 12 REPORT LIMITATIONS

This report has been prepared for our client for their purposes. It is not to be relied upon or used out of context by any other person without reference to BCD. The reliance by other parties on the information or opinions contained in this report shall, without prior review and agreement in writing, be at such parties' sole risk.

Engineering design and modelling completed for this report is of a preliminary level of detail only. The purpose of the modelling is to confirm the sizing for any civil infrastructure that may convey or dispose of the generated waste or runoff from the proposed development. These calculations will be subject to further refinement during Detailed Design/ Engineering Plan Approval and may require further input.

# Appendix A Master Plan Drawings

DESIGNGROUP STAPLETON ELLIOTT + COX

# WAIKATO THOROUGHBRED RACING
# **WAIKATO RACING HUB**
# **SUBSTANTIVE APPLICATION**

Issued for Substantive Application
Version 01 • 25 September 2026

designgroup
stapleton elliott

# DESIGN STATEMENT

The proposal establishes a clear architectural and landscape architectural framework for a world-class horse racing venue within an integrated rural destination in the heart of the Waikato. It is conceived as a place shaped by landscape, movement, arrival, and rural character, with built form, open space, and activity carefully composed to create a distinctive and enduring development.

The design approach avoids the introduction of an urban model and instead responds to the scale, openness, and texture of the surrounding rural environment. Buildings, race-day facilities, training areas, landscape structure, and complementary uses are organised within a coordinated site composition that reinforces the character of the land rather than competing with it.

At its core, the site will provide a first-class horse racing venue for both thoroughbred and harness racing, supported by major training facilities for both codes. Race-day operational requirements will be integrated with entertainment and event facilities, allowing the venue to function as a highly active public destination on race days while also supporting wider events, gatherings, and community use at other times.

Complementary development, including a senior living complex with villas, apartments, assisted living and shared community facilities, together with rural lifestyle blocks, will be arranged to create a coherent settlement pattern within the broader site.

Commercial activity is structured around two distinct but complementary precincts: a flexible commercial area near the racing entry and an equine-related commercial area adjacent to the training barns. A substantial bloodstock sales venue is also accommodated on the site, reinforcing the development's role as a regional equine destination. These elements support the overall destination while maintaining a considered relationship with open land, views, access, and the rural edge.

Overall, the development is design-led in its ambition to create a legible, high-quality rural environment where architecture, landscape, equine activity, lifestyle living, and commercial viability are brought together as a single, integrated place. The outcome sought is not simply a collection of uses, but a well-structured rural destination that reflects the identity of the Waikato and contributes positively to its sporting, community, and landscape character.

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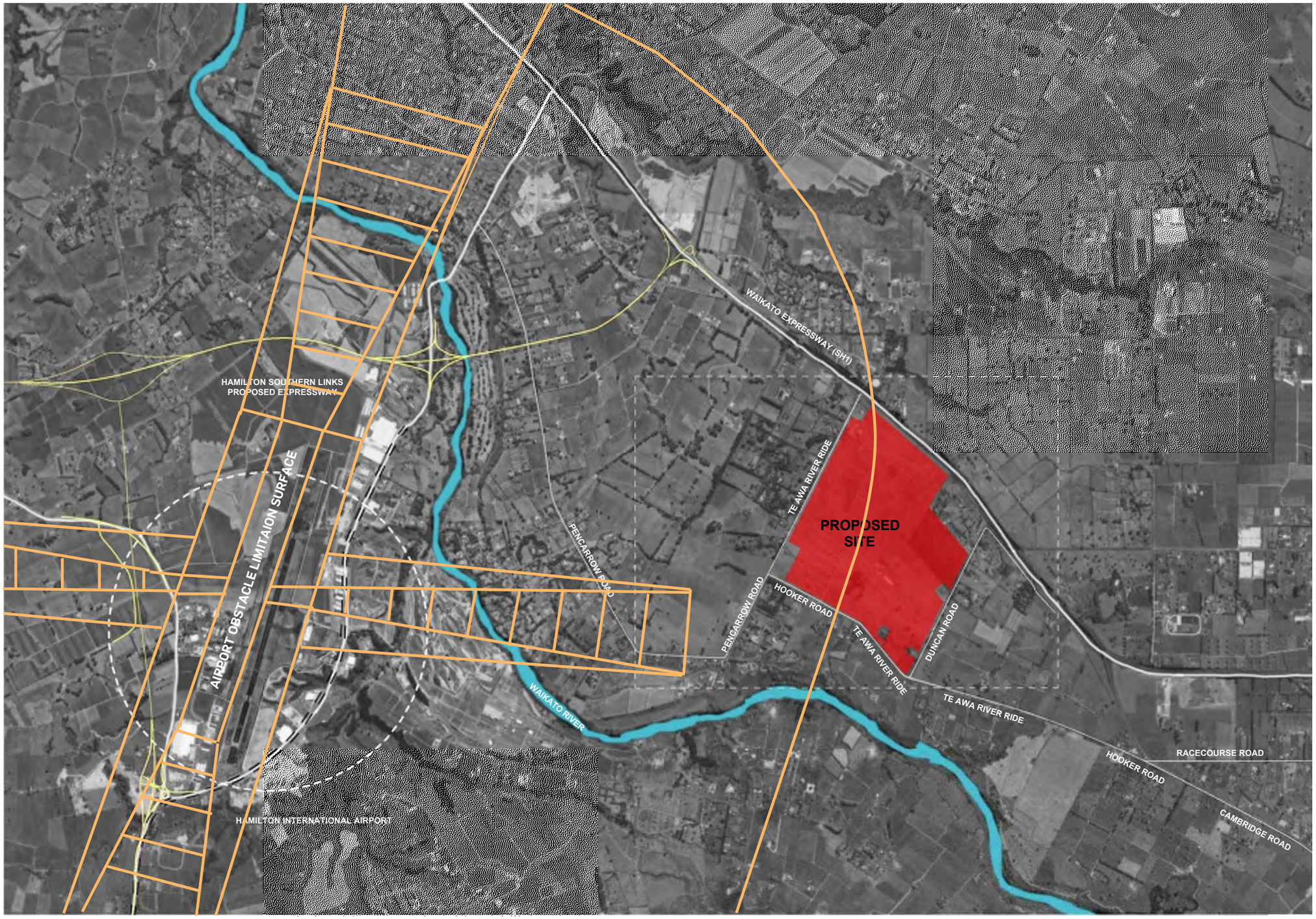
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# 1

# OVERALL SITE

# 1.1 LOCATION PLAN




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# 1.2 EXISTING SITE PLAN




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# 1.3 CLOSE AERIAL VIEW - RENDER



Artist's Impression - Indicative Only

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# 1.4 MASTERPLAN




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# 1.5 INDICATIVE COMMERCIAL ZONES

**1 Commercial Equine Services**

Area ~7,600sqm
GFA – 7,600sqm. Max 2 floors
2 Blocks @ 3,800sqm GFA each

**2 Bloodstock**

Areas ~ 55,200sqm
GFA – 14,200sqm. Max 2 floors
Function and Auction Block – 3000sqm
Stables – various sizes – total – 11200sqm

**3 Commercial Hub**

Area - 23,000sqm
GFA - 8,900sqm. Max 2 floors
4 blocks 2 800sqm GFA
6 Blocks @ 300sqm GFA
1 Block @ 600sqm GFA
1 Block @ 1300sqm GFA
1 Block @ 2000sqm GFA

**4 Training Areas**

Area ~100,000sqm
GFA - 32,600sqm. Max 2 floors
WTR – 17x12 horse stables @ 413sqm
WTR – 22x24 horse stables @ 825sqm
Harness – 2x12 horse stables @ 413sqm
Harness – 8x24 Horse stables @ 825sqm

**5 Rural Residential Development**

Area ~85,000sqm
34 @ 2,500sqm Lots

**6 Comprehensive Residential Development for Senior Living**

Area ~115,000sqm
GFA - 16,550sqm. Max 2 floors
90 Villas – average 100sqm - single floor
40 Apartments - average - 50sqm - max 2 floors
180 care suites – average 25sqm – max 2 floors
Community Centre – 1050sqm – single floor

*All figures are approximate. Indicative only.*




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# 1.6 VIEW SHAFTS - PLAN



# 1.7 PENCARROW MAIN ENTRY - RENDER




Artist's Impression - Indicative Only

# 1.7 PENCARROW SECOND ENTRY - RENDER

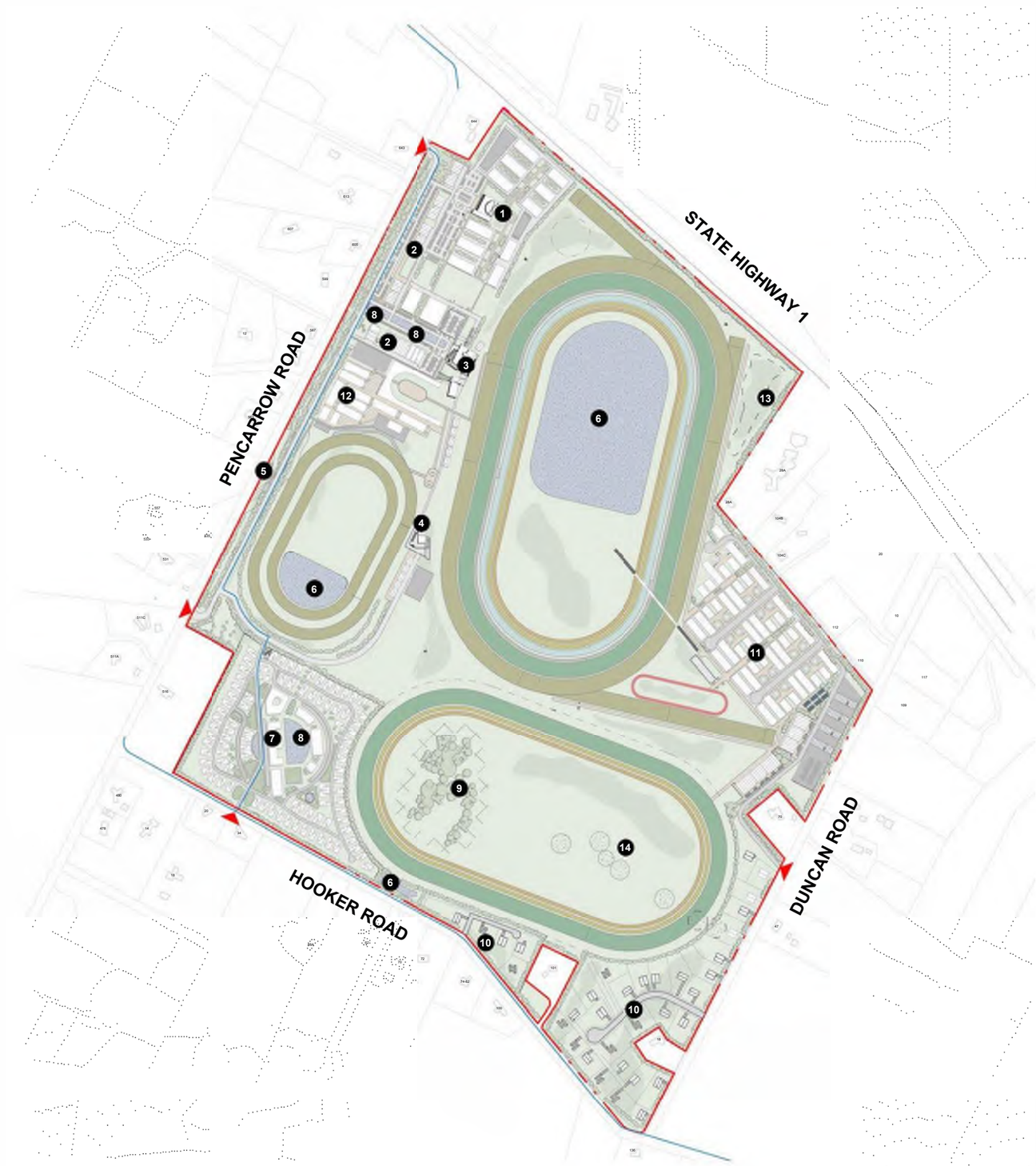



Artist's Impression - Indicative Only

# LANDSCAPE

# 2

# 2.1 SITE PLAN




**LEGEND**

- Site Boundary
- Proposed Cycle Link
- Te Awa River Ride
- Site Entry

1. Bloodstock
2. Commercial Precinct
3. Thoroughbred Events Building
4. Harness Events Building
5. Public Viewpoint & Karakia Space
6. Stormwater Pond
7. Comprehensive Senior Living Development
8. Pond
9. Existing Kahikatea Stand
10. Lifestyle Blocks
11. Thoroughbred Stables
12. Harness Stables
13. Native Bush Track
14. Borrow Pits

NOTES:

Refer to Landscape Callouts For Further Details.
For Development Areas Refer to Architectural Drawings.

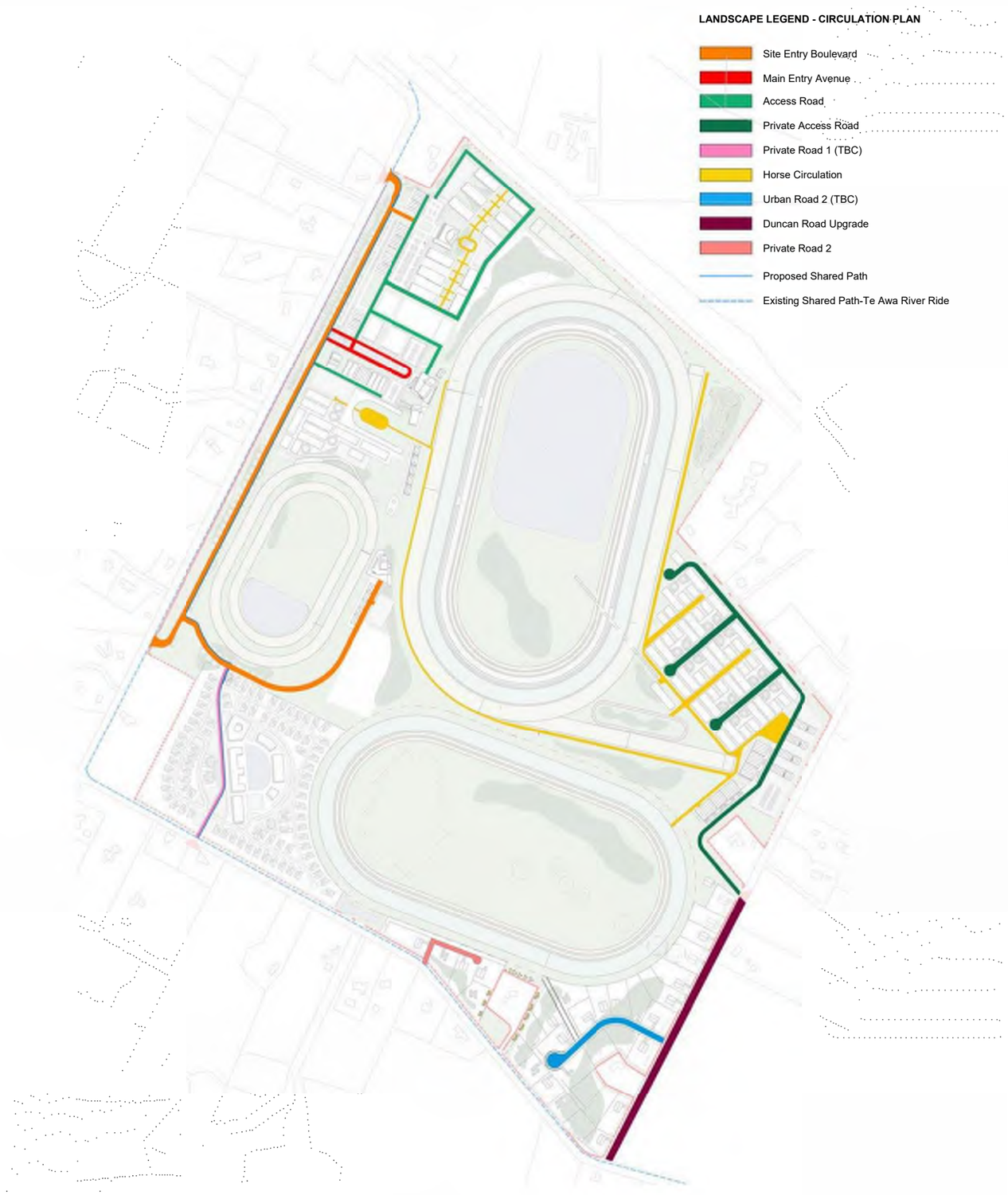
**LANDSCAPE SITE PLAN V.14**
SCALE @ A3 -1 : 10000

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# 2.2 CIRCULATION AND SWALES PLANS

N




LANDSCAPE CIRCULATION PLAN
1 : 10000




LANDSCAPE COMPONENTS PLAN
1 : 10000

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# 2.3 PENCARROW MAIN ENTRY GA

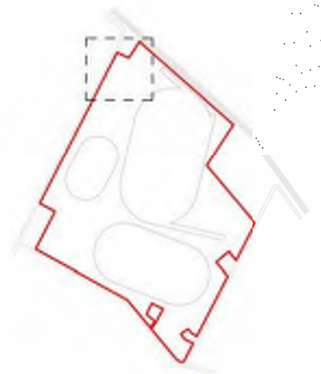



MAIN ENTRY - CALLOUT

1 : 2000

**KEY PLAN:**

Not to Scale



**LEGEND**

**Surfaces**

- Hardscape 1 - Pedestrian Paths Exposed Agg. Concrete
- Hardscape 2 - Roads & Carparking (Refer to Civil's Documentation)
- Hardscape 3 - Pavlng
- Limestone Chip Path

**Planting**

- Amenity Planting 1
- Amenity Planting 2
- Specimen Tree 1
- Specimen Tree 2
- Specimen Tree 3
- Native Trees

**Site Components**

- Post and Rail Fence
- Concrete Wall
- Biovegetated Swale Wide (Refer to Civil's Documentation)

1. Bloodstock
2. Low Mounds
3. Stables
4. Car Park
5. 1 to 2 Storey Commercial Buildings
6. Alfresco Courtyard
7. Park / Play Area
8. Overflow Parking (Grass)
9. Pedestrian Link
10. Pond
11. WTR Signage

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# 2.4 EVENTS DAY / PARADE GA



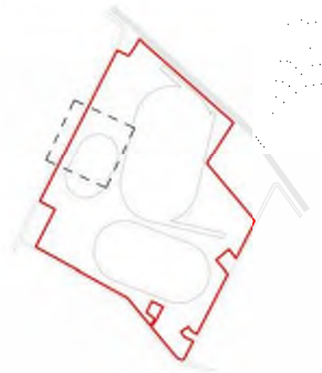

EVENTS DAY & AVENUE - CALLOUT

1 : 2000

**KEY PLAN:**

Not to Scale

N



**LEGEND**

**Surfaces**

- Hardscape 1 - Pedestrian Paths Exposed Agg. Concrete
- Hardscape 2 - Roads & Carparking (Refer to Civil's Documentation)
- Hardscape 3 - Pavlng
- Limestone Chip Path

**Planting**

- Amenity Planting 1
- Amenity Planting 2
- Specimen Tree 1
- Specimen Tree 2
- Specimen Tree 3
- Native Trees

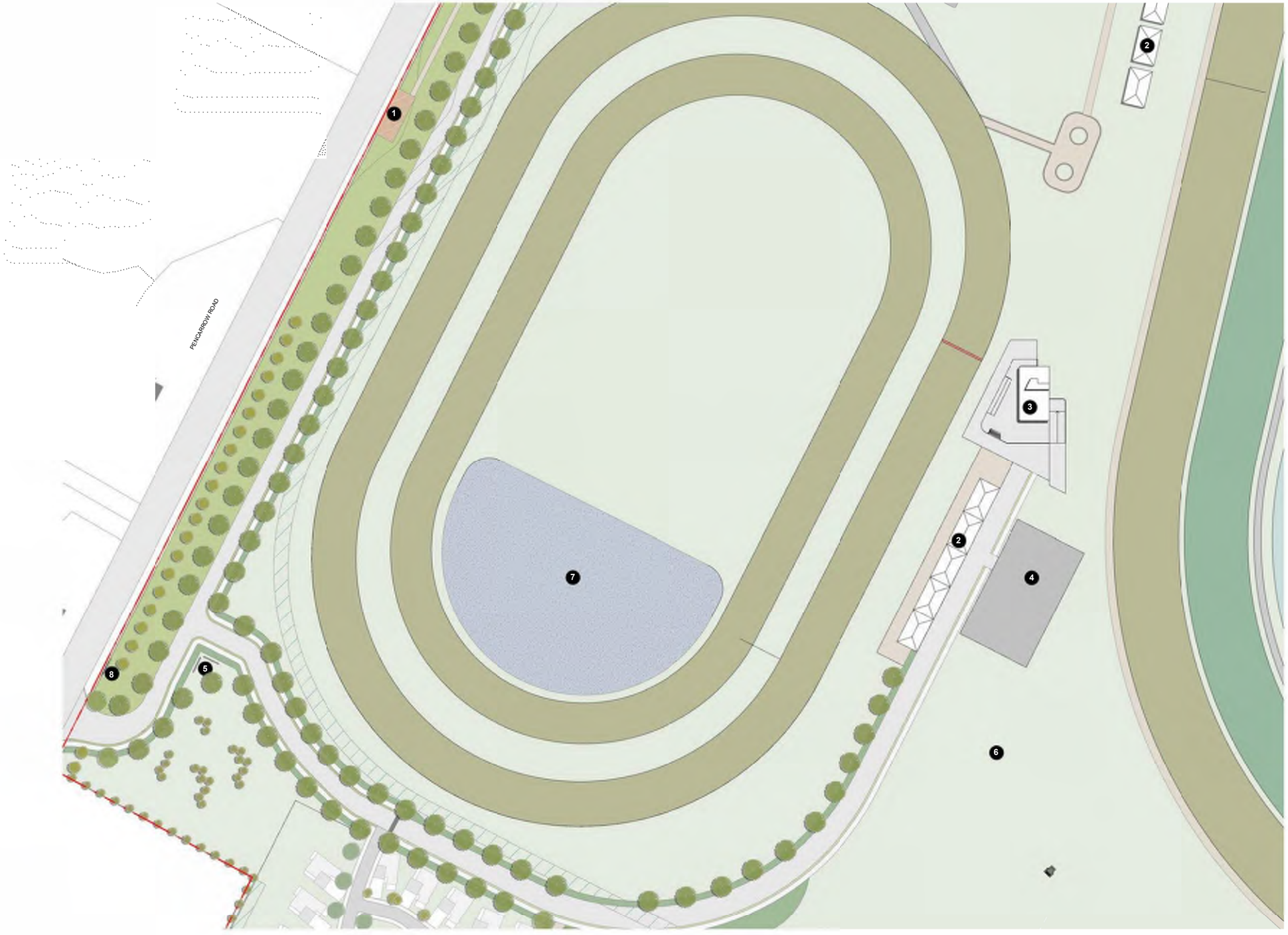
**Site Components**

- Post and Rail Fence
- Concrete Wall
- Biovegetated Swale Wide (Refer to Civil's Documentation)

1. Commercial Buildings
2. Thoroughbred Events Building
3. Admin and Raceday Building
4. Parking
5. Tie ups
6. Maintenance Building and Yard
7. Pond
8. Alfresco Courtyard
9. Marquee / Events Zone
10. Harness Parade
11. Parade
12. Harness Stables
13. Utility
14. Public Viewpoint and Karakia Space

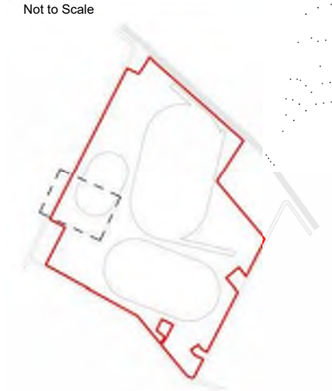
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# 2.5 PENCARROW SECOND ENTRY GA




**KEY PLAN:**

Not to Scale




**LEGEND**

**Surfaces**

- Hardscape 1 - Pedestrian Paths Exposed Agg. Concrete
- Hardscape 2 - Roads & Carparking (Refer to Civil's Documentation)
- Hardscape 3 - Pavlng
- Limestone Chip Path

**Planting**

- Amenity Planting 1
- Amenity Planting 2
- Specimen Tree 1
- Specimen Tree 2
- Specimen Tree 3
- Native Trees

**Site Components**

- Post and Rail Fence
- Concrete Wall
- Biovegetated Swale Wide (Refer to Civil's Documentation)

1. Public Viewpoint and Karakia Space
2. Marquee Zone
3. Harness Events Building
4. Carpark
5. Concrete Feature Wall / Way Finding
6. Overflow Parking
7. Stormwater Detention Pond
8. WTR Signage

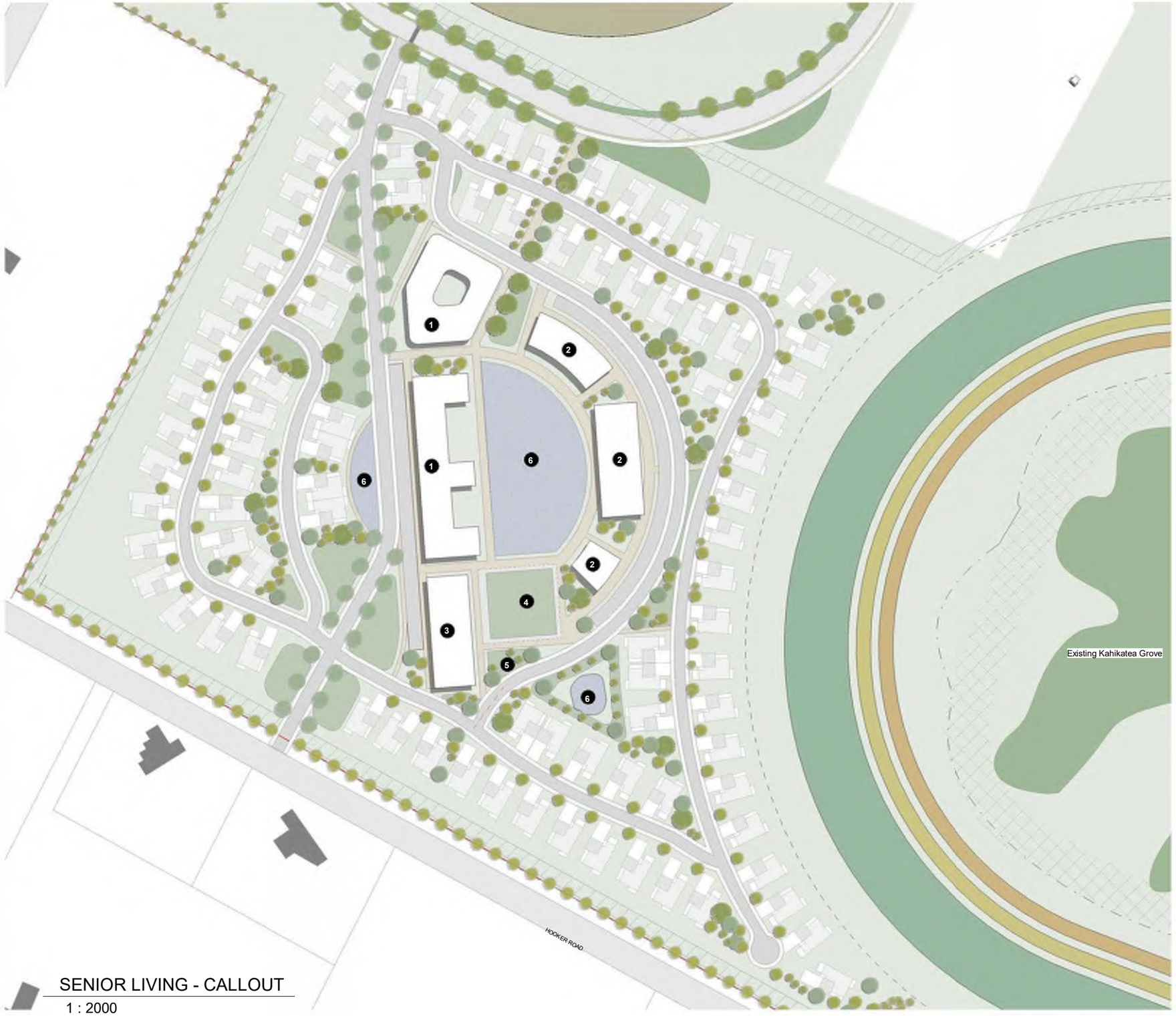
ALT ENTRY - CALLOUT

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# 2.6 SENIOR LIVING CONCEPT GA




SENIOR LIVING - CALLOUT

1 : 2000

**KEY PLAN:**

Not to Scale

N



**LEGEND**

**Surfaces**

- Hardscape 1 - Pedestrian Paths Exposed Agg. Concrete
- Hardscape 2 - Roads & Carparking (Refer to Civil's Documentation)
- Hardscape 3 - Pavlng
- Limestone Chip Path

**Planting**

- Amenity Planting 1
- Amenity Planting 2
- Specimen Tree 1
- Specimen Tree 2
- Specimen Tree 3
- Native Trees

**Site Components**

- Post and Rail Fence
- Concrete Wall
- Biovegetated Swale Wide (Refer to Civil's Documentation)

1. Care Suite
2. Apartments
3. Community Centre
4. Bowling Green
5. Play Space
6. Pond

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# 2.7 LIFESTYLE BLOCK CONCEPT GA

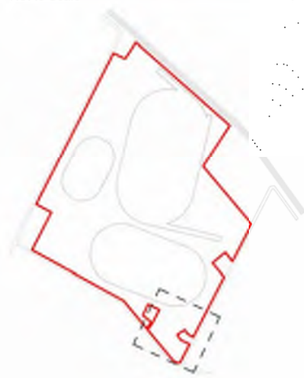



LIFESTYLE BLOCK- CALLOUT

1 : 2000

**KEY PLAN:**

Not to Scale




**LEGEND**

**Surfaces**

- Hardscape 1 - Pedestrian Paths Exposed Agg. Concrete
- Hardscape 2 - Roads & Carparking (Refer to Civil's Documentation)
- Hardscape 3 - Pavlng
- Limestone Chip Path

**Planting**

- Amenity Planting 1
- Amenity Planting 2
- Specimen Tree 1
- Specimen Tree 2
- Specimen Tree 3
- Native Trees

**Site Components**

- Post and Rail Fence
- Concrete Wall
- Biovegetated Swale Wide (Refer to Civil's Documentation)

1 Lifestyle Block Development

2 Duncan Road Upgrade

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# 2.8 DUNCAN RD ENTRY GA




**KEY PLAN:**

Not to Scale

N

**LEGEND**

**Surfaces**

- Hardscape 1 - Pedestrian Paths Exposed Agg. Concrete
- Hardscape 2 - Roads & Carparking (Refer to Civil's Documentation)
- Hardscape 3 - Pavlng
- Limestone Chip Path

**Planting**

- Amenity Planting 1
- Amenity Planting 2
- Specimen Tree 1
- Specimen Tree 2
- Specimen Tree 3
- Native Trees

**Site Components**

- Post and Rail Fence
- Concrete Wall
- Biovegetated Swale Wide (Refer to Civil's Documentation)

1. Horse Trailer & Float Parking
2. Timber Noise Wall
3. Carpark
4. Trainers Tie Ups
5. Trainers Facilities
6. Potential Vet
7. Potential Equine Commercial

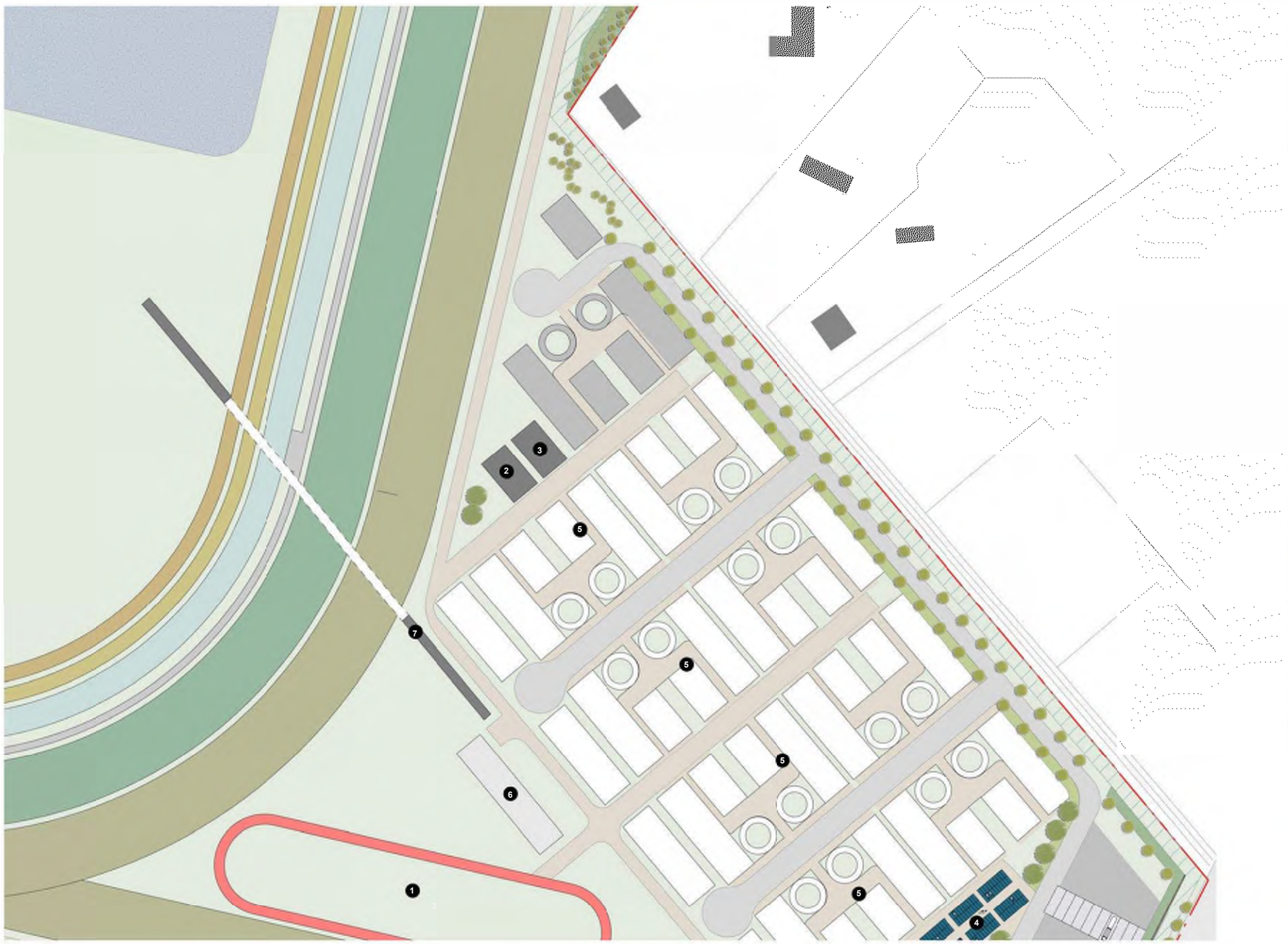
DUNCAN RD ENTRY - CALLOUT

1 : 2000

COX

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# 2.9 STABLES

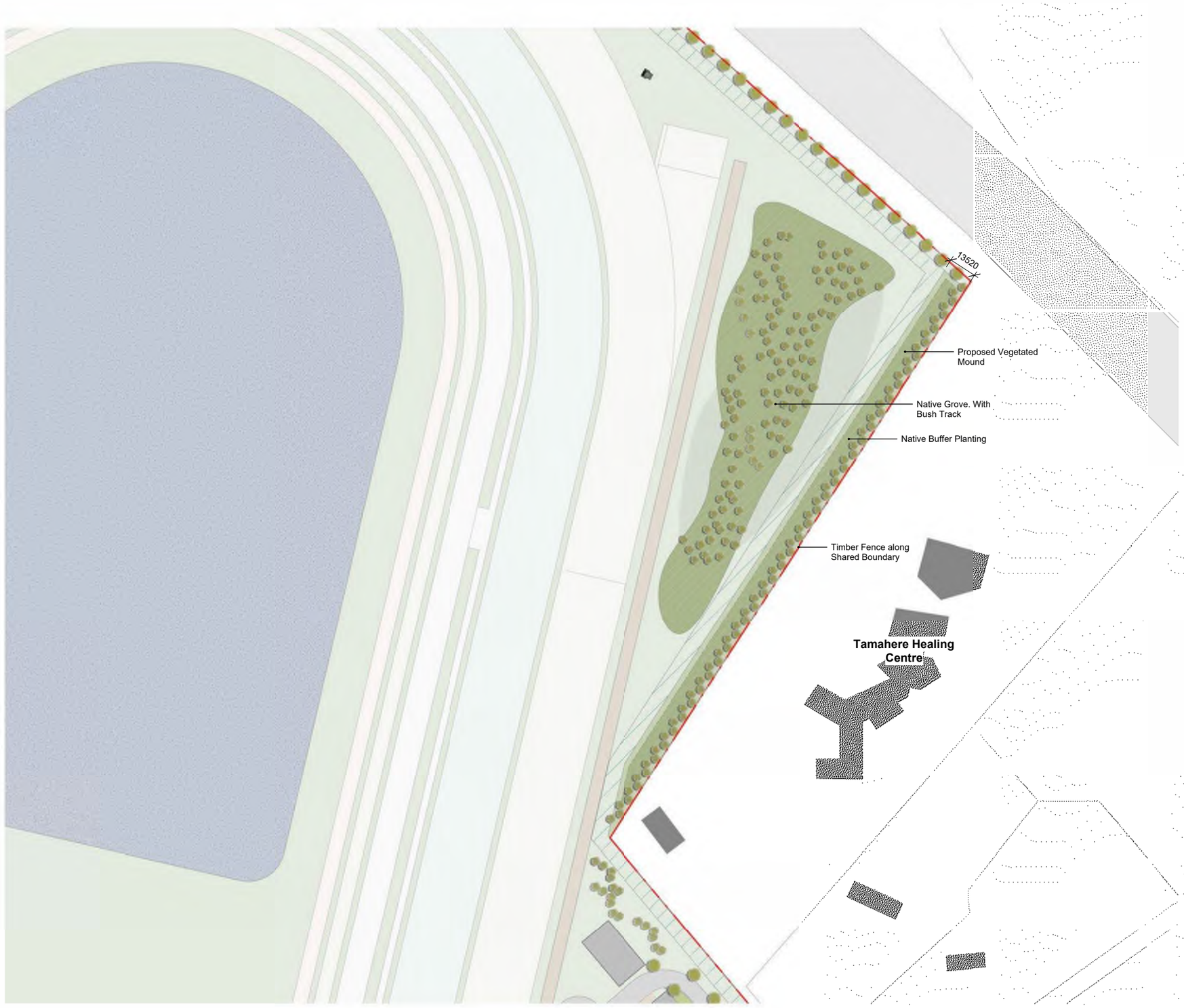



STABLES - CALLOUT

1 : 2000

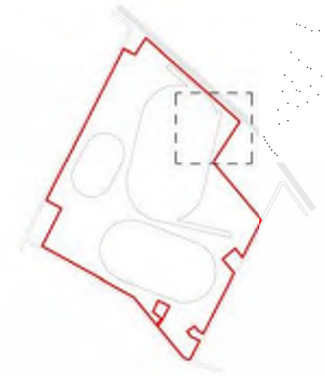
designgroup stapleton elliott

# 2.10 NATIVE BUSH TRACK




**KEY PLAN:**

Not to Scale




**PLANTING LEGEND**

- Native Planting
- Biovegetated Swale - Refer to Civils
- Proposed Specimen Tree
- Proposed Small Native Trees

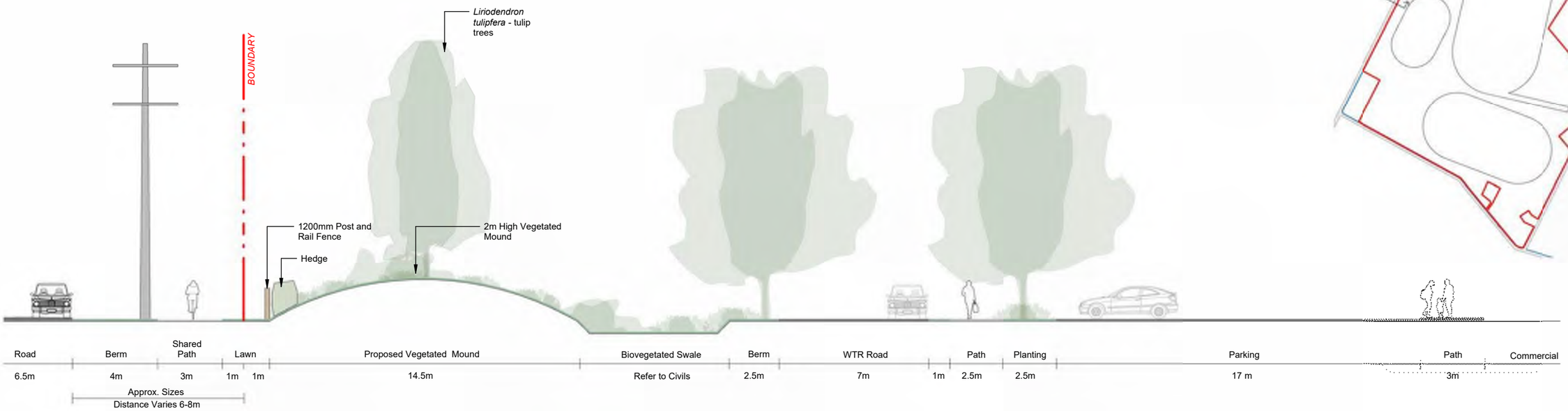
**NATIVE BUSH TRACK - CALLOUT**

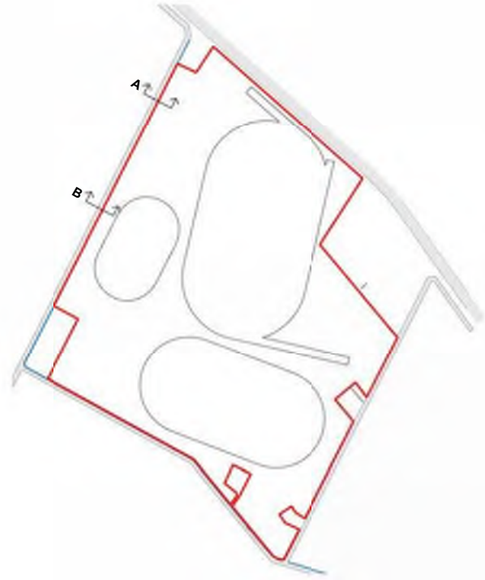
SCALE @ A3 - 1 : 2000

COX

designgroup stapleton elliott

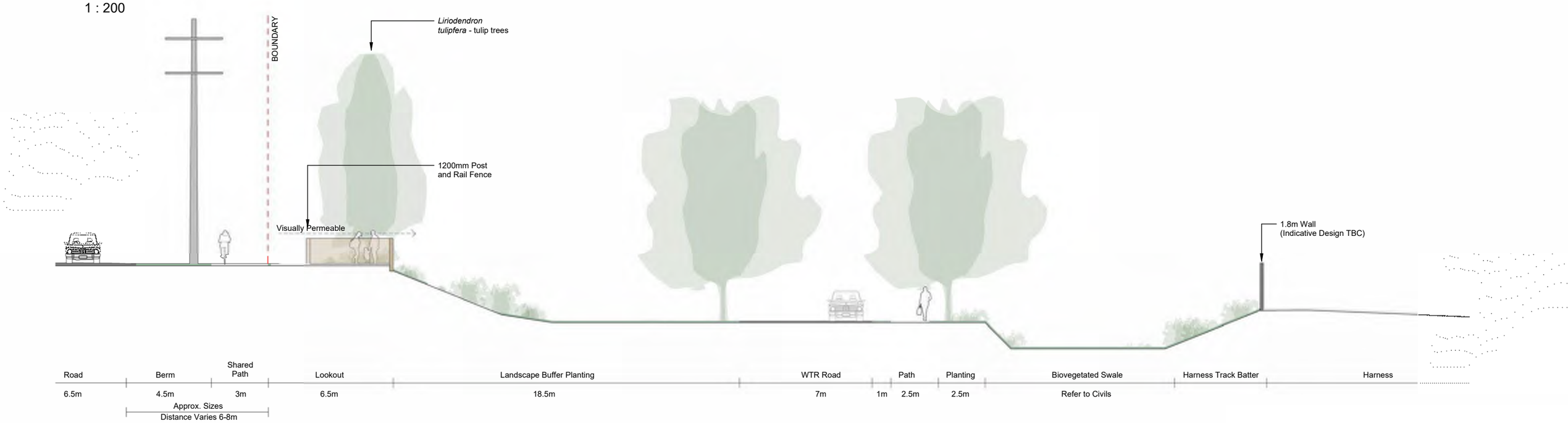
# 2.11 PENCARROW RD - EDGE CONDITIONS 1




## Landscape Section -TYPE A_Pencarrow Road

1 : 200




## Landscape Section -TYPE B_Pencarrow Road

1 : 200

designgroup stapleton elliott

# 2.12 PENCARROW RD - EDGE CONDITIONS 2





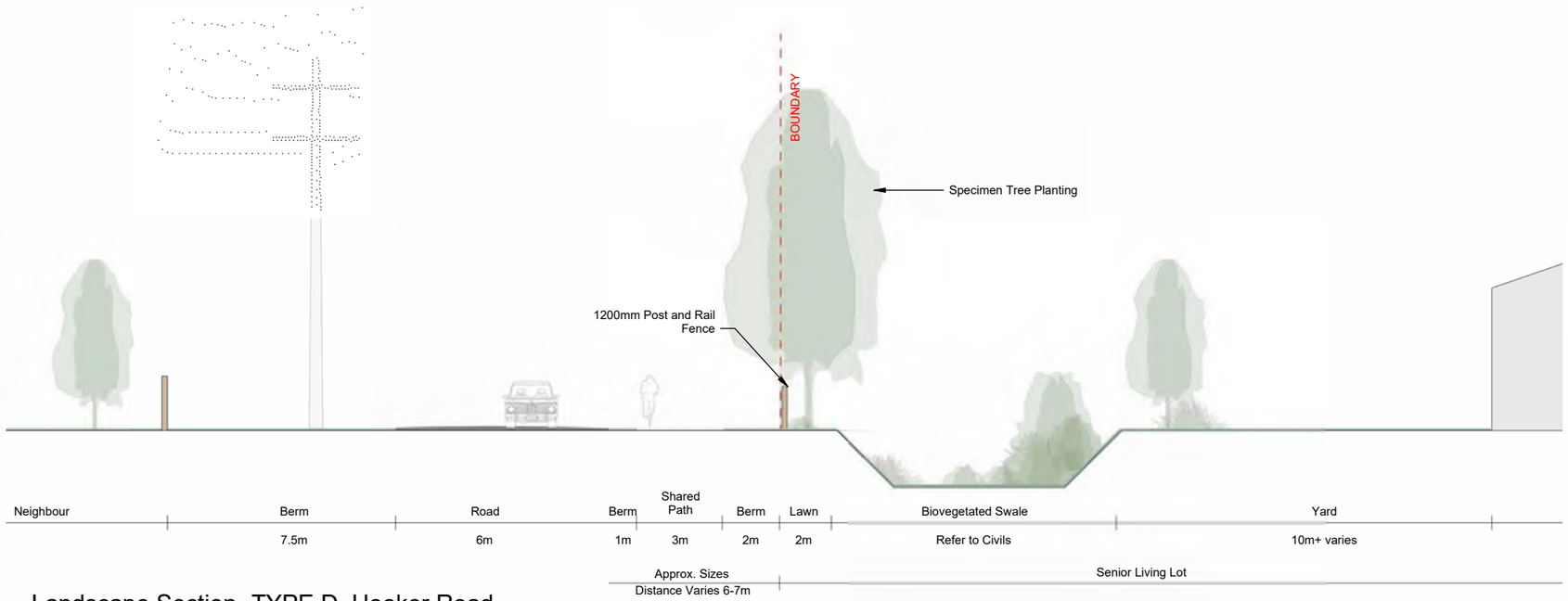


Landscape Section -TYPE C_Pencarrow Road

1 : 200

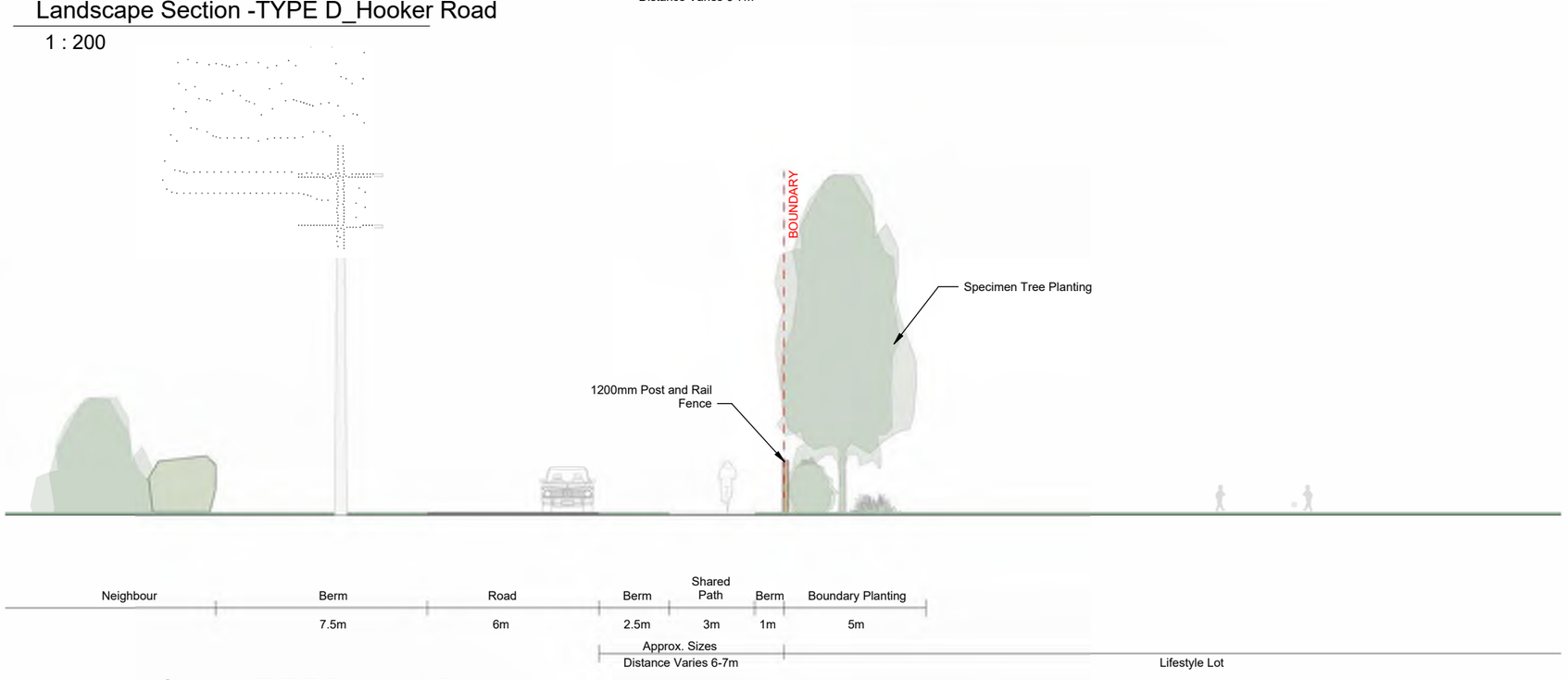
designgroup stapleton elliott

# 2.13 HOOKER RD - EDGE CONDITIONS



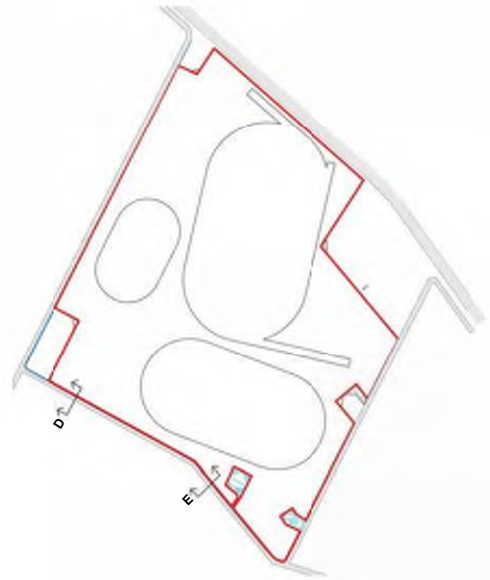

Landscape Section -TYPE D_Hooker Road

1 : 200



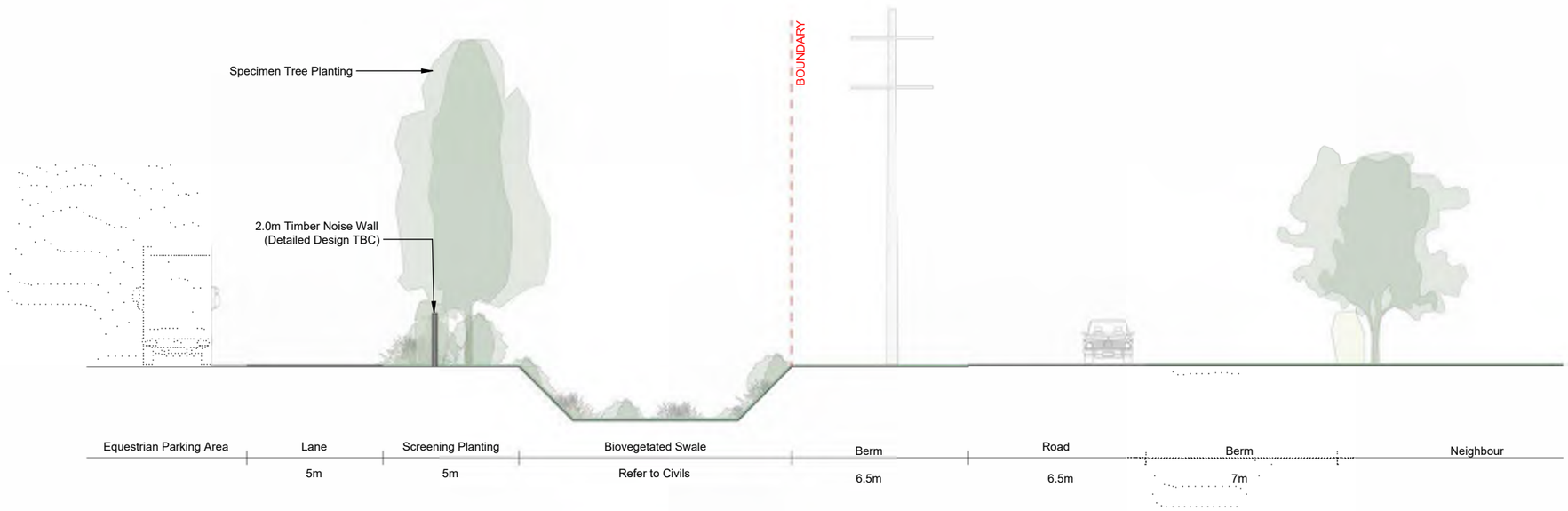

Landscape Section -TYPE E_Hooker Road

1 : 200




designgroup stapleton elliott

# 2.14 DUNCAN RD EDGE CONDITIONS 1

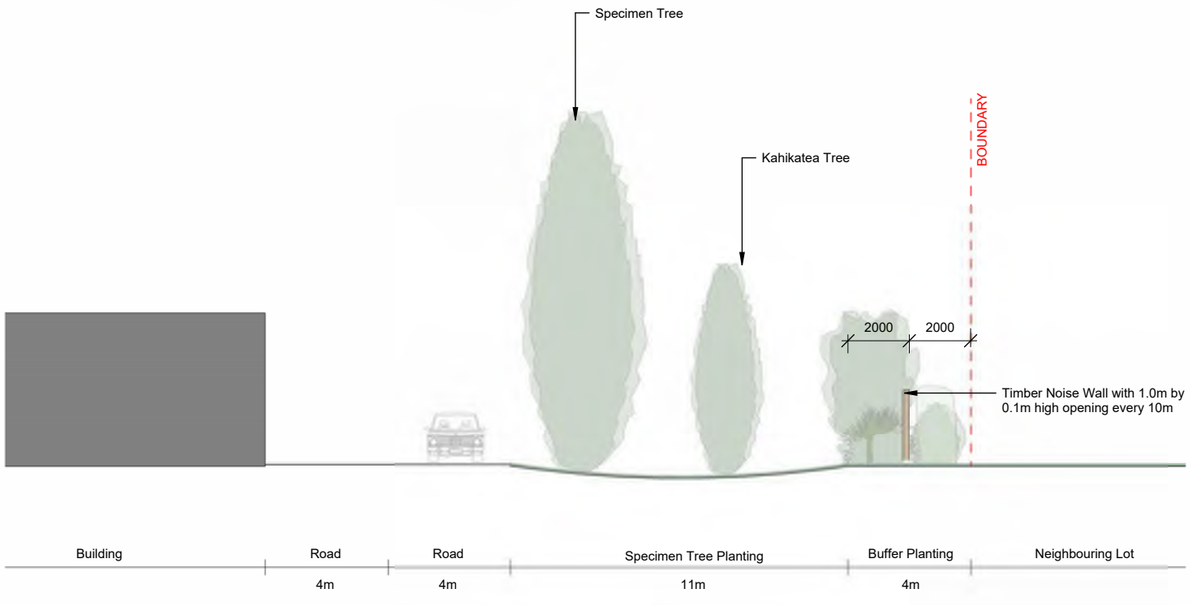






## Landscape Section -TYPE F_ Duncan Road

1 : 200

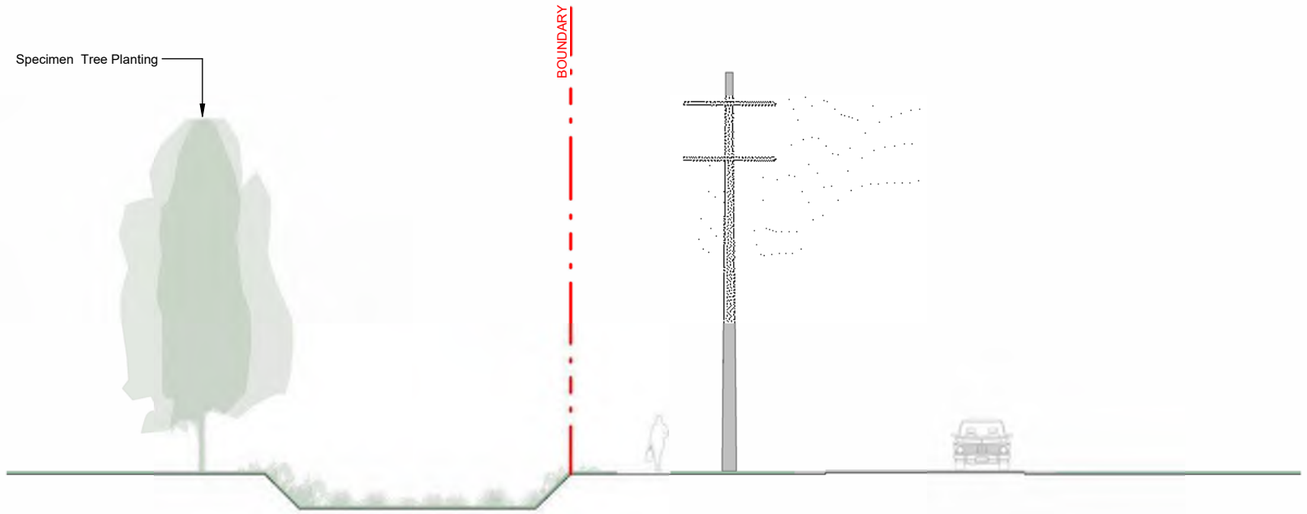



## Landscape Section -TYPE G_ Duncan Road

1 : 200

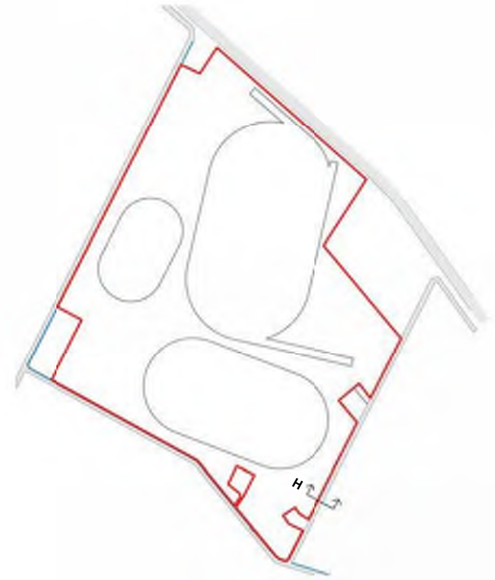
designgroup stapleton elliott

# 2.15 DUNCAN RD EDGE CONDITIONS 2



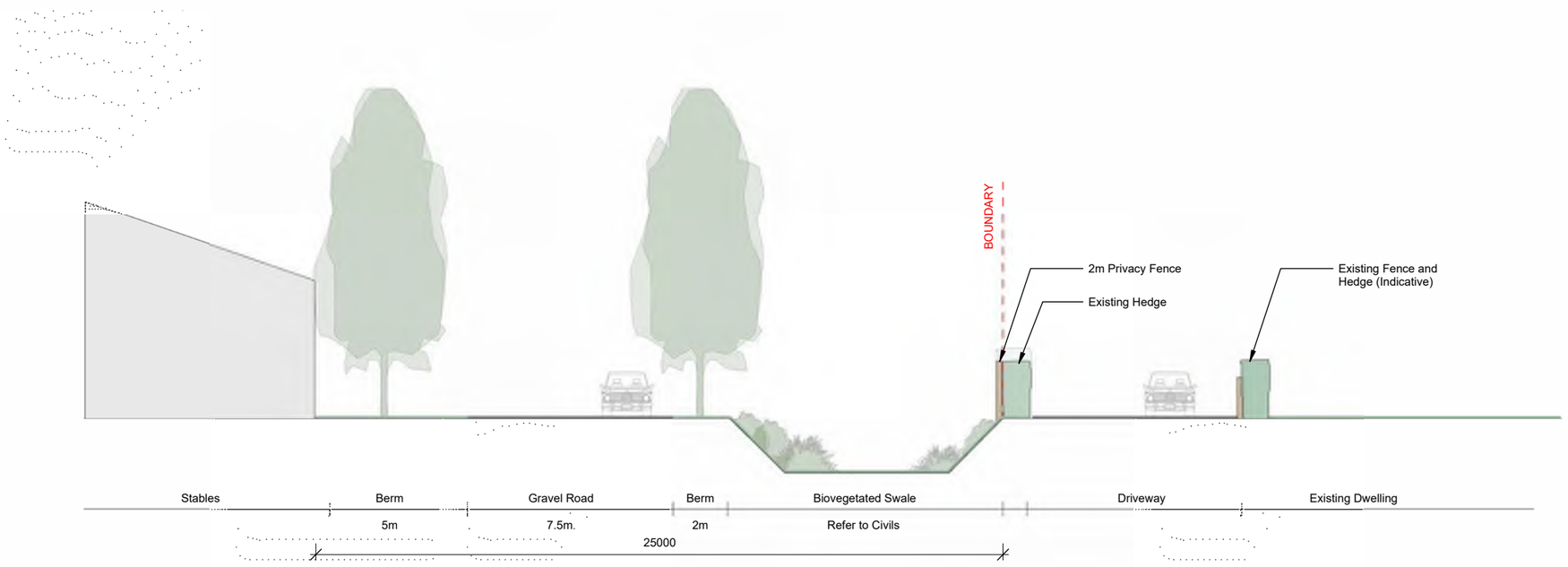

Landscape Section -TYPE H_ Duncan Road Upgrade

1 : 200



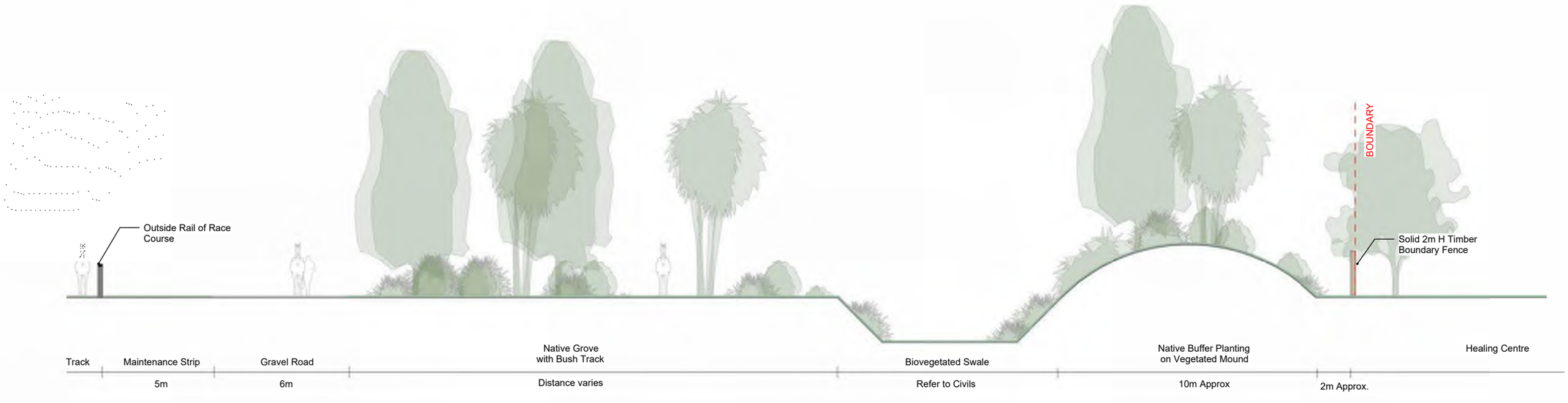

designgroup stapleton elliott

# 2.16 TAMAHERE HEALING CENTRE - EDGE CONDITIONS



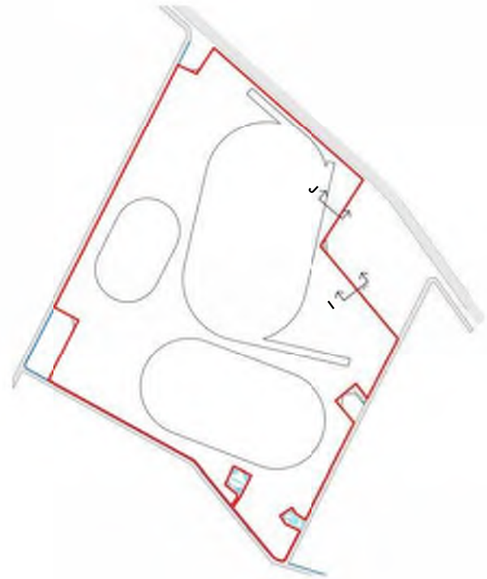

Landscape Section - TYPE I_ Tamahere Healing W

1 : 200



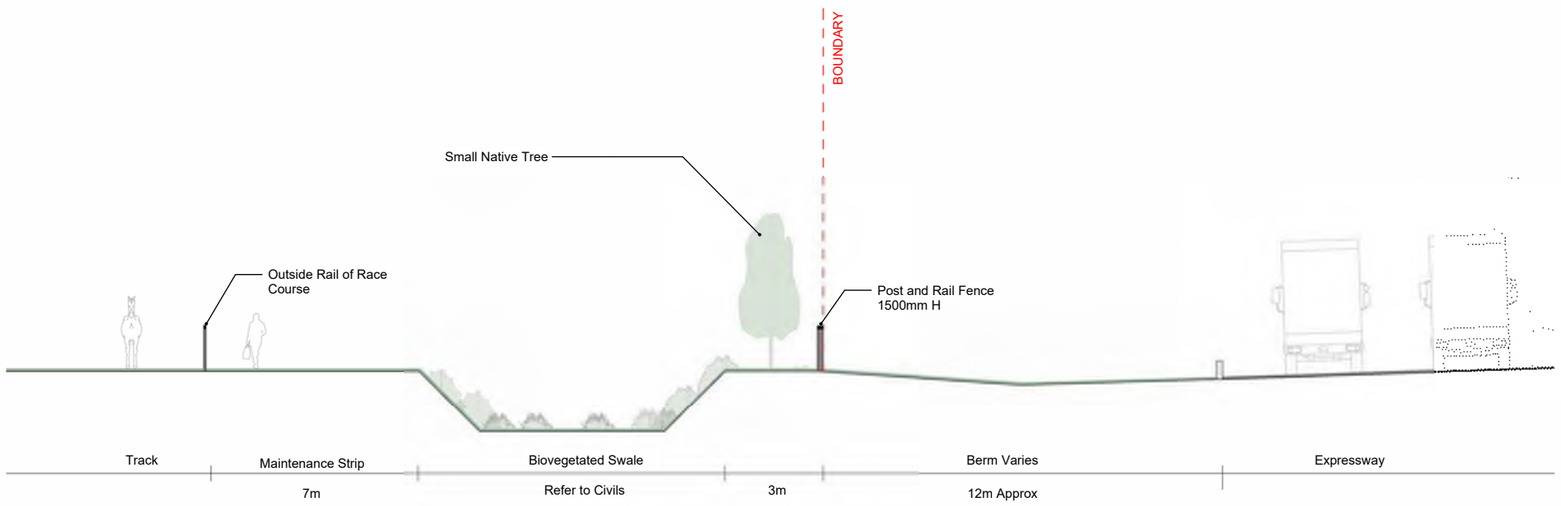

Landscape Section - TYPE J_ Tamahere Healing Nth

1 : 200



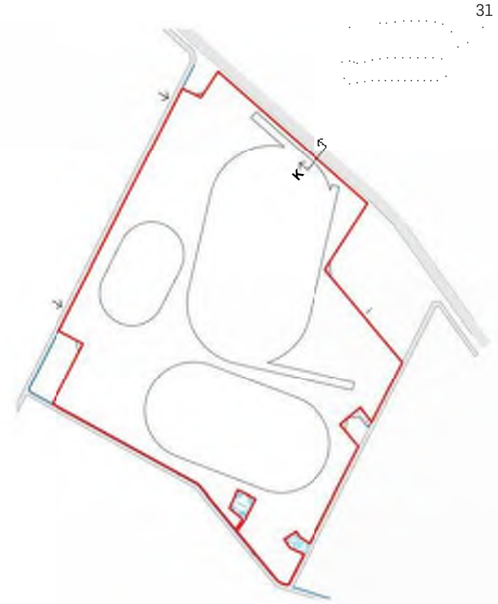

designgroup stapleton elliott

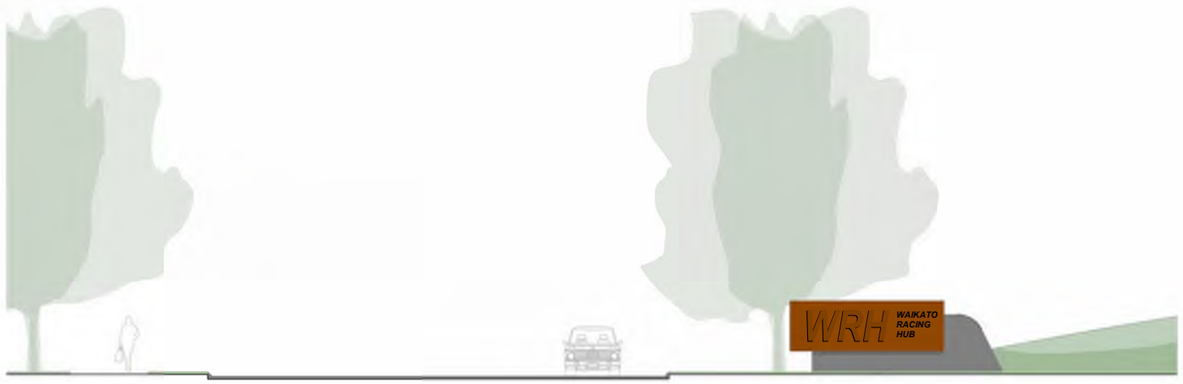
# 2.17 ENTRY + EXPRESSWAY - EDGE CONDITIONS




Landscape Section - TYPE K_ Expressway

1 : 200




Pencarrow - Main Entry

1 : 200



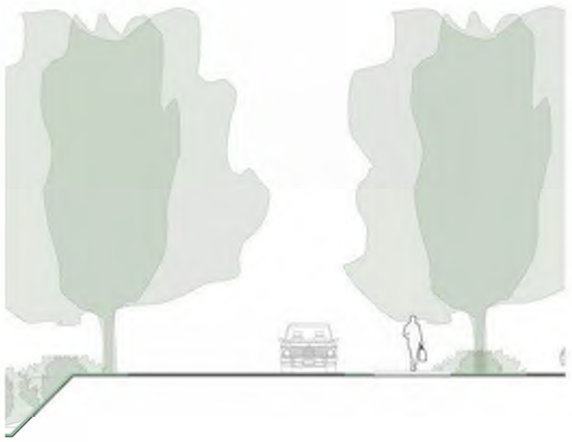

Pencarrow - Second Entry

1 : 200

COX

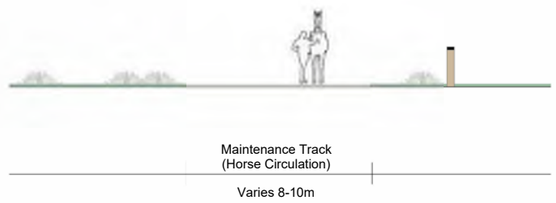
designgroup stapleton elliott

# 2.18 ROAD TYPES SECTION 1



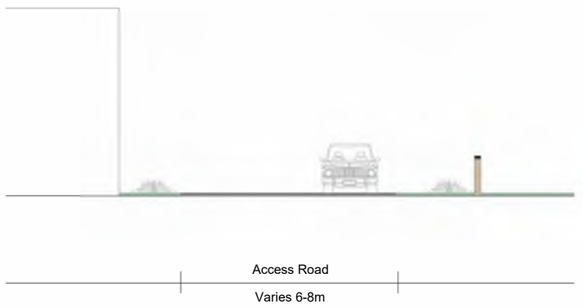

SITE ENTRY BOULEVARD - ROAD TYPE A

1 : 200




HORSE CIRCULATION - ROAD TYPE B

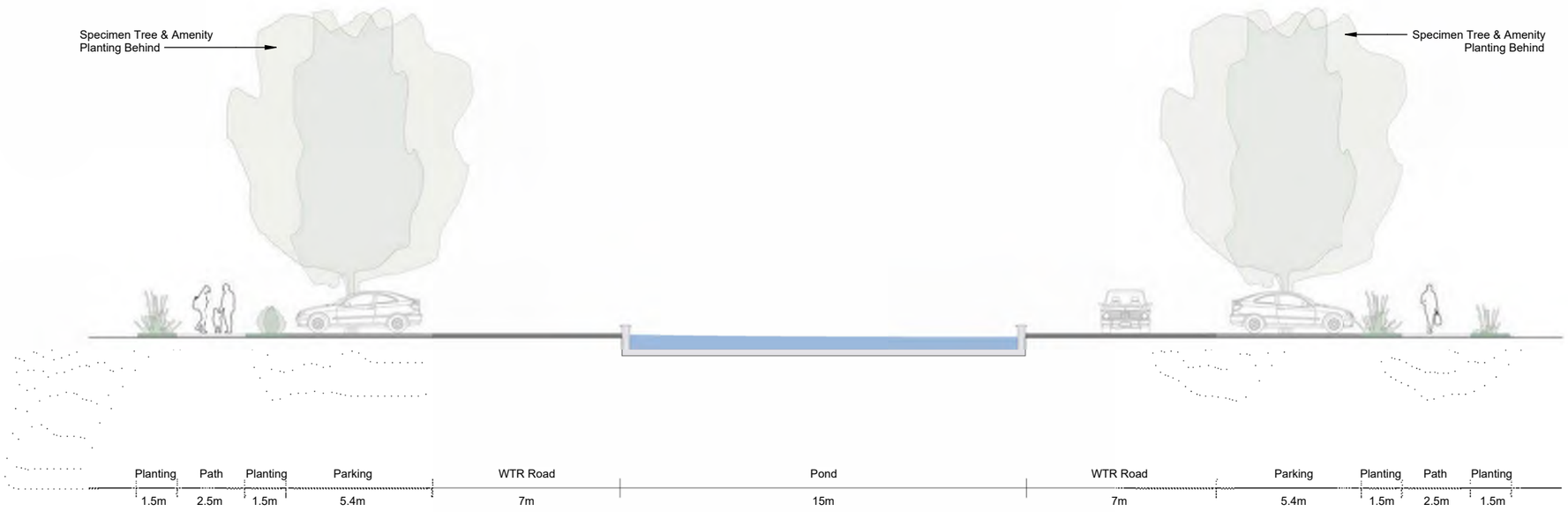
1 : 200




ACCESS RD - ROAD TYPE C

1 : 200



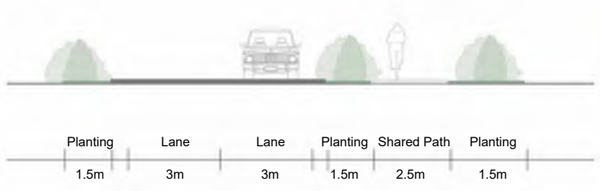

MAIN ENTRY AVENUE - ROAD TYPE D

1 : 200

COX

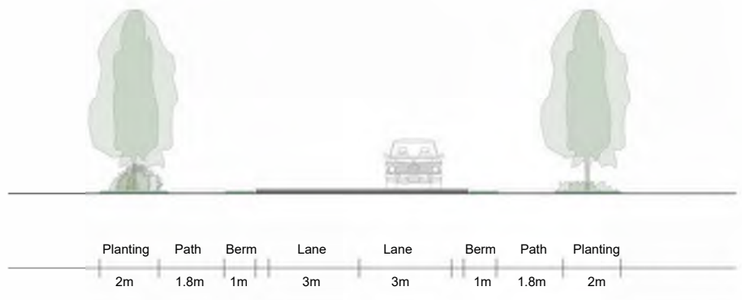
designgroup
stapleton elliott

# 2.19 ROAD TYPES SECTION 2




URBAN ROAD 1 - ROAD TYPE E

1 : 200



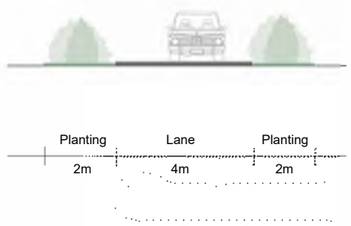

URBAN ROAD 2 - ROAD TYPE F

1 : 200




PRIVATE ACCESS RD - ROAD TYPE G

1 : 200




PRIVATE RIGHT OF WAY - ROAD TYPE H

1 : 200

Not to Scale

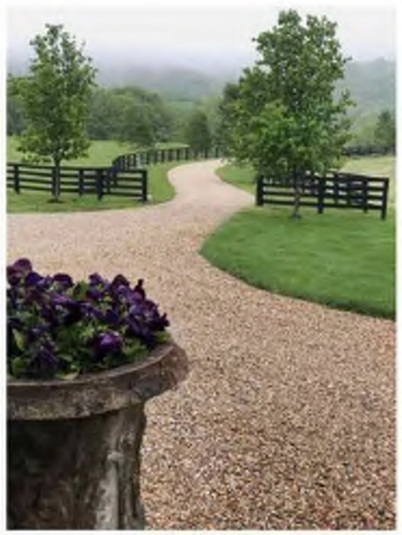



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# 2.20 LANDSCAPE LOOK AND FEEL



















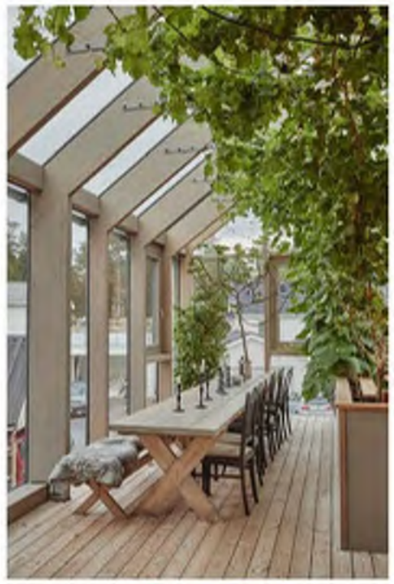




# 2.21 LANDSCAPE LOOK AND FEEL 2



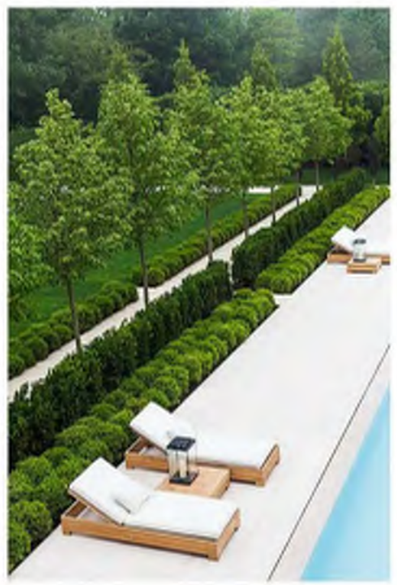










# 2.22 INDICATIVE PLANT PALETTE

Note: Indicative plant selection to be reviewed by mana whenua for comment prior to final selections.
Proposed NZ native plants labelled in **green**.



*Carpinus betulus fastigiata* - upright hornbeam



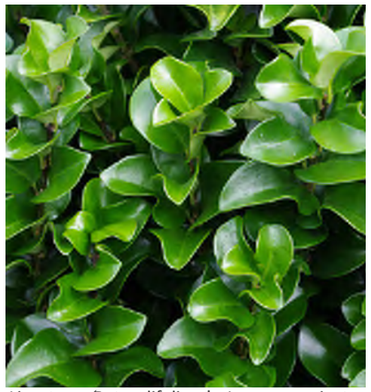
*Liriodendron tulipfera* - tulip tree



*Betula* 'Jacquemontii' - white barked birch



*Psuedopanax* 'Cyril Watson' - houpara



*Ligustrum* 'Rotundifolium' - Japanese privet



*Geniostoma ligustrifolium* - hangehange



*Griselinia littoralis* - kapuka



*Populus nigra* - Lombardy poplar



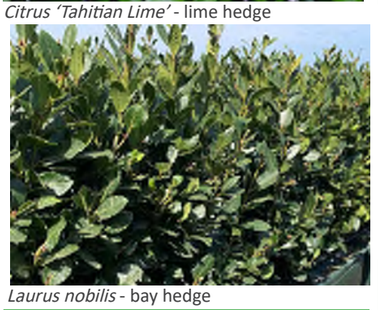
*Vitex lucens* - puriri



*Michelia figo* - port wine magnolia hedge



*Citrus 'Tahitian Lime'* - lime hedge



*Laurus nobilis* - bay hedge



*Hydrangea spp.*- hydrangea



*Beilschmiedia tawa* - tawa



*Dacrycarpus dacrydiodes* - kahikatea



*Macropiper subs. psittacorum* - kawakawa



*Laurelia nz* - pukatea



*Dichondra repens* - Mercury Bay weed



*Pratia angulata* - pānakenake

# 2.23 INDICATIVE PLANT PALETTE 2

Note: Indicative plant selection to be reviewed by mana whenua for comment prior to final selections.
Proposed NZ native plants labelled in **green**.



*Miscanthus spp.* - maiden grass



*Salvia spp.* - sage



*Hebe* spp. - hebe



*Libertia grandiflora* - mikoioi



*Guara spp.* - bee blossom



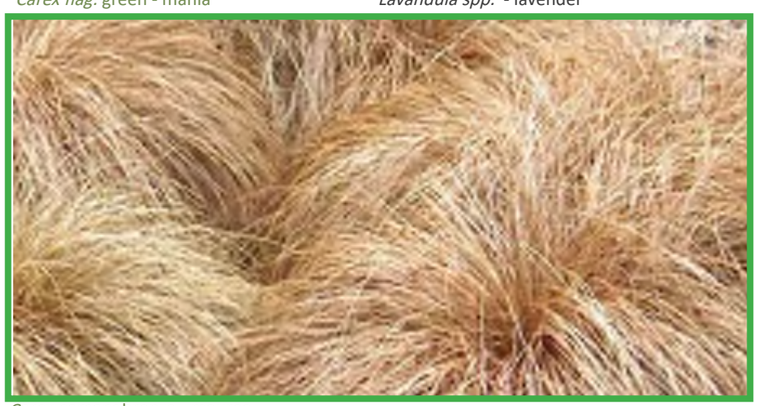
*Dianella nigra* - tūrutu



*Carex flag.* green - mānia



*Lavandula spp.* - lavender



*Carex comans* bronze - maurea



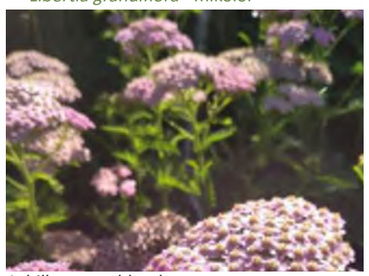
*Achillea spp.* - bloodwort



*Hemerocallis spp.* - day lilies



*Rosmarinus spp.* - rosemary



*Achillea spp.* - bloodwort



*Daphne spp* - daphne



*Acorus 'Mini Green'* - Japanese sweet flag



*Zephyranthes candida* - rain lilies



*Chionochloa spp.* - dwarf toetoe

# BUILDINGS

3

# 3.1 FUNCTION AND EVENT CENTRE - RENDER

Artist's Impression - Indicative Only

designgroup
stapleton elliott

# 3.2 FUNCTION AND EVENT CENTRE - RENDER 2

Artist's Impression - Indicative Only

designgroup
stapleton elliott

# 3.3 FUNCTION AND EVENT CENTRE ENTRY - RENDER



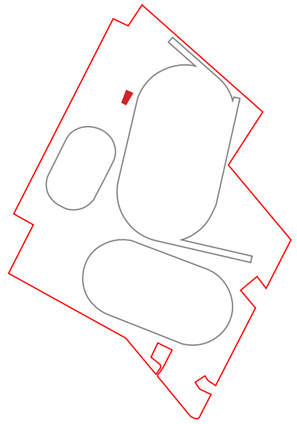

Artist's Impression - Indicative Only

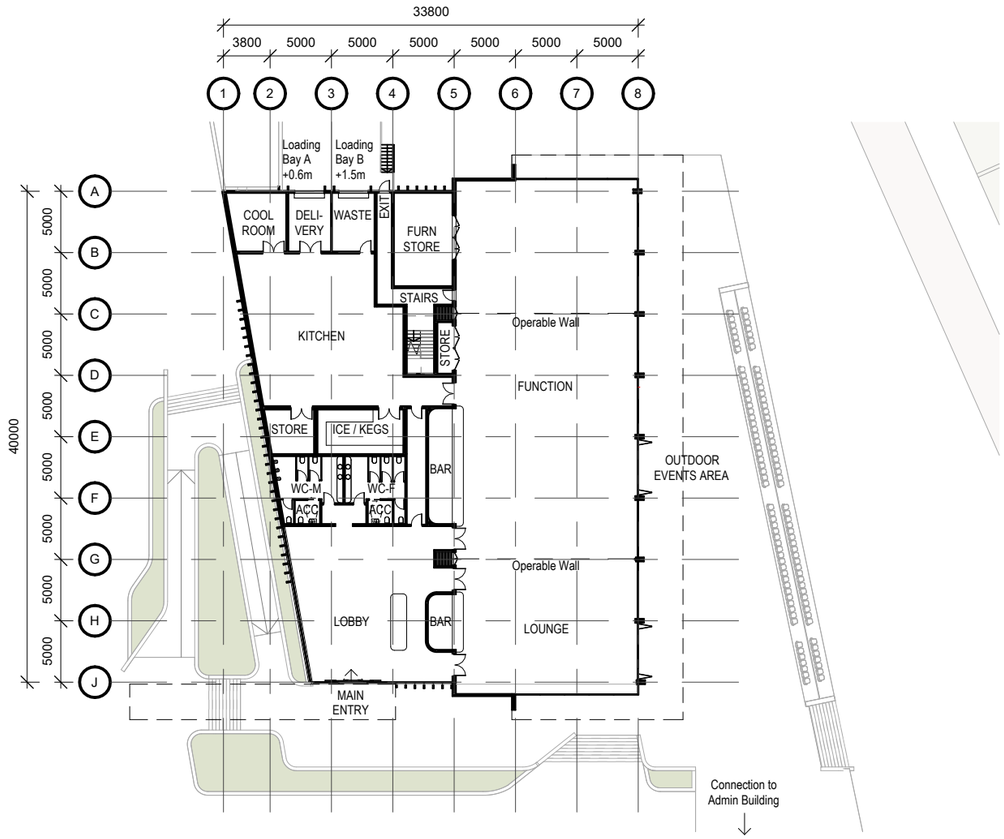
# 3.4 FUNCTION AND EVENT CENTRE ENTRY - RENDER 2




Artist's Impression - Indicative Only

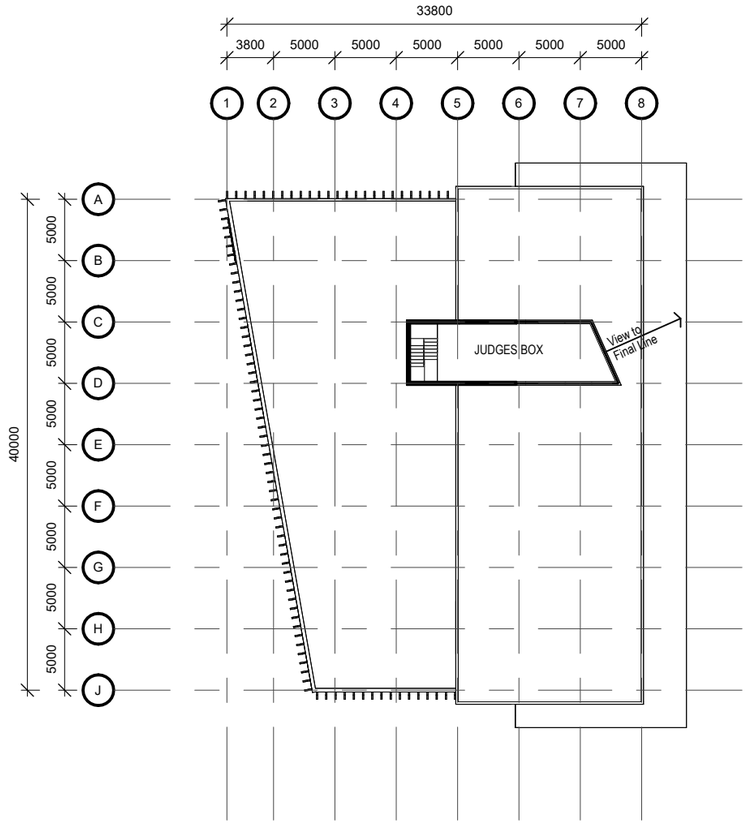
# 3.5 FUNCTION AND EVENT CENTRE - PLAN






GROUND FLOOR PLAN

1 : 500




LEVEL 1

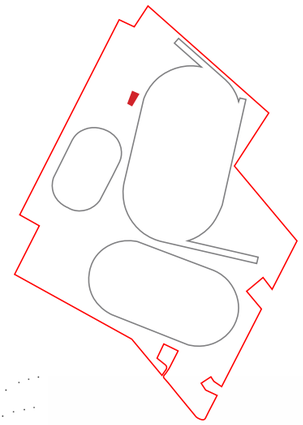
1 : 500

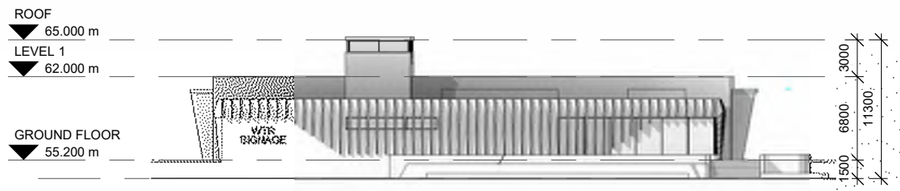



COX

designgroup
stapleton elliott

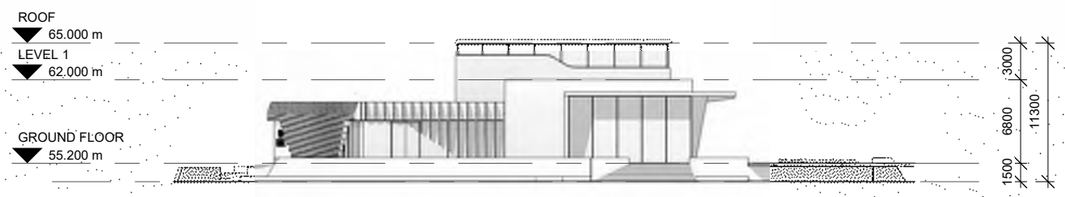
# 3.6 FUNCTION AND EVENT CENTRE - ELEVATIONS





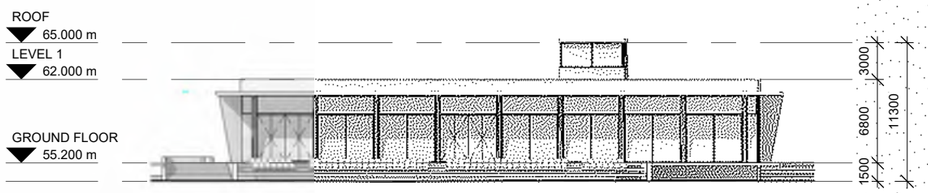

WEST ELEVATION

1 : 500



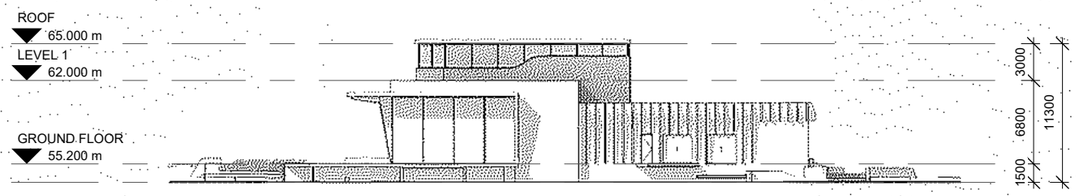

SOUTH ELEVATION

1 : 500




EAST ELEVATION

1 : 500




NORTH ELEVATION

1 : 500

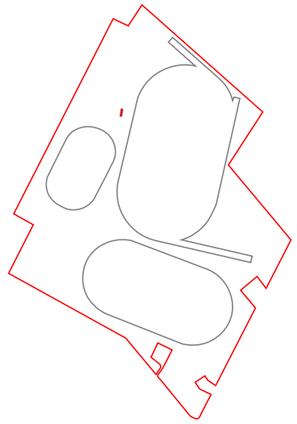
# 3.7 ADMINISTRATION BUILDING - RENDER

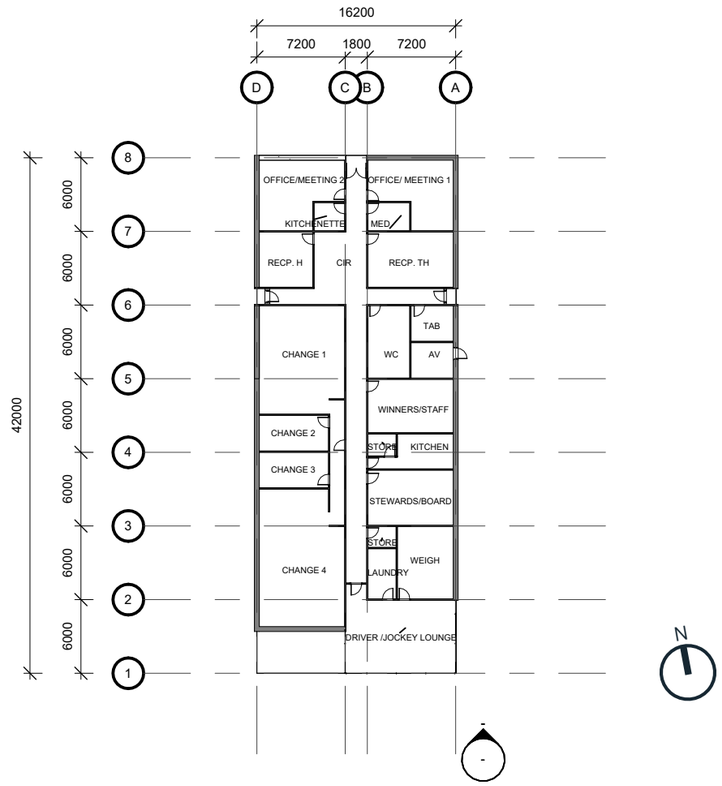


Artist's Impression - Indicative Only

designgroup
stapleton elliott

# 3.8 ADMINISTRATION BUILDING - PLAN

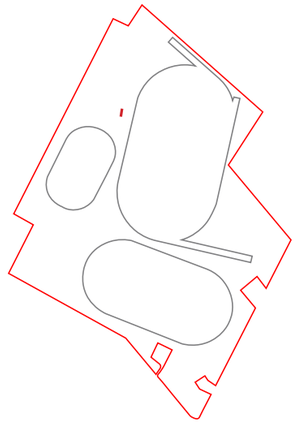


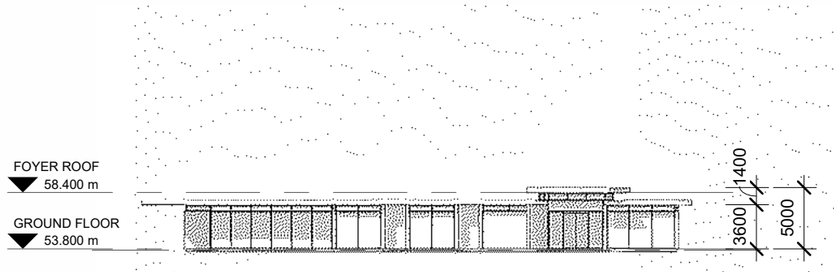



GROUND FLOOR PLAN

designgroup
stapleton elliott

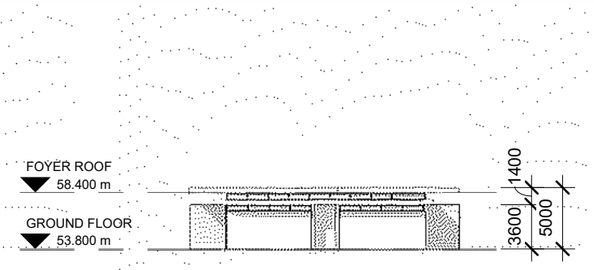
# 3.9 ADMINISTRATION BUILDING - ELEVATIONS





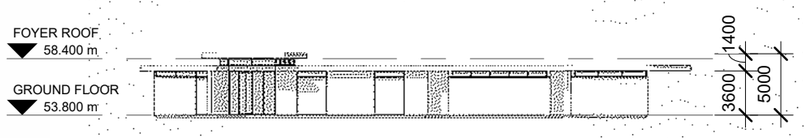

EAST ELEVATION

1 : 500



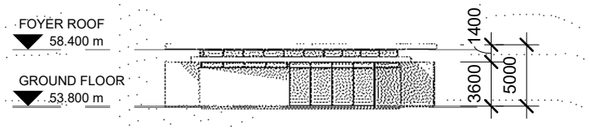

NORTH ELEVATION

1 : 500




WEST ELEVATION

1 : 500




SOUTH ELEVATION

1 : 500

designgroup
stapleton elliott

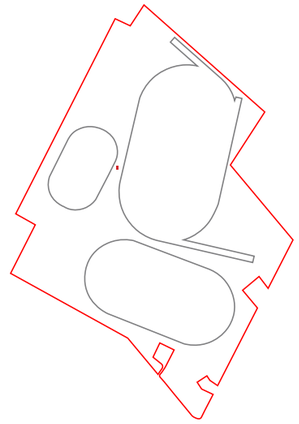
# 3.10 HARNESS BUILDING - RENDER

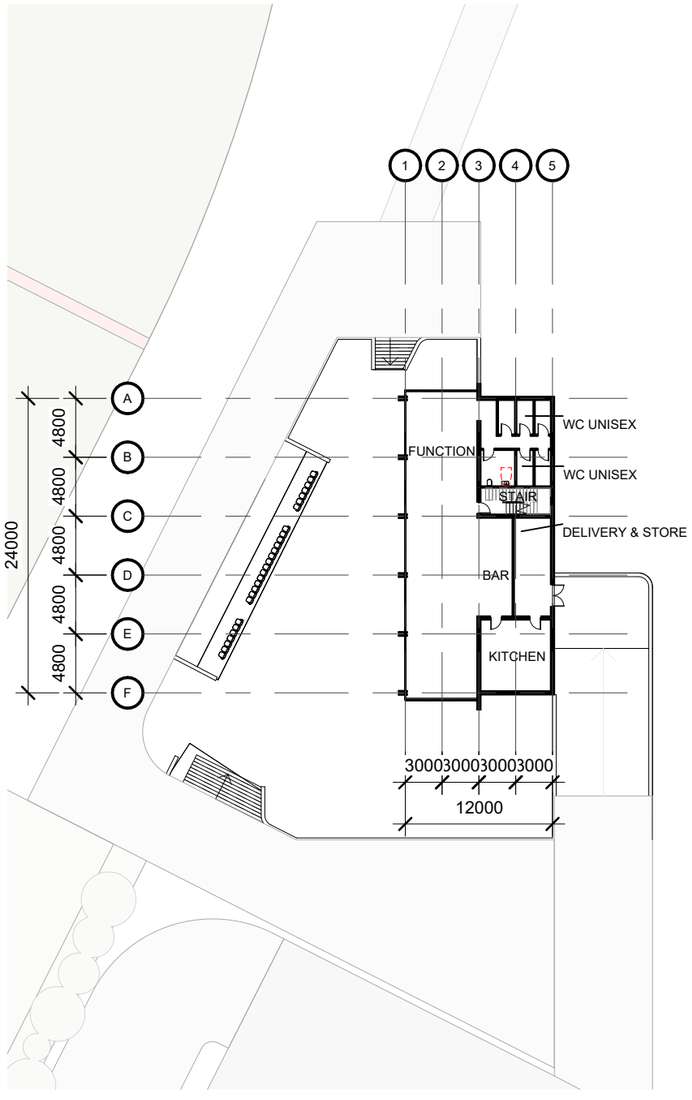


Artist's Impression - Indicative Only

designgroup
stapleton elliott

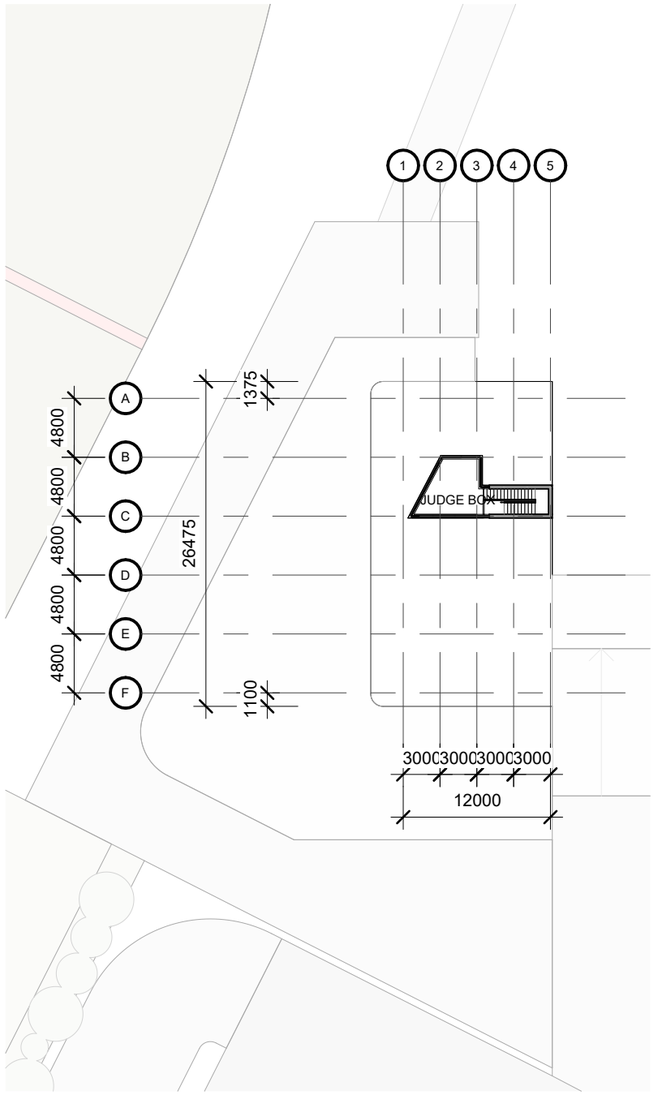
# 3.11 HARNESS BUILDING - PLAN






GROUND FLOOR PLAN

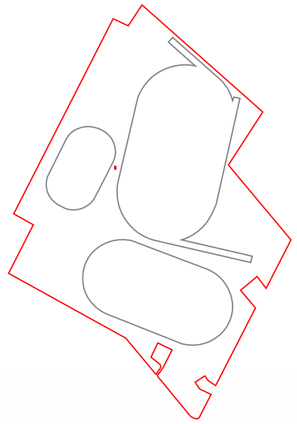
1 : 500

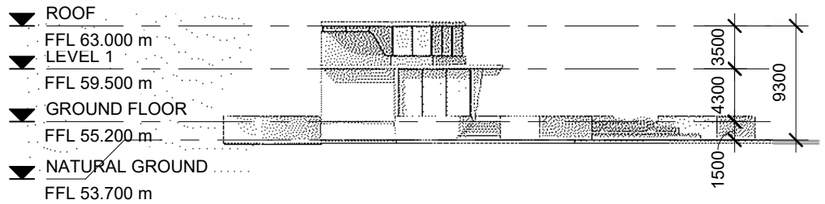



LEVEL 1 FLOOR PLAN

1 : 500

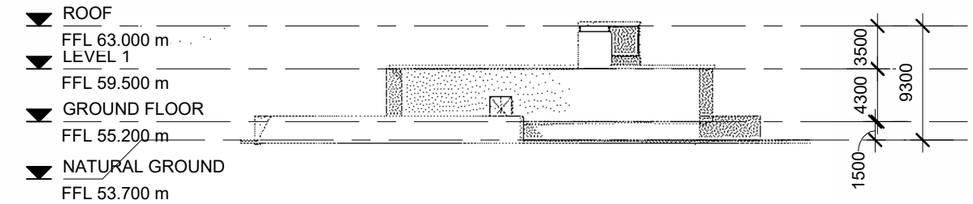
# 3.12 HARNESS BUILDING - ELEVATIONS





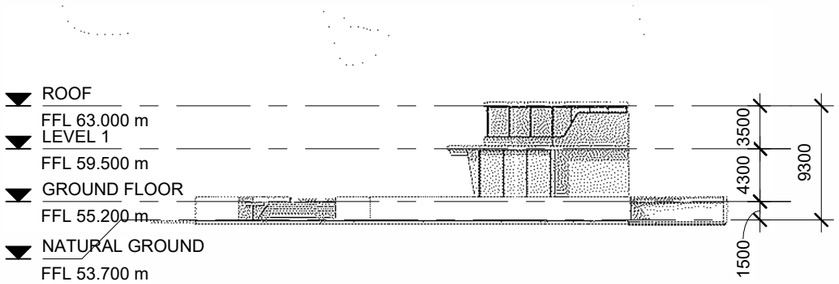

NORTH - ELEVATION

1 : 500



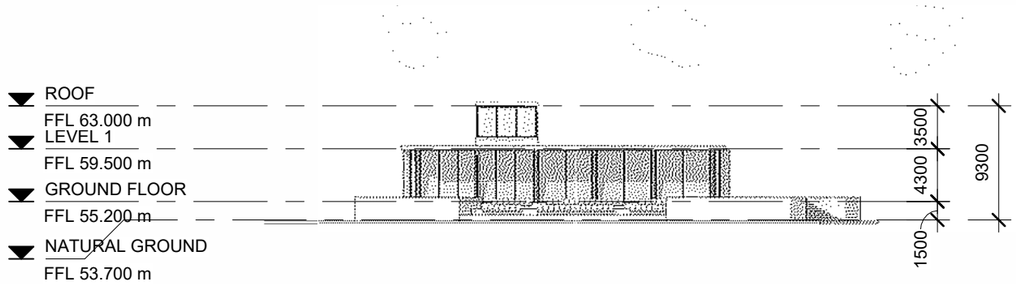

EAST - ELEVATION

1 : 500




SOUTH - ELEVATION

1 : 500




WEST - ELEVATION

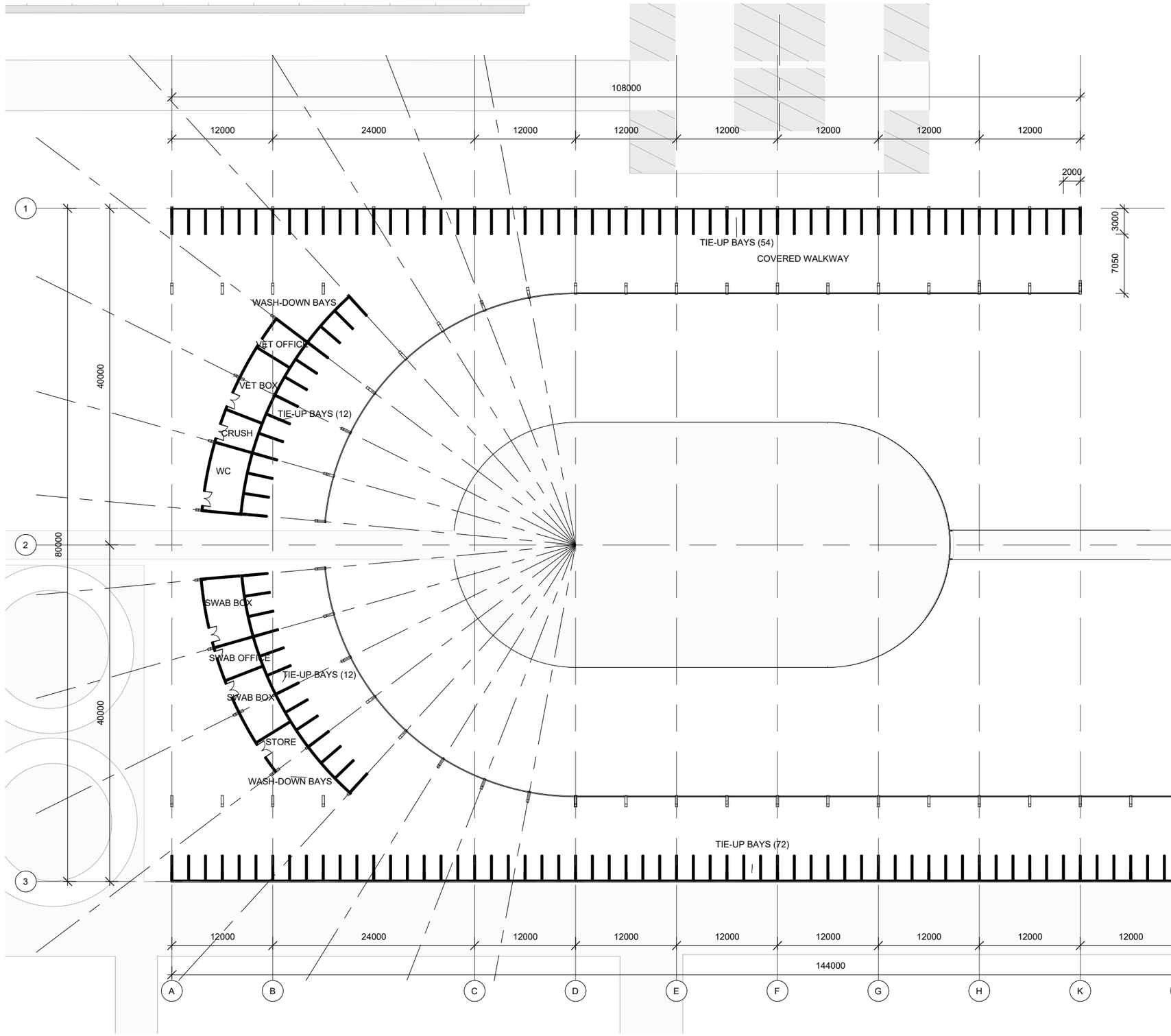
1 : 500

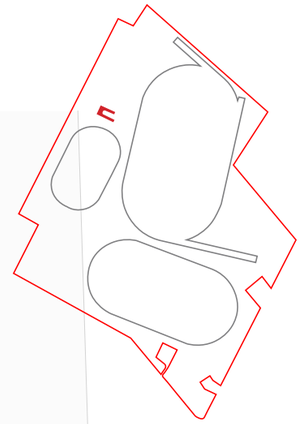
# 3.13 TIE-UPS - RENDER

Artist's Impression - Indicative Only

designgroup
**stapleton elliott**

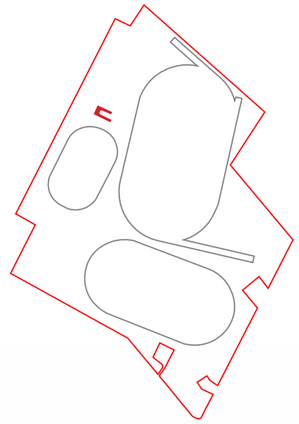
# 3.14 TIE UPS - PLAN

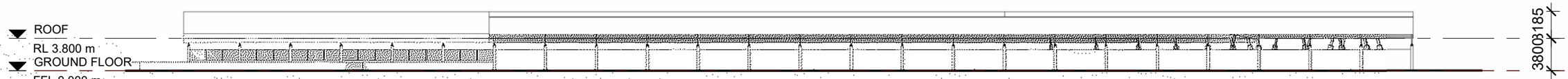


designgroup
stapleton elliott

# 3.15 TIE UPS - ELEVATIONS





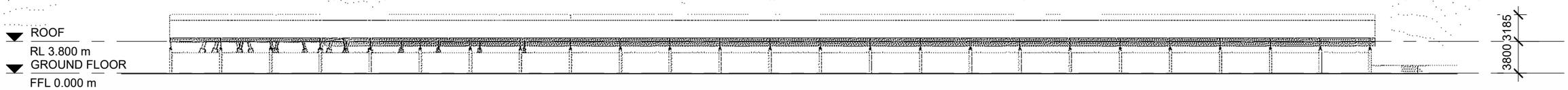

NORTH ELEVATION

1 : 500




EAST ELEVATION

1 : 500




SOUTH ELEVATION

1 : 500

COX designgroup stapleton elliott

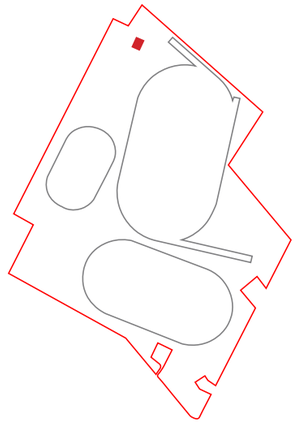
# 3.16 BLOODSTOCK FUNCTION / AUCTION SPACE - RENDER

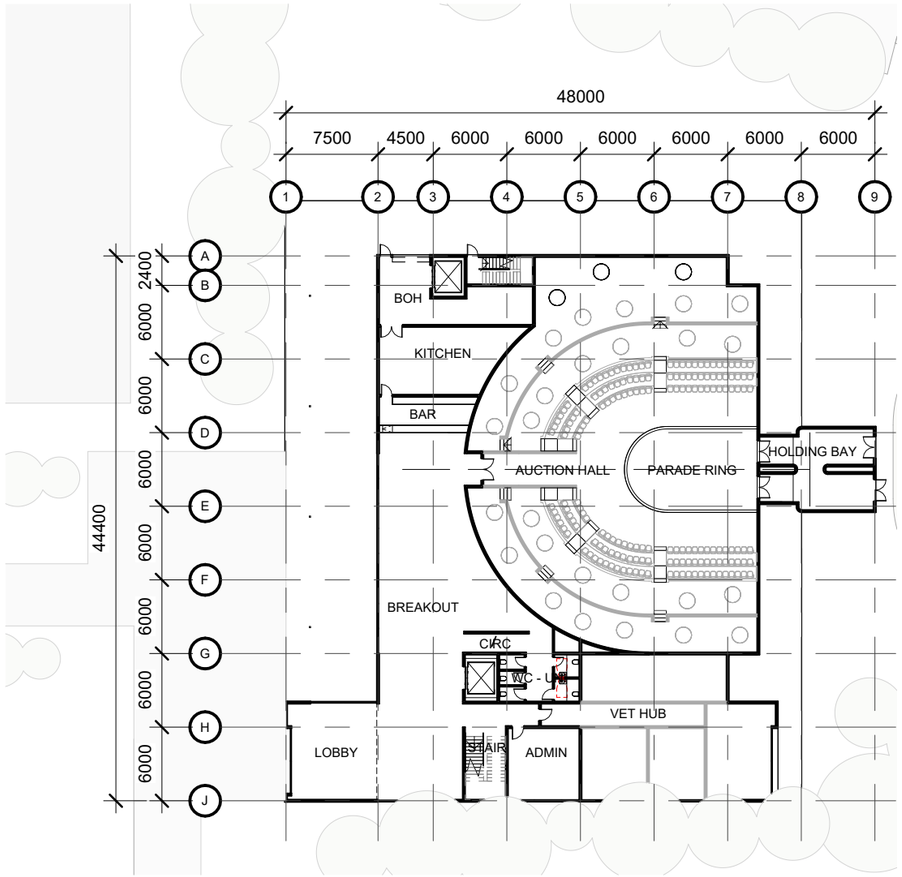



Artist's Impression - Indicative Only

designgroup
**stapleton elliott**

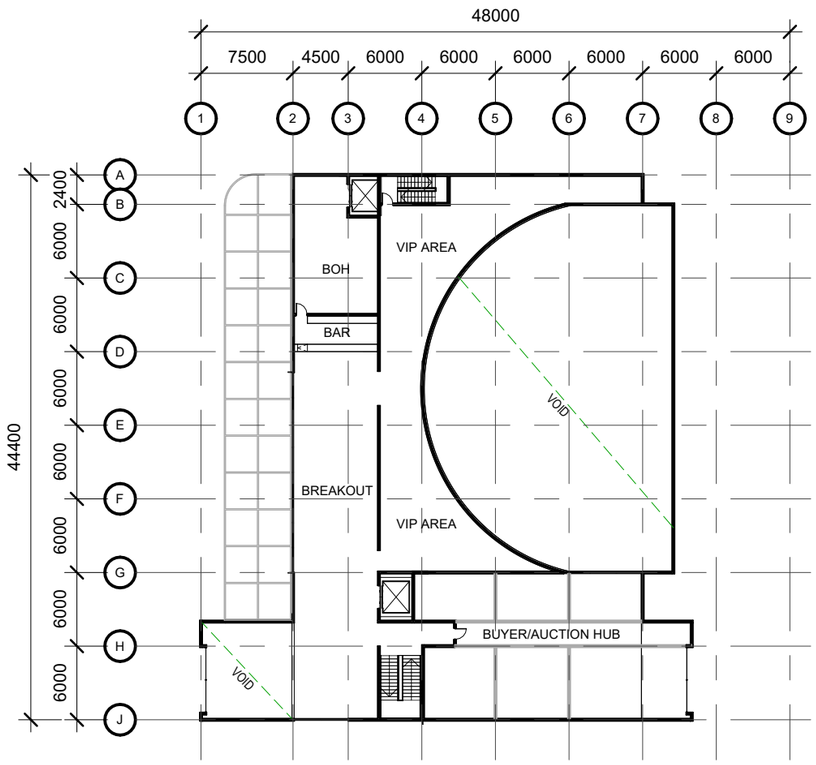
# 3.17 BLOODSTOCK FUNCTION / AUCTION SPACE - PLAN





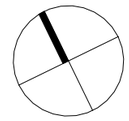

GROUND FLOOR PLAN

1 : 500



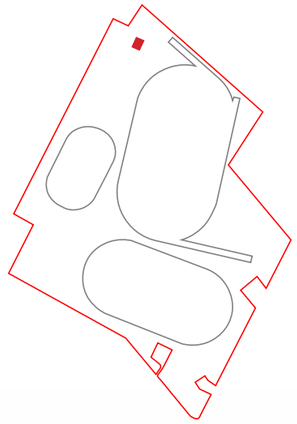

LEVEL 1 FLOOR PLAN

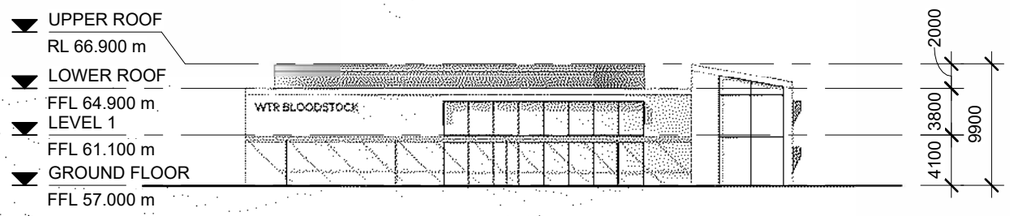
1 : 500



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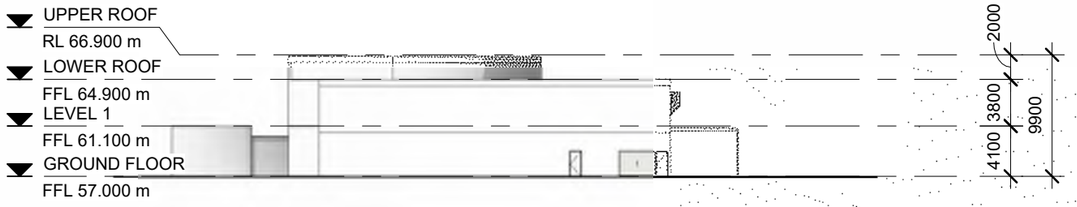
# 3.18 BLOODSTOCK FUNCTION / AUCTION SPACE - ELEVATIONS





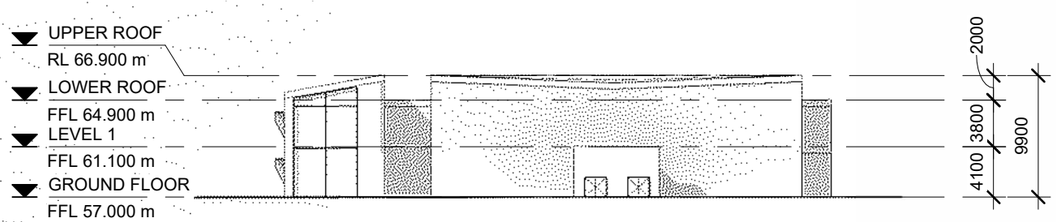

WEST ELEVATION

1 : 500



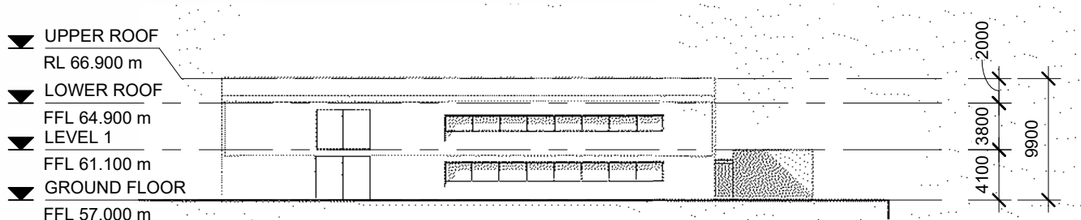

NORTH ELEVATION

1 : 500



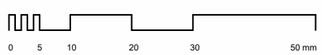

EAST ELEVATION

1 : 500




SOUTH ELEVATION

1 : 500




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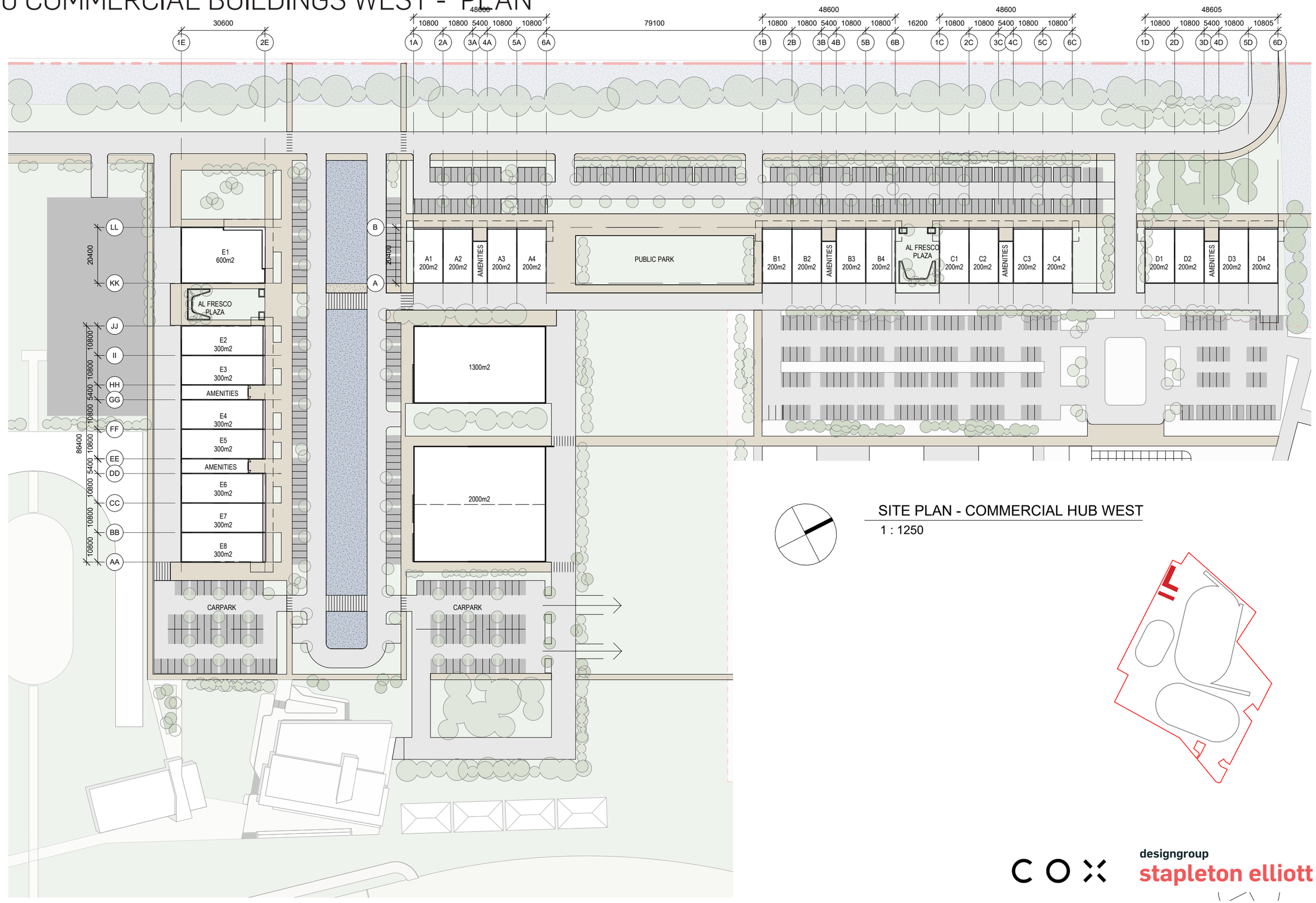
# 3.19 COMMERCIAL BUILDINGS




Artist's Impression - Indicative Only

designgroup
**stapleton elliott**

# 3.20 COMMERCIAL BUILDINGS WEST - PLAN




SITE PLAN - COMMERCIAL HUB WEST

1 : 1250



designgroup stapleton elliott

# 3.21 COMMERCIAL BUILDINGS EAST - PLAN

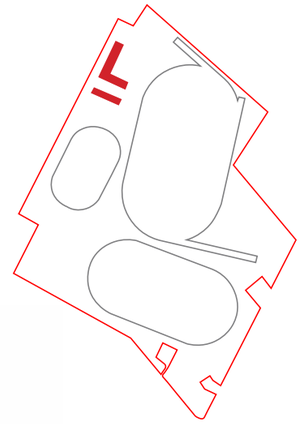


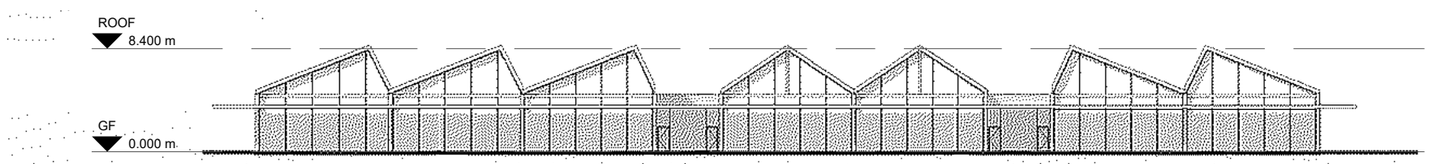

SITE PLAN - COMMERCIAL HUB EAST

1 : 1250

designgroup stapleton elliott

# 3.22 COMMERCIAL BUILDINGS - TYPICAL ELEVATIONS





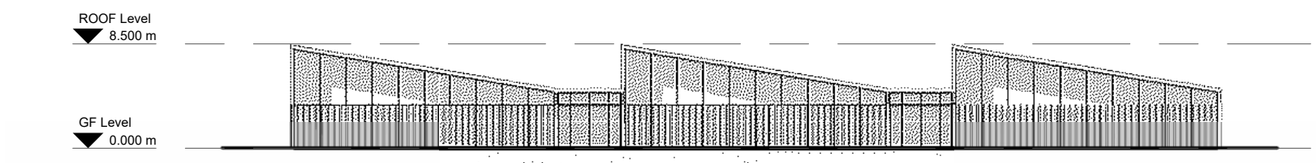

PENCARROW COMMERCIAL_FRONT ELEVATION

1 : 500




PENCARROW LARGER FORMAT_FRONT ELEVATION

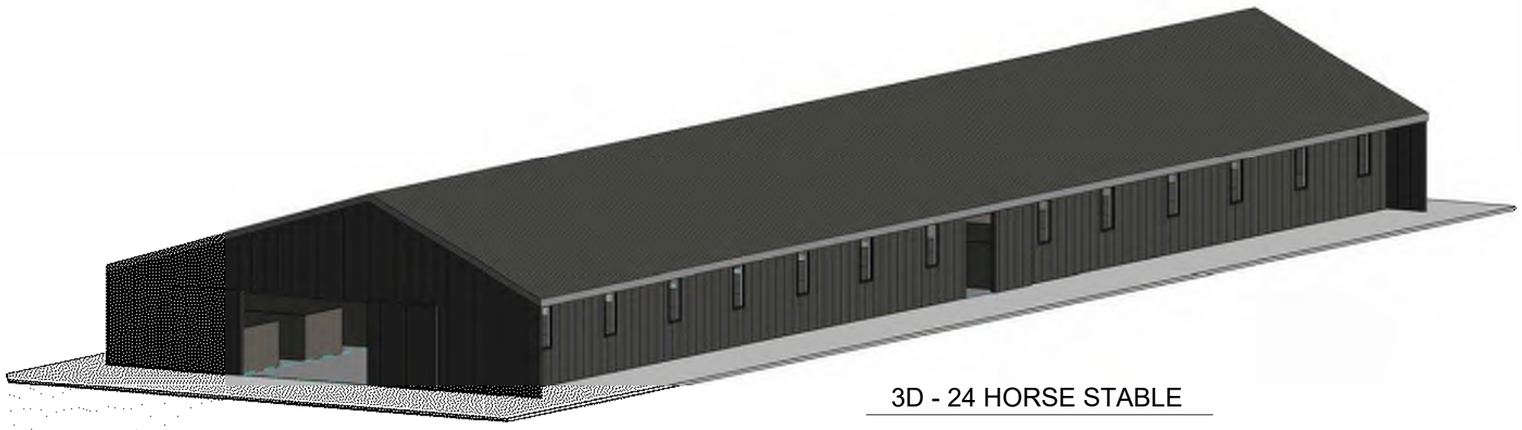
1 : 500



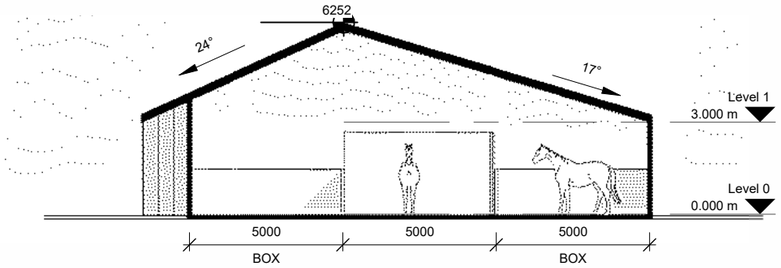

DUNCAN COMMERCIAL_FRONT ELEVATION

1 : 500

# 3.23 STABLE LAYOUTS

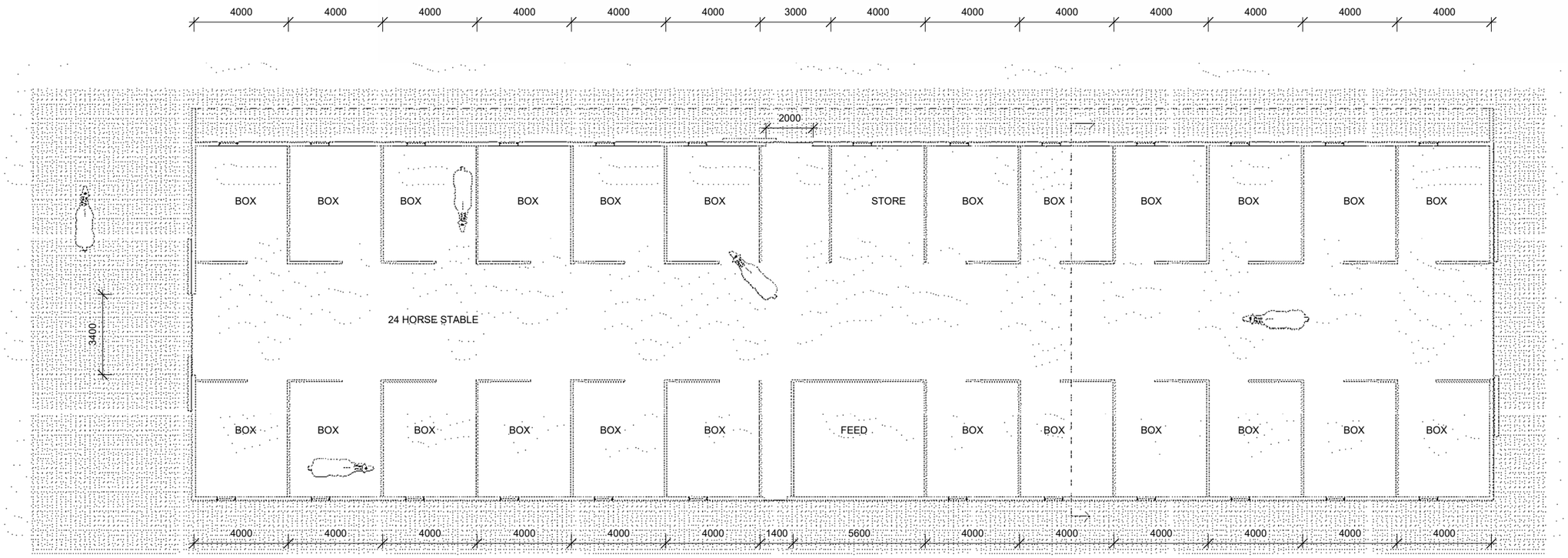


3D - 24 HORSE STABLE




TYPICAL STABLE SECTION

1 : 200

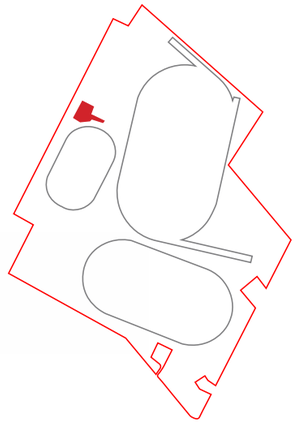


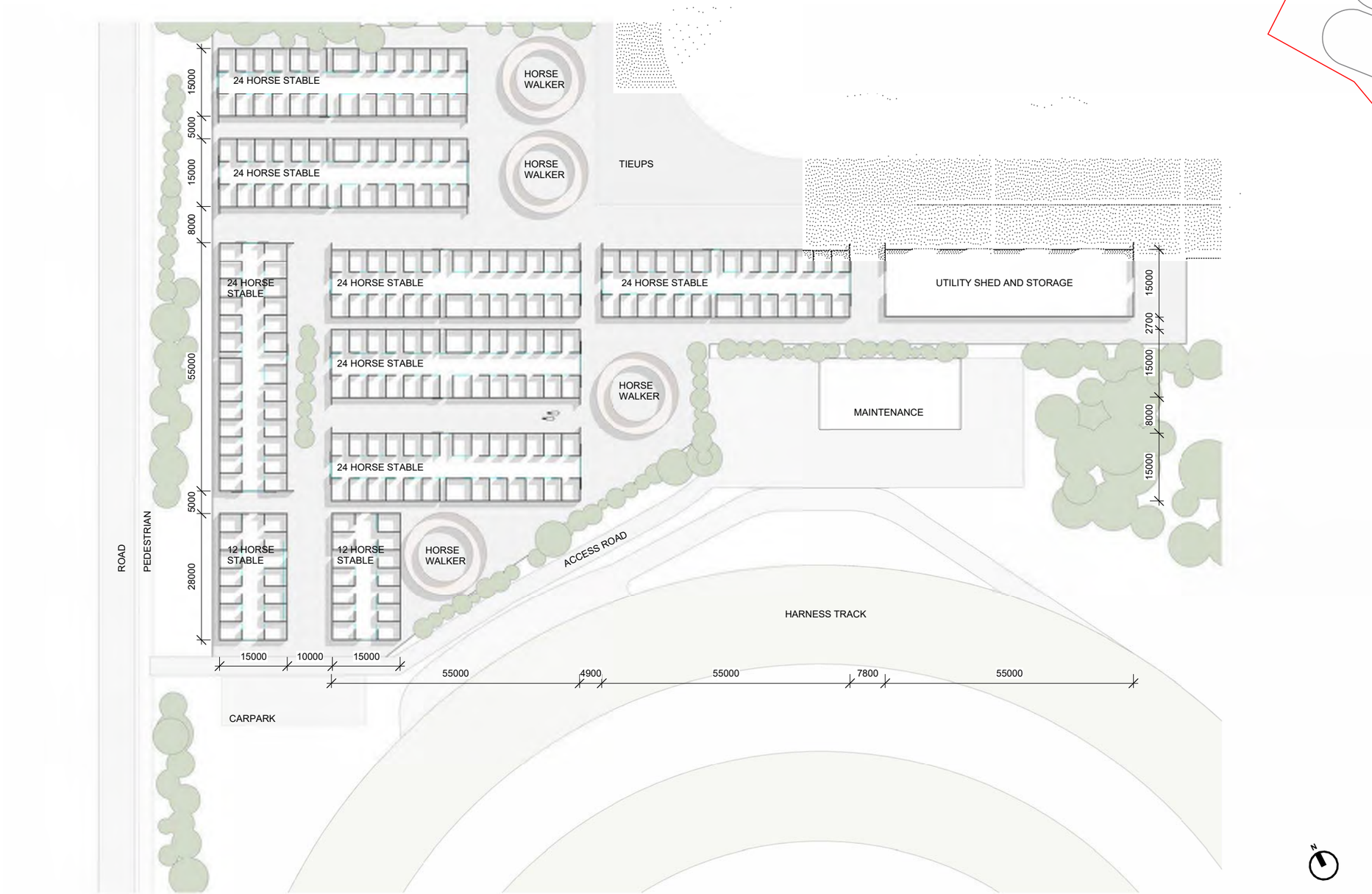

24 HORSE STABLE LAYOUT

1 : 200

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# 3.24 HARNESS STABLES - PLAN

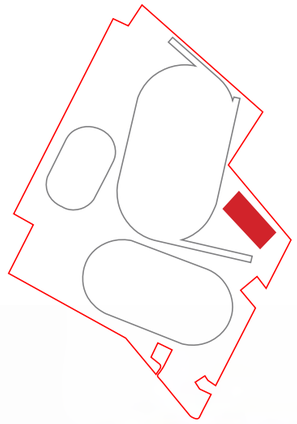


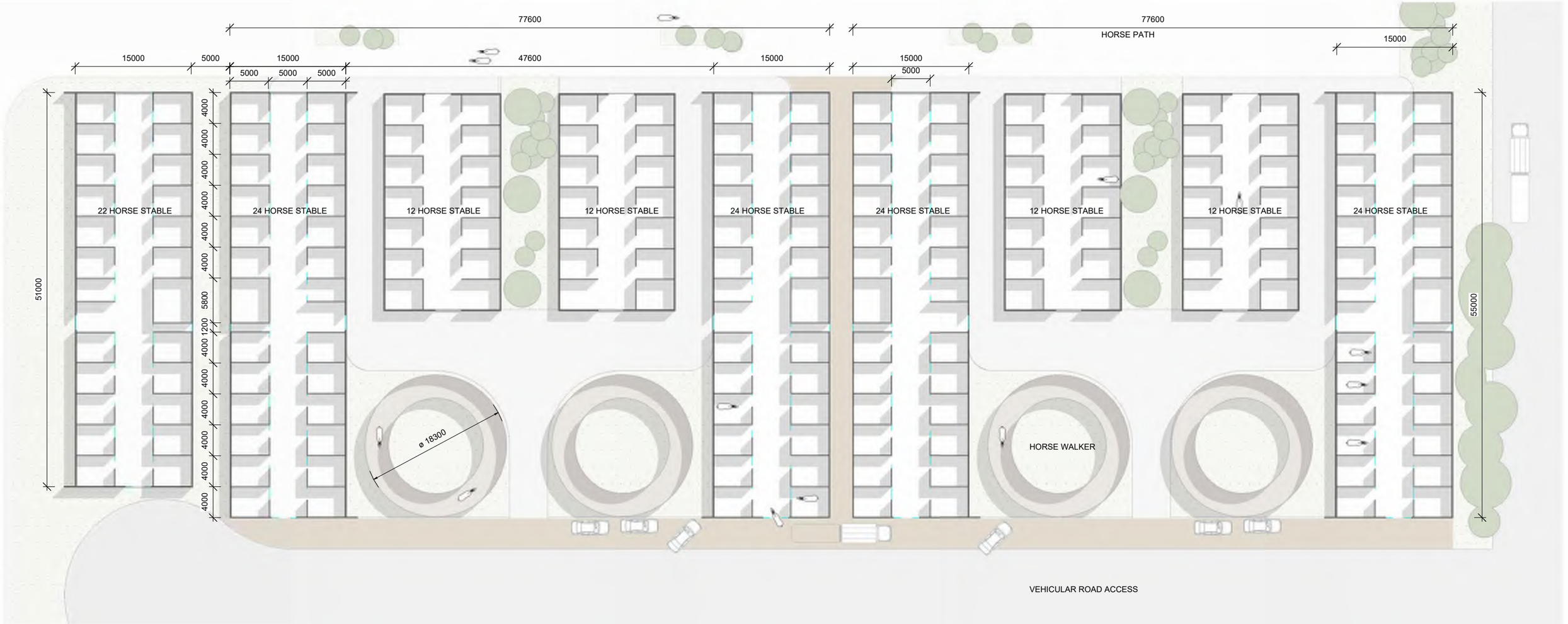



**HARNESS STABLE LAYOUTS**
SCALE @ A3 - 1 : 1000

designgroup stapleton elliott

# 3.25 THOROUGHBRED STABLES - PLAN






COX

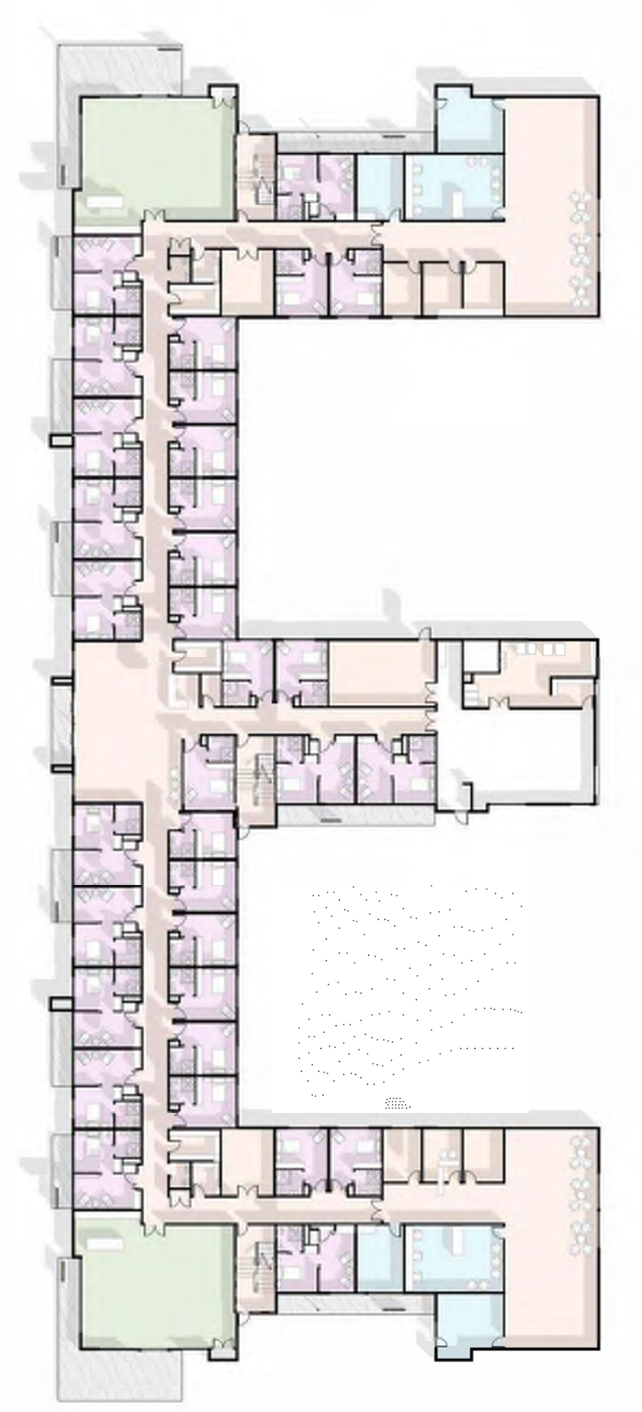
designgroup
stapleton elliott

# 3.26 SENIOR LIVING CARE FACILITY - RENDER

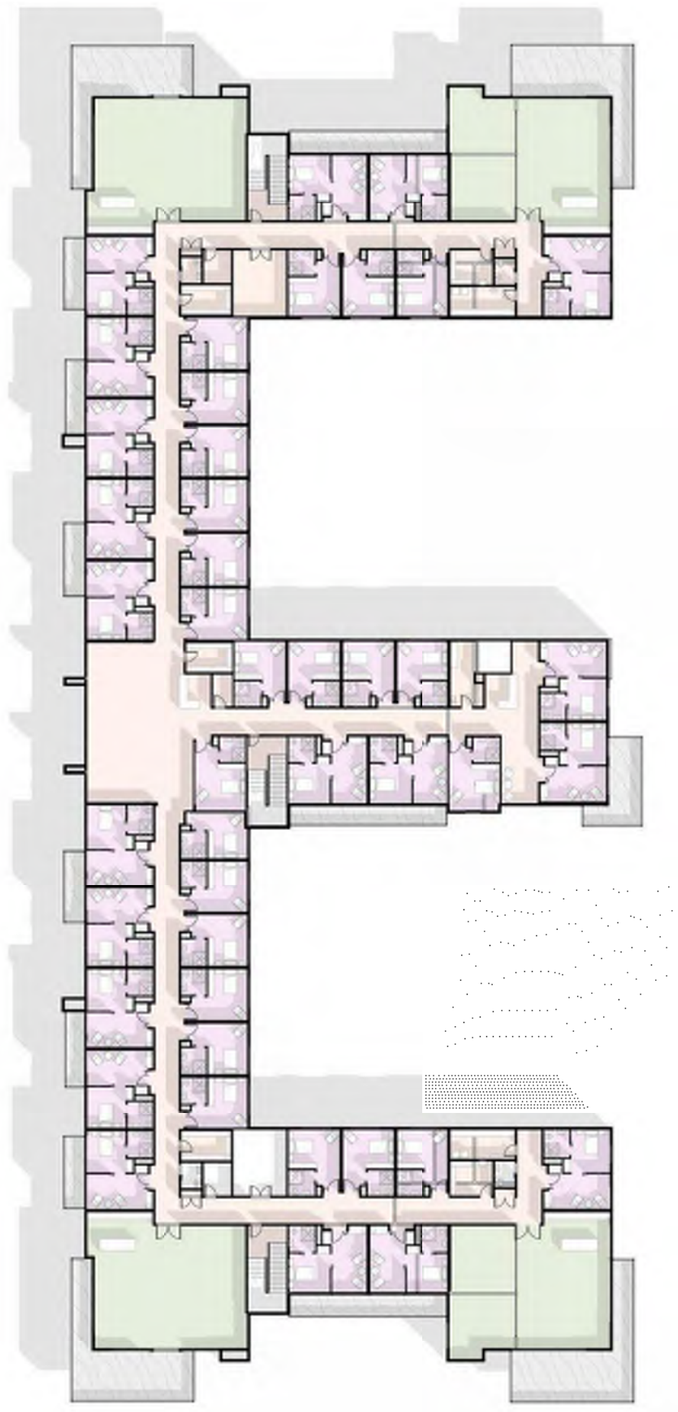


Artist's Impression - Indicative Only

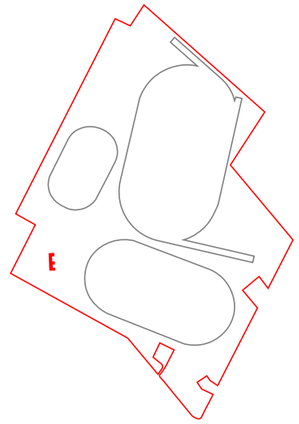
# 3.27 SENIOR LIVING CARE UNITS - PLAN



**CARE & AMENITY BUILDING - GROUND FLOOR**
SCALE @ A3 - 1 : 500



**CARE & AMENITY BUILDING - LEVEL ONE**
SCALE @ A3 - 1 : 500



**LEGEND:**

**AREA SCHEDULE**

- CARE ROOMS / CARE SUITES
- CIRCULATION
- CARE LOUNGE
- RESIDENTS / SHARED AMENITIES
- SERVICES & STAFF ADMIN

**TOTAL AREA CARE & AMENITIES BUILDING**

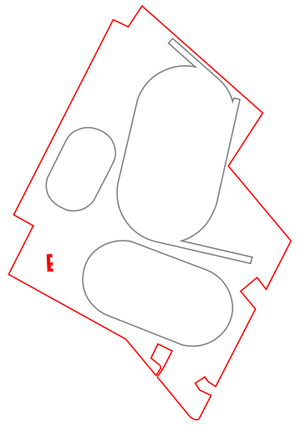
The main spaces are facing North to create a seamless connection between the indoor and outdoor space.

All care rooms and lounge have doors and windows to outdoor areas providing natural ventilation and daylight.

COX

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# 3.28 SENIOR LIVING CARE UNITS - ELEVATIONS







CARE & AMENITY - FRONT ELEVATION

1 : 500



CARE & AMENITY - LEFT ELEVATION

1 : 500




CARE & AMENITY - BACK ELEVATION

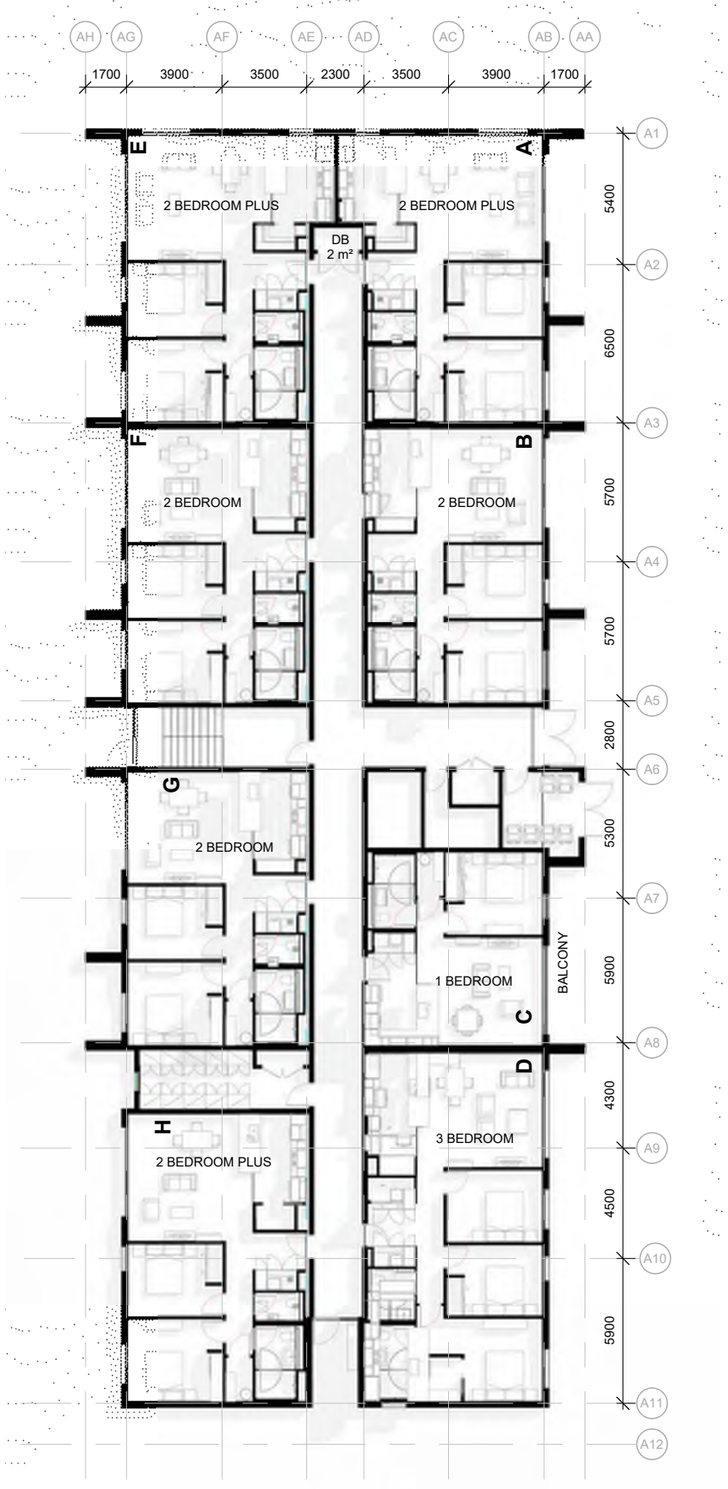
1 : 500



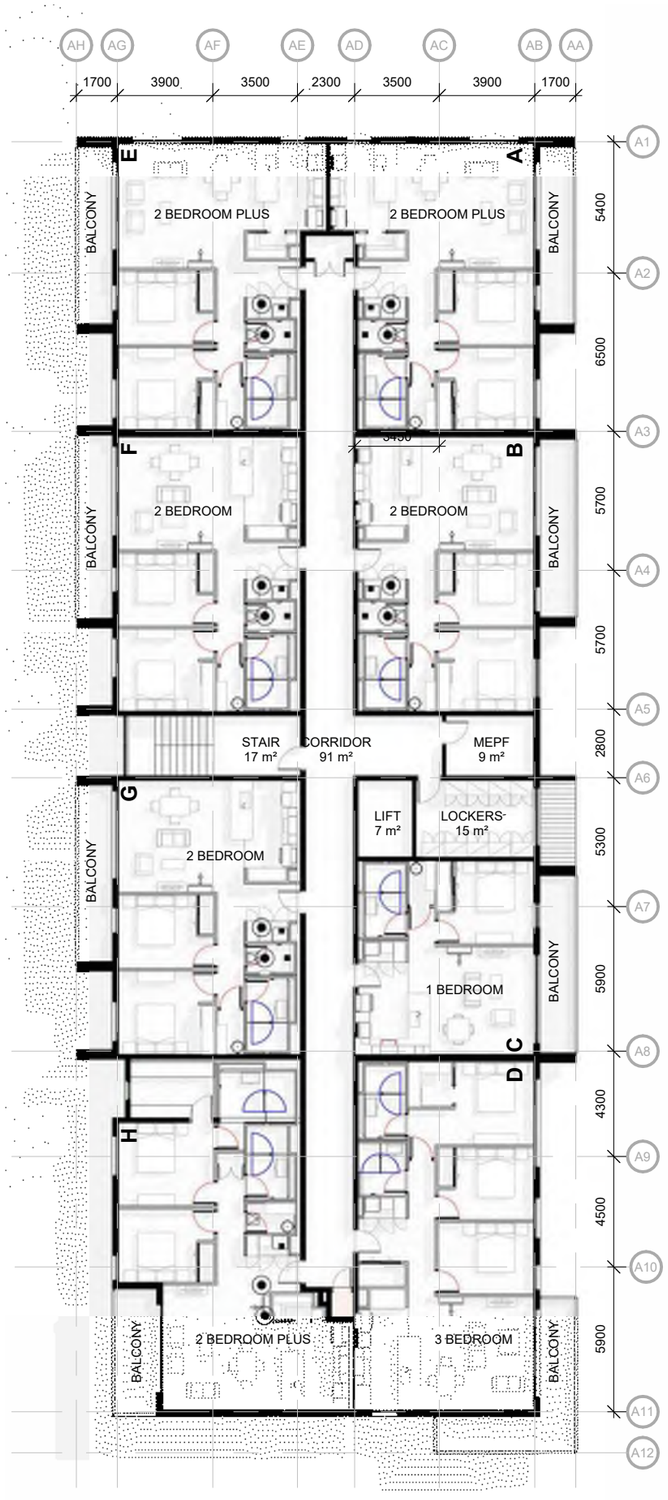
CARE & AMENITY - RIGHT ELEVATION

1 : 500

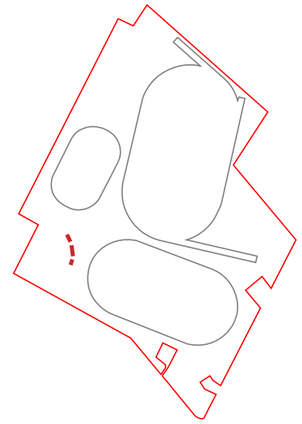
# 3.29 SENIOR LIVING APARTMENTS - PLAN




**APARTMENTS - GROUND FLOOR**
SCALE @ A3 - 1 : 500

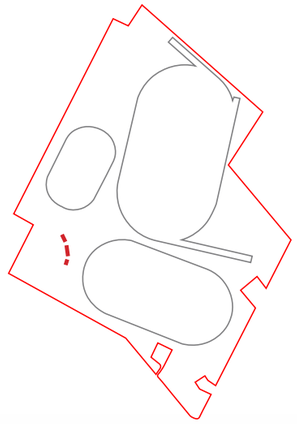



**APARTMENTS - LEVEL ONE**
SCALE @ A3 - 1 : 500



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# 3.30 SENIOR LIVING APARTMENTS - ELEVATIONS






APARTMENTS - WEST ELEVATION

1 : 500



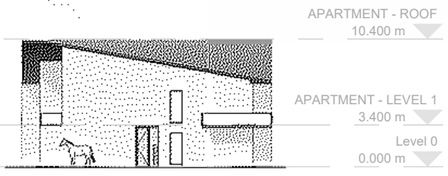

APARTMENTS - NORTH ELEVATION

1 : 500




APARTMENTS - EAST ELEVATION

1 : 500




APARTMENTS - SOUTH ELEVATION

1 : 500

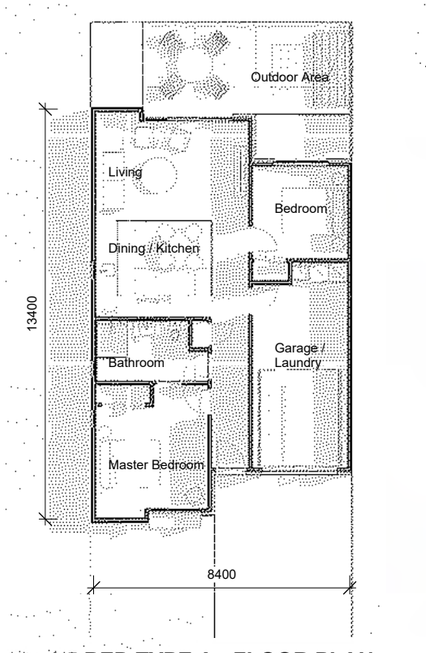
# 3.31 SENIOR LIVING VILLAS - RENDER

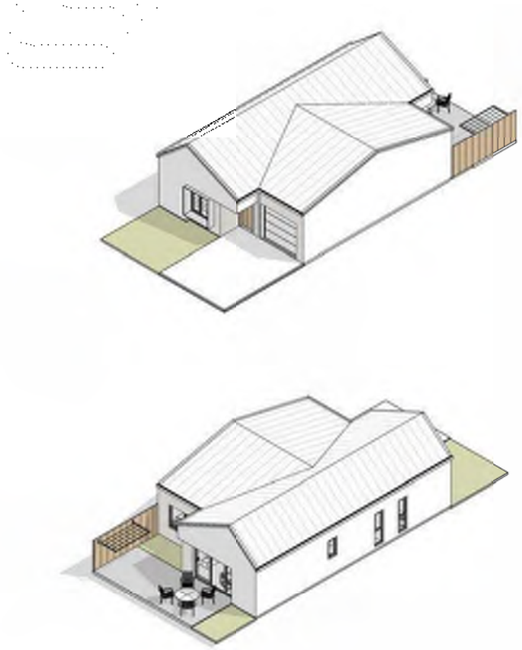


Artist's Impression - Indicative Only

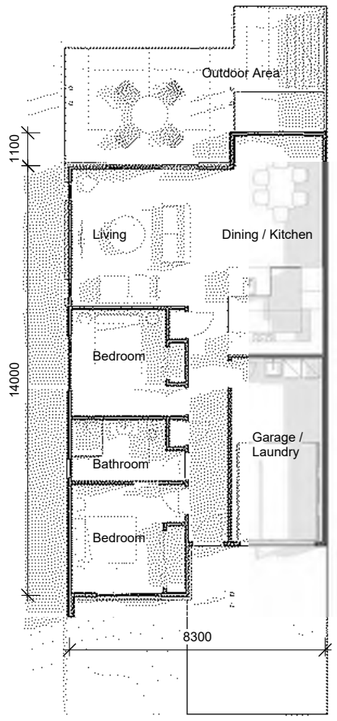
designgroup
**stapleton elliott**

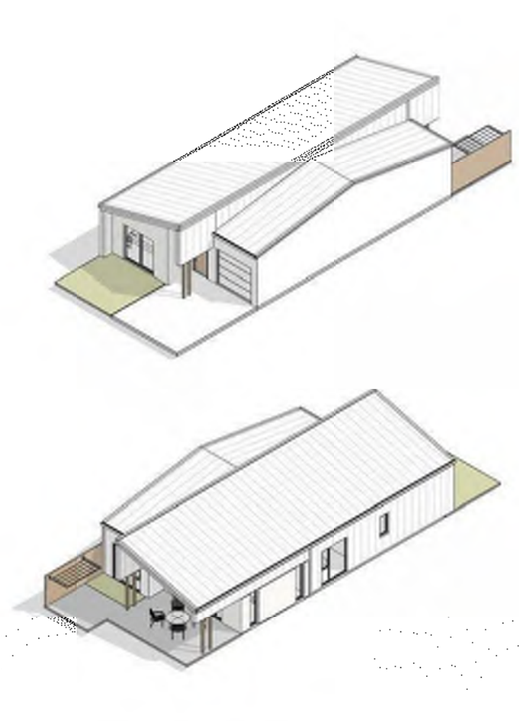
# 3.32 SENIOR LIVING VILLA TYPOLOGIES



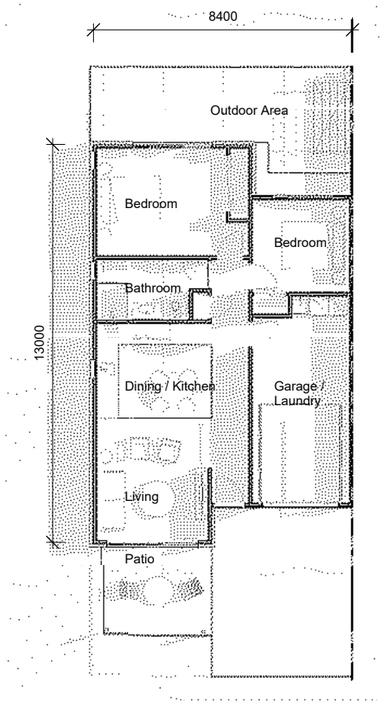



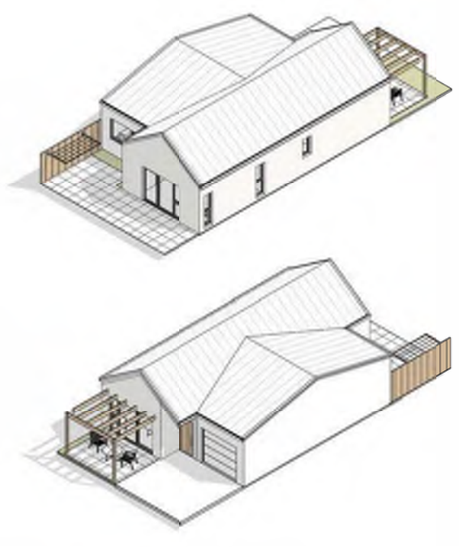
**1.5 BED TYPE A - FLOOR PLAN**
SCALE @ A3 - 1 : 200



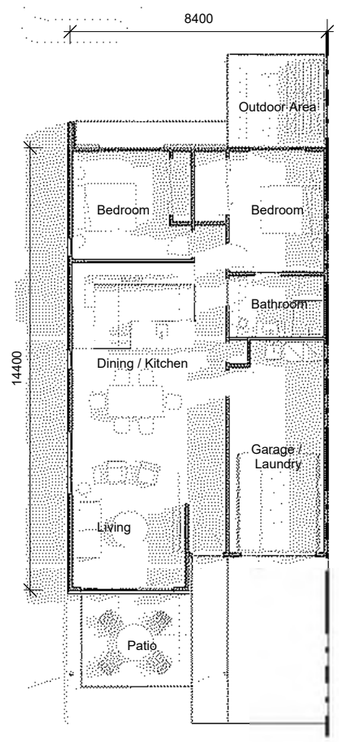



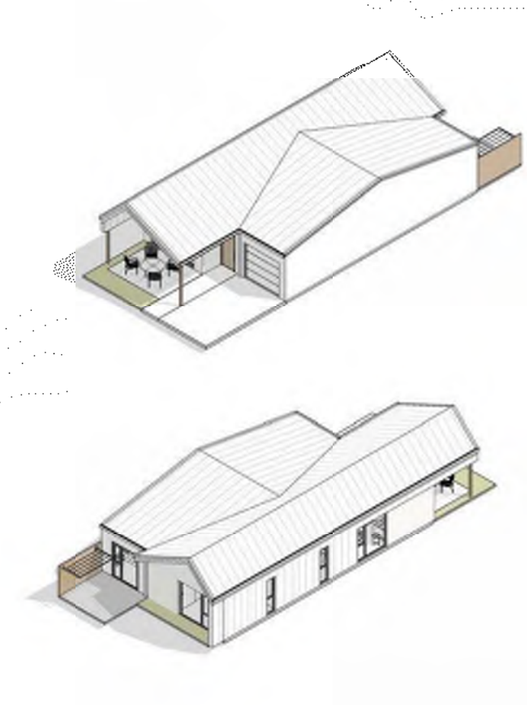
**2 BED TYPE A - FLOOR PLAN**
SCALE @ A3 - 1 : 200



**1.5 BED TYPE B - FLOOR PLAN**
SCALE @ A3 - 1 : 200



**2 BED TYPE B - FLOOR PLAN**
SCALE @ A3 - 1 : 200

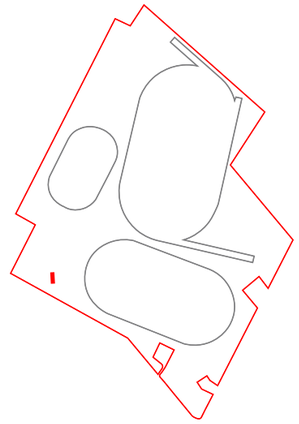
designgroup
stapleton elliott

# 3.33 SENIOR LIVING COMMUNITY CENTRE - RENDER

Artist's Impression - Indicative Only

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# 3.34 SENIOR LIVING COMMUNITY CENTRE - PLAN






COMMUNITY CENTRE

1 : 500

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**HE MANA TŌ TE HOAHOANGA KA WHAKAATA I TE TANGATA ME TŌNA TŪRANGAWAEWAE //** **THERE IS POWER IN DESIGNING ARCHITECTURE THAT REFLECTS ITS PEOPLE AND PLACE.**

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stapleton elliott

# Appendix B Combined Calculations

| | |
|---|---|
| *Job Name* | **Waikato Thoroughbred Racing - Internal** |
| *Location* | **Pencarrow Road, Tamahere** |
| *Job Number* | **23-1883** |
| *Date* | **25/08/2026** |
| *By* | **SJD** |

# PAVEMENT DESIGN (LIGHT PAVEMENTS)

## Design Traffic in terms of Design Number of Equivalent Standard Axles ( DESA )

The available data is restricted to the AADT and the percentage of HMV's

$$DESA = ESA / HVAG \times N_{DT}$$

( EQ ( 7.4 ) - Section 7.6.3 Austroads Pavement Design )

Where: DESA = Design number of Equivalent Standard Axles
ESA / HVAG = average number of Equivalent Standard Axles per Heavy Vehicle Axle Group
$N_{DT}$ = cumulative number of Heavy Vehicle Axle Groups over the design period

and:

$$N_{DT} = 365 \times ( AADT \times DF ) \times \%HV/100 \times N_{HVAG} \times LDF \times CGF$$

( EQ ( 7.1 ) - Section 7.4.1 Austroads Pavement Design )

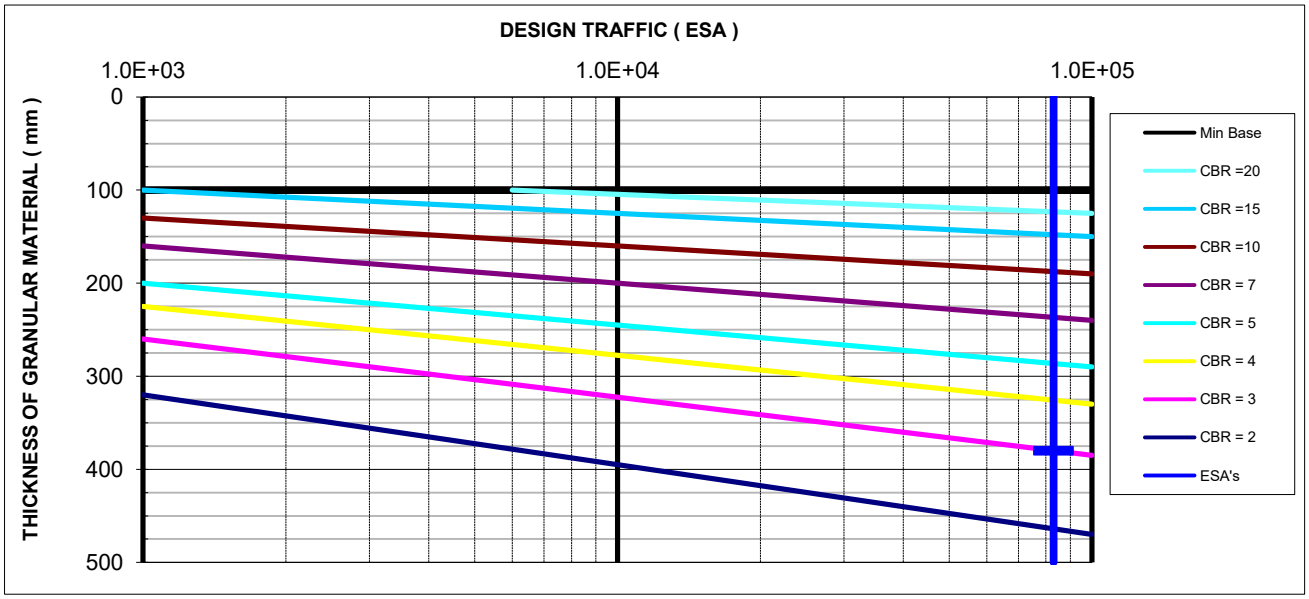
Where: AADT = Annual Average Daily Traffic
DF = Direction Factor
%HV = average percentage of all traffic comprising Heavy Vehicles
$N_{HVAG}$ = average number of Axle Groups per Heavy Vehicle
LDF = Lane Distribution Factor
CGF = Cumulative Growth Factor

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Data | AADT = | 120 | $N_{HVAG}$ = | 2.1 | Growth = | 1.0% | |
| | DF = | 0.5 | LDF = | 1 | Design period = | 50 | Years |
| | %HMV = | 4.0% | | | CGF = | 64.5 | |
| Formula | NDT = 365 x ( 120 x 0.5 ) x 0.04 x 2.1 x 1 x 64.5 = | | | | | 1.2E+05 | Heavy Vehicle Axle Groups |
| Data | ESA / HVAG = | 0.70 | | | | | |
| Formula | DESA = | 0.7 x | 1.2E+05 | = | | 8.3E+04 | Equivalent Standard Axles |

## Pavement Design

Values taken from Fig 8.5 Design chart for granular pavements with thin bituminous surfacing (Austroads Pavement Design for Light Traffic). Design depths for subgrade with a CBR of:-

| | | | |
|---|---|---|---|
| CBR = | 3 | Basecourse Depth (mm) | 150 |
| DESA's = | 8.3E+04 | Subbase Depth (mm) | 230 |
| | | Subgrade Improvement Layer (mm) | 0 |
| | | Total depth (mm) | **380** |



| | |
|---|---|
| *Job Name* | **Waikato Thoroughbred Racing - Main Ro** |
| *Location* | **Pencarrow Road, Tamahere** |
| *Job Number* | **23-1883** |
| *Date* | **25/08/2026** |
| *By* | **SJD** |

# PAVEMENT DESIGN (PREMIUM)

## Design Traffic in terms of Design Number of Equivalent Standard Axles ( DESA )

The available data is restricted to the AADT and the percentage of HMV's

$$DESA = ESA / HVAG \times N_{DT}$$

( EQ ( 7.4 ) - Section 7.6.3 Austroads Pavement Design )

Where: DESA = Design number of Equivalent Standard Axles
ESA / HVAG = average number of Equivalent Standard Axles per Heavy Vehicle Axle Group
$N_{DT}$ = cumulative number of Heavy Vehicle Axle Groups over the design period

and:

$$N_{DT} = 365 \times ( AADT \times DF ) \times \%HV/100 \times N_{HVAG} \times LDF \times CGF$$

( EQ ( 7.1 ) - Section 7.4.1 Austroads Pavement Design )

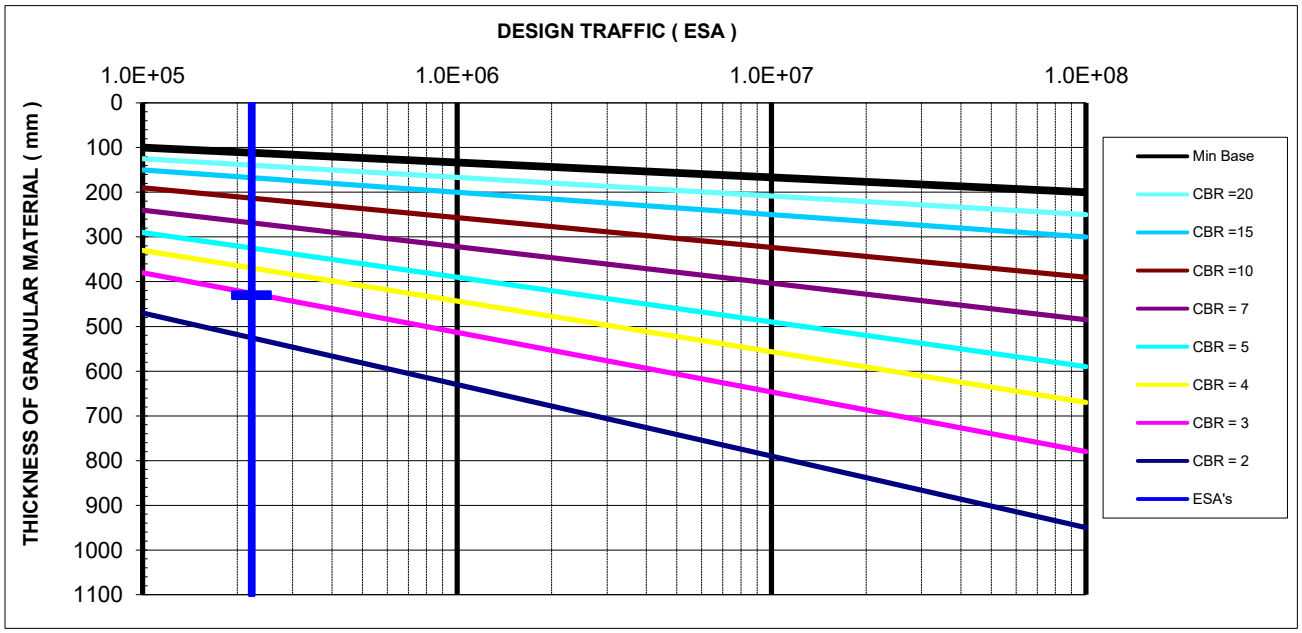
Where: AADT = Annual Average Daily Traffic
DF = Direction Factor
%HV = average percentage of all traffic comprising Heavy Vehicles
$N_{HVAG}$ = average number of Axle Groups per Heavy Vehicle
LDF = Lane Distribution Factor
CGF = Cumulative Growth Factor

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Data | AADT = | 500 | $N_{HVAG}$ = | 2.1 | Growth = | 1.0% | |
| | DF = | 0.5 | LDF = | 1 | Design period = | 50 | Years |
| | %HMV = | 6.0% | | | CGF = | 64.5 | |
| Formula | NDT = 365 x ( 500 x 0.5 ) x 0.06 x 2.1 x 1 x 64.5 = | | | | | 7.4E+05 | Heavy Vehicle Axle Groups |
| Data | ESA / HVAG = | 0.30 | | | | | |
| Formula | DESA = | 0.3 x | 7.4E+05 | = | | 2.2E+05 | Equivalent Standard Axles |

## Pavement Design

Values taken from Fig 8.4 Design chart for granular pavements with thin bituminous surfacing (Austroads Pavement Design). Design depths for subgrade with a CBR of:-

| | | | | |
|---|---|---|---|---|
| CBR = | 3 | Basecourse Depth (mm) | 150 | |
| DESA's = | 2.2E+05 | Subbase Depth (mm) | 190 | |
| | | Subgrade Improvement Layer (mm) | 90 | ( CBR > 5 ) |
| | | Total depth (mm) | **430** | |



PROJECT: **Waikato Thoroughbred Racing - Substantive Application**

JOB No. **23-1883** DATE : **28-09-26**

BY: **CPD** PAGE: **1**

**DESIGN SPREADSHEET**

**Determine Wastewater Flows for WTR development discharging into MBBR system**

## Wastewater Flow Rates

| Reference | Senior Living Precinct | |
|---|---|---|
| | **Population** | |
| Villas (1.8 person per villa) | **162** | *number of units as per master plan* |
| Apartment (2 person per) | **80** | *number of units as per master plan* |
| 180 care suites (1 person per) | **180** | *number of units as per master plan* |
| Wastewater Flow | **220** | *litres/person/day (from table 6.2 TP58, commercial wastewater flows for Retirement Home resident)* |

**Average Daily Flow, ADF** = $\frac{\text{consumption x population}}{86400}$

**Average Daily Flow, ADF = 1.07 L/s**

**Peak Wet Weather Flow, PWWF 7.20 L/s** *Peaking factor of 6.7× as per RITS v2 section 5.2.4.5*

| Reference | Bloodstock Precinct | |
|---|---|---|
| Peak Occupancy | **1000** | *as per client figures provided* |
| Wastewater Flow | **25** | *litres/person/day (from table 6.2 TP58, commercial wastewater flows for lunch patron)* |

**Average Daily Flow, ADF** = $\frac{\text{consumption x population}}{86400}$

**Average Daily Flow, ADF = 0.29 L/s**

**Peak Wet Weather Flow, PWWF 1.94 L/s** *Peaking factor of 6.7× as per RITS v2 section 5.2.4.5*

| Reference | Entry Road Commercial Area | |
|---|---|---|
| Assumed Occupancy | **360** | *based on 150 people per hectare (RITS v2 section 6.2.3/5.2.4.7)* |
| Wastewater Flow | **25** | *litres/person/day (from table 6.2 TP58, commercial wastewater flows for lunch patron)* |

**Average Daily Flow, ADF** = $\frac{\text{consumption x population}}{86400}$

**Average Daily Flow, ADF = 0.10 L/s**

**Peak Wet Weather Flow, PWWF 0.70 L/s** *Peaking factor of 6.7× as per RITS v2 section 5.2.4.5*

| Reference | Harness Large Race Day | |
|---|---|---|
| Harness Race Day Spectators | **3000** | *as per client figures provided* |
| Harness Race Day Non-Spectators | **157** | *as per client figures provided* |
| Harness Horses onsite | **100** | *10 races with an average of 10 runners* |
| Spectator Water Wastewater Flow | **20** | *litres/person/day (from table 6.2 TP58, commercial wastewater flows for bar patron)* |
| Non-Spectator Wastewater Flow | **40** | *litres/person/day as per TP58 day staff useage* |
| Horse Washdown Water | **150** | *Litres/horse/day* |

**Average Daily Flow, ADF** = $\frac{\text{consumption x population}}{86400}$

**Average Daily Flow, ADF = 0.94 L/s**

**Peak Wet Weather Flow PWWF = 5.31 L/s** *Peaking factor of 6.7× as per RITS v2 section 5.2.4.5 applied to human wastewater flows*

**DESIGN SPREADSHEET**

**Determine Wastewater Flows for WTR development discharging into MBBR system**

| **Reference** | **Harness Training Days (Monday to Saturday)** |
|---|---|

| | | |
|---|---|---|
| Harness Training Non-Spectators | **90** | *as per client figures provided* |
| Harness Horses onsite | **205** | *as per client figures provided* |
| Non-Spectator Wastewater Flow | **40** | *litres/person/day as per TP58 day staff useage* |
| Horse Washdown Water | **150** | *Litres/horse/day* |

**Average Daily Flow, ADF** = $\frac{\text{consumption x population}}{86400}$

**Average Daily Flow, ADF = 0.40 L/s**

**Peak Wet Weather Flow, PWWF = 0.64 L/s** *Peaking factor of 6.7× as per RITS v2 section 5.2.4.5 applied to human wastewater flows*

| **Reference** | **Harness Horse Urine within Stables** |
|---|---|

| | | |
|---|---|---|
| Number of Stabled Horses | **205** | *as per client figures provided* |
| Stabled Urine Volume | **2.4** | *gallons/horse/day as per Penn State College of Agricultural Research and Cooperative Extension titled "Horse Stable Manure Management"* |
| | **9.1** | *litres/horse/day* |
| Woodchip/Hay absorption | **10%** | *woodchip/hay assumed to absorb urine and then mucked out* |
| Captured Urine | **8.2** | *litres/horse/day* |

= $\frac{\text{consumption x population}}{86400}$

**Average Daily Flow, ADF = 0.02 L/s** *No peaking factor applied*

| **Reference** | **Thoroughbred Large Race Day** |
|---|---|

| | | |
|---|---|---|
| Thoroughbred Race Day Spectators | **6000** | *as per client figures provided* |
| Thoroughbred Race Day Non-Spectators | **330** | *as per client figures provided* |
| Thoroughbred Horses onsite | **120** | *10 races with an average of 12 runners* |
| Spectator Wastewater Flow | **20** | *litres/person/day (from table 6.2 TP58, commercial wastewater flows for bar patron)* |
| Non-Spectator Wastewater Flow | **40** | *litres/person/day as per TP58 day staff useage* |
| Horse Washdown Water | **150** | *Litres/horse/day* |

**Average Daily Flow, ADF** = $\frac{\text{consumption x population}}{86400}$

**Average Daily Flow, ADF = 1.75 L/s**

**Peak Wet Weather Flow, PWWF = 10.54 L/s** *Peaking factor of 6.7× as per RITS v2 section 5.2.4.5 applied to human wastewater flows*

**DESIGN SPREADSHEET**

**Determine Wastewater Flows for WTR development discharging into typical OSET system**

| **Reference** | **Thoroughbred Training Days (Monday to Saturday)** |
|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Trainers, Jockeys & Stablehands | | | **293** | | *as per client figures provided* |
| Thoroughbred Horses onsite | | | **900** | | *as per client figures provided* |
| Trainers, Jockeys & Stablehands Wastewater Flow | | | **48** | | *litres/person/day as per TP58 day staff useage* |
| Horse Washdown Water | | | **150** | | *Litres/horse/day* |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 14064 |
| **Average Daily Flow,** | **ADF** | = | consumption x population | | 135000 |
| | | | 86400 | | 0.1041778 |
| **Average Daily Flow,** | **ADF** | = | **1.73** | **L/s** | |
| **Peak Wet Weather Flow,** | **PWWF** | = | **2.65** | **L/s** | *Peaking factor of 6.7× as per RITS v2 section 5.2.4.5 applied to human wastewater flows* |

| **Reference** | **Thoroughbred Horse Urine within Stables** |
|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Number of Stabled Horses | | | **900** | | *as per client figures provided* |
| Stabled Urine Volume | | | **2.4** | | *gallons/horse/day as per Penn State College of Agricultural Research and Cooperative Extension titled "Horse Stable Manure Management"* |
| | | | **9.1** | | *litres/horse/day* |
| Woodchip/Hay absorption | | | **10%** | | *woodchip/hay assumed to absorb urine and then mucked out* |
| Captured Urine | | | **8.2** | | *litres/horse/day* |

| | | | | | |
|---|---|---|---|---|---|
| | | = | consumption x population | | |
| | | | 86400 | | |
| **Average Daily Flow,** | **ADF** | = | **0.09** | **L/s** | *No peaking factor applied* |

| **Reference** | **Equine Support Services** |
|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Zone/Establishment | | | **Business Zone** | | *(from Table 91 RITS v2 section 5.2.4.7)* |
| Wastewater Flow | | | **40** | | *litres/person/day as per TP58 day staff useage* |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Population | = | Population Equivalent | | x | Area (ha) | | |
| Population | = | 45 | | x | 0.50 | | *as per masterplan* |
| **Population** | = | **23** | **persons** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Average Daily Flow,** | **ADF** | = | consumption x population | | |
| | | | 86400 | | |
| **Average Daily Flow,** | **ADF** | = | **0.01** | **L/s** | |
| **Peak Wet Weather Flow,** | **PWWF** | = | **0.07** | **L/s** | *Peaking Factor of 6.7× as per RITS v2 section 6.2.3* |

PROJECT: **Waikato Thoroughbred Racing - Substantive**

JOB No. **23-1883** DATE : **28-09-26**

BY: **CPD** PAGE: **1**

**DESIGN SPREADSHEET**

**Determine Potable Water Supply Flow Rates using Waikato LASS - Regional Infrastructure Technical Specifications (RITS v2)**

## Potable Water Demand Rates

| Reference | Senior Living Precinct |
|---|---|

| | Population | |
|---|---|---|
| Villas (1.8 person per villa) | **162** | *number of units as per master plan* |
| Apartment (2 person per) | **80** | *number of units as per master plan* |
| care suites (1 person per) | **180** | *number of units as per master plan* |
| Water Consumption | **260** | *litres/person/day (from RITS v2 section 6.2.3)* |

**Daily Flow, DF =** $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 1.27 L/s**

**Peak Flow, PF = 6.35 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

| Reference | Bloodstock Precinct |
|---|---|

| | | |
|---|---|---|
| Bloodstock Event Visitors | **1000** | *as per client figures provided* |
| Water Consumption | **30** | *litres/person/day (1.2× expected wastewater flows)* |

**Daily Flow, DF =** $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 0.35 L/s**

**Peak Flow, PF = 1.74 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

| Reference | Entry Road Commercial Area |
|---|---|

| | | |
|---|---|---|
| Commecial Area Occupancy | **360** | *based on 150 people per hectare (RITS v2 section 6.2.3/5.2.4.7)* |
| Water Consumption | **30** | *litres/person/day (1.2× expected wastewater flows)* |

**Daily Flow, DF =** $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 0.12 L/s**

**Peak Flow, PF = 0.62 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

| Reference | Harness Large Race Day |
|---|---|

| | | |
|---|---|---|
| Harness Race Day Spectators | **3000** | *as per client figures provided* |
| Harness Race Day Non-Spectators | **157** | *as per client figures provided* |
| Harness Horses onsite | **100** | *10 races with an average of 10 runners* |
| Spectator Water Consumption | **24** | *litres/person/day (1.2× expected wastewater flows)* |
| Non-Spectator Consumption | **48** | *litres/person/day as per 1.2× TP58 day staff useage* |
| Horse Washdown Water | **150** | *Litres/horse/day* |
| Horse Drinnking Water | **45** | *litres/horse/day (as per System Equine comprehensive water consumption chart)* |

**Daily Flow, DF =** $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 1.15 L/s**

**Peak Flow, PF = 5.73 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

| Reference | Harness Training Days (Monday to Saturday) |
|---|---|

| | | |
|---|---|---|
| Harness Training Non-Spectators | **90** | *as per client figures provided* |
| Harness Horses onsite | **205** | *as per client figures provided* |
| Non-Spectator Consumption | **48** | *litres/person/day as per 1.2× TP58 day staff useage* |
| Horse Washdown Water | **150** | *Litres/horse/day* |
| Horse Drinnking Water | **45** | *litres/day (as per System Equine comprehensive water consumption chart)* |

**Daily Flow, DF =** $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 0.43 L/s**

**Peak Flow, PF = 2.15 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

**DESIGN SPREADSHEET**

**Determine Potable Water Supply Flow Rates using Waikato LASS - Regional Infrastructure Technical Specifications (RITS v2)**

| Reference | Thoroughbred Large Race Day |
|---|---|

| | | |
|---|---|---|
| Thoroughbred Race Day Spectators | **6000** | *as per client figures provided* |
| Thoroughbred Race Day Non-Spectators | **330** | *as per client figures provided* |
| Thoroughbred Horses onsite | **120** | *10 races with an average of 12 runners* |
| Spectator Water Consumption | **24** | *litres/person/day (1.2× expected wastewater flows)* |
| Non-Spectator Consumption | **48** | *litres/person/day as per 1.2× TP58 day staff useage* |
| Horse Washdown Water | **150** | *Litres/horse/day* |
| Horse Drinnking Water | **45** | *litres/horse/day (as per System Equine comprehensive water consumption chart)* |

**Daily Flow, DF** = $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 2.12 L/s**

**Peak Flow, PF = 10.60 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

| Reference | Thoroughbred Training Days (Monday to Saturday) |
|---|---|

| | | |
|---|---|---|
| Trainers, Jockeys & Stablehands | **293** | *as per client figures provided* |
| Thoroughbred Horses onsite | **900** | *as per client figures provided* |
| Trainers, Jockeys & Stablehands Consumption | **48** | *litres/person/day as per 1.2× TP58 day staff useage* |
| Horse Pool water Usage | **5138** | *litres/day (allowance for evaporation +10%)* |
| Horse Washdown Water | **150** | *Litres/horse/day* |
| Horse Drinnking Water | **45** | *litres/day (as per System Equine comprehensive water consumption chart)* |

**Daily Flow, DF** = $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 2.25 L/s**

**Peak Flow, PF = 11.27 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

| Reference | Equine Support Services |
|---|---|

| | | |
|---|---|---|
| Zone/Establishment | **Business Zone** | *(from Table 91 RITS v2 section 5.2.4.7)* |
| Water Consumption | **48** | *litres/person/day as per 1.2× TP58 day staff useage* |

Population = Population Equivalent x Area (ha)

Population = 45 x 0.50 *as per masterplan*

**Population = 23 persons**

**Daily Flow, DF** = $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 0.01 L/s**

**Peak Flow, PF = 0.05 L/s** *Peaking Factor of 5× as per RITS v2 section 6.2.3*

| Reference | Rural Residential Lifestyle Sections |
|---|---|

| | | |
|---|---|---|
| Number of Lots | **34** | |
| People per household | **4** | *typically 2.8 people per household as per RITS v2 section 5.2.4.7 Table 91 but increased due to expected larger homes* |
| Water Consumption | **260** | *litres/person/day (from RITS v2 section 6.2.3)* |

**Population = 136 persons**

**Daily Flow, DF** = $\frac{\text{consumption x population}}{86400}$

**Daily Flow, DF = 0.41 L/s** *Peak flow not required as each lot will manage there own supply individually*

*Job Name* **Waikato Thoroughbred Racing - Substantive Application**
*Location* **Pencarrow Road, Tamahere**
*Job Number* **23-1883**
*Date* **30/09/2026**
*By* **SJD**

## Stormwater Reuse Storage Calculator

### Stormwater Runoff

| Location | Hamilton |
|---|---|

Monthly mean rainfall retrieved from NIWA 1991-2020 period
https://niwa.co.nz/climate-and-weather/mean-monthly-rainfall-mm

| Reference | Surface Type | Slope | Coefficient | Area (m²) | Effective Area (m²) |
|---|---|---|---|---|---|
| Bloodstock Precinct | Roof | 5-10% | 0.90 | 13,150 | 11,835.0 |
| Bloodstock Carparks | Asphalt/concrete | 0-5% | 0.80 | 8,836 | 7,068.8 |
| Entry Road Commercial Building | Roof | 5-10% | 0.90 | 10,500 | 9,450.0 |
| Entry Road Commercial Carparking | Asphalt/concrete | 0-5% | 0.80 | 3,841 | 3,072.8 |
| Events Buildings & Tie ups | Roof | 5-10% | 0.90 | 7,950 | 7,155.0 |
| Raceday Parking & Harness Float | Asphalt/concrete | 0-5% | 0.80 | 8,734 | 6,987.2 |
| Harness Trainers Buildings | Roof | 5-10% | 0.90 | 8,570 | 7,713.0 |
| Thoroughbred Trainers Buildings | Roof | 5-10% | 0.90 | 28,255 | 25,429.5 |
| Equine Support Buildings | Roof | 5-10% | 0.90 | 7,600 | 6,840.0 |
| Thoroughbred Float Parking | Asphalt/concrete | 0-5% | 0.80 | 12,268 | 9,814.4 |
| | | | Total | 109,704 | 95,365.7 |

| | | | | | |
|---|---|---|---|---|---|
| Inner Tracks | Grass (high soakage) | 0-5% | 0.15 | 50,000 | 7,500.0 |

### Maximum Expected Irrigation Water Consumption

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grass Track Irrigation Demand (m³) | 21,908 | 16,699 | 10,418 | 9,192 | 9,192 | 9,192 | 9,192 | 9,192 | 9,192 | 9,192 | 15,473 | 17,924 | 146,766 |
| Other Tracks Irrigation Demand (m³) | 1,778 | 1,778 | 1,778 | 1,778 | 200 | 200 | 200 | 200 | 1,778 | 1,778 | 1,778 | 1,778 | 15,025 |
| Harness Tracks Irrigation Demand (m³) | 3,224 | 3,224 | 3,224 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | 3,224 | 3,224 | 3,224 | 30,950 |
| Total Irrigation Demand (m³) | 26,910 | 21,701 | 15,420 | 12,905 | 11,326 | 11,326 | 11,326 | 11,326 | 12,905 | 14,194 | 20,475 | 22,927 | 192,741 |
| Monthly water take from Bore (m³) | 22,475 | 22,475 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,100 | 22,475 | 22,475 | 93,000 |
| Daily Water take from bore | 725 | 725 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 725 | 725 | |

### Water Storage

| | | | |
|---|---|---|---|
| Starting Storage | 100,000 | m³ | |
| Pond Volume | 135,000 | m³ | minimum required storage capacity within irrigation ponds |
| Nominal Pond Area | 90,000 | m² | assumed average depth of 1.5m to allow for minimal excavation into groundwater |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Monthly Rainfall (mm) | 75.4 | 65.0 | 75.4 | 92.3 | 103.3 | 117.8 | 124.2 | 106.5 | 100.1 | 86.0 | 79.0 | 99.2 | |
| Contributing Runoff (m³) | 6,251 | 5,389 | 6,251 | 7,652 | 8,564 | 9,766 | 10,296 | 8,829 | 8,298 | 7,130 | 6,549 | 8,224 | 93,198 |
| Irrigation Consumption (m³) | 26,910 | 21,701 | 15,420 | 12,905 | 11,326 | 11,326 | 11,326 | 11,326 | 12,905 | 14,194 | 20,475 | 22,927 | 192,741 |
| Evaporation Losses on Pond (m³) | 1,307 | 1,066 | 833 | 478 | 275 | 190 | 202 | 322 | 506 | 798 | 1,031 | 1,213 | 8,220 |
| Water Take from Bores (m³) | 22,475 | 22,475 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,100 | 22,475 | 22,475 | 93,000 |
| Inner Tracks Contributing Runoff (m³) | 566 | 488 | 566 | 692 | 775 | 884 | 932 | 799 | 751 | 645 | 593 | 744 | 8,432 |
| Monthly Surplus/Shortage (m³) | 1,075 | 5,585 | -9,436 | -5,038 | -2,263 | -867 | -300 | -2,021 | -4,361 | -4,118 | 8,111 | 7,303 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Storage Volume Remaining (m³) | 101,075 | 106,659 | 97,223 | 92,185 | 89,922 | 89,054 | 88,754 | 86,733 | 82,372 | 78,254 | 86,365 | 93,668 | |
| Pond Top Up from Direct Rain (m³) | 5,429 | 4,680 | 5,429 | 6,646 | 7,438 | 8,482 | 8,942 | 7,668 | 7,207 | 6,192 | 5,688 | 7,142 | |
| Total Storage Remaining (m³) | 106,504 | 111,339 | 102,652 | 98,830 | 97,359 | 97,536 | 97,697 | 94,401 | 89,580 | 84,446 | 92,053 | 100,811 | |

**Notes:**

- 1 Mean monthly rainfall retrieved from NIWA and covers the mean monthly values for the 1991-2020 period
- 2 Irrigation demand for equine tracks provided by argonomist
- 3 Evaporation losses were estimated by the agronomist and adjusted to account for the use of evaporation-reduction measures
- 4 Pond area is nominal only and is to be confirmed at detailed design
- 5 A minimum of 1 months worth of irrigation volume (40,000m³) is to be in pond at all times to allow for 1 month of no rainfall.
- 6 Monthly irrigation demand varies throughout the year based on peak summer requirements and minimum irrigation requirements during winter for sand and plough tracks. Irrigation consumption rates have been provided by argonomist

*Job Name* **Waikato Thoroughbred Racing - Substantive Application**
*Location* **Pencarrow Road, Tamahere**
*Job Number* **23-1883**
*Date* **30/09/2026**
*By* **SJD**

## Stormwater Reuse Storage Calculator

### Stormwater Runoff

| Location | Hamilton |
|---|---|

Monthly mean rainfall retrieved from NIWA 1991-2020 period
https://niwa.co.nz/climate-and-weather/mean-monthly-rainfall-mm

| Reference | Surface Type | Slope | Coefficient | Area (m²) | Effective Area (m²) |
|---|---|---|---|---|---|
| Bloodstock Precinct | Roof | 5-10% | 0.90 | 13,150 | 11,835.0 |
| Bloodstock Carparks | Asphalt/concrete | 0-5% | 0.80 | 8,836 | 7,068.8 |
| Entry Road Commercial Building | Roof | 5-10% | 0.90 | 10,500 | 9,450.0 |
| Entry Road Commercial Carparking | Asphalt/concrete | 0-5% | 0.80 | 3,841 | 3,072.8 |
| Events Buildings & Tie ups | Roof | 5-10% | 0.90 | 7,950 | 7,155.0 |
| Raceday Parking & Harness Float | Asphalt/concrete | 0-5% | 0.80 | 8,734 | 6,987.2 |
| Harness Trainers Buildings | Roof | 5-10% | 0.90 | 8,570 | 7,713.0 |
| Thoroughbred Trainers Buildings | Roof | 5-10% | 0.90 | 28,255 | 25,429.5 |
| Equine Support Buildings | Roof | 5-10% | 0.90 | 7,600 | 6,840.0 |
| Thoroughbred Float Parking | Asphalt/concrete | 0-5% | 0.80 | 12,268 | 9,814.4 |
| | | | Total | 109,704 | 95,365.7 |
| Inner Tracks | Grass (high soakage) | 0-5% | 0.15 | 50,000 | 7,500.0 |

### Assessed Irrigation Water Consumption

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grass Track Irrigation Demand (m³) | 21,908 | 16,699 | 6,251 | 5,515 | 0 | 0 | 0 | 0 | 5,515 | 5,515 | 15,473 | 17,924 | 94,800 |
| Other Tracks Irrigation Demand (m³) | 1,778 | 1,778 | 1,067 | 1,067 | 200 | 200 | 200 | 200 | 1,067 | 1,067 | 1,778 | 1,778 | 12,180 |
| Harness Tracks Irrigation Demand (m³) | 3,224 | 3,224 | 1,934 | 1,161 | 967 | 967 | 967 | 967 | 1,161 | 1,934 | 3,224 | 3,224 | 22,955 |
| Total Irrigation Demand (m³) | 26,910 | 21,701 | 9,252 | 7,743 | 1,167 | 1,167 | 1,167 | 1,167 | 7,743 | 8,516 | 20,475 | 22,927 | 129,935 |
| Monthly water take from Bore (m³) | 10,447 | 10,447 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10,447 | 10,447 | 41,788 |
| Daily Water take from bore | 337 | 337 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 337 | 337 | |

### Water Storage

| | | | |
|---|---|---|---|
| Starting Storage | 100,000 | m³ | |
| Pond Volume | 135,000 | m³ | minimum required storage capacity within irrigation ponds |
| Nominal Pond Area | 90,000 | m² | assumed average depth of 1.5m to allow for minimal excavation into groundwater |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Monthly Rainfall (mm) | 75.4 | 65.0 | 75.4 | 92.3 | 103.3 | 117.8 | 124.2 | 106.5 | 100.1 | 86.0 | 79.0 | 99.2 | |
| Contributing Runoff (m³) | 5,033 | 4,339 | 5,033 | 6,162 | 6,896 | 7,864 | 8,291 | 7,110 | 6,682 | 5,741 | 5,274 | 6,622 | 75,047 |
| Irrigation Consumption (m³) | 26,910 | 21,701 | 9,252 | 7,743 | 1,167 | 1,167 | 1,167 | 1,167 | 7,743 | 8,516 | 20,475 | 22,927 | 129,935 |
| Evaporation Losses on Pond (m³) | 1,307 | 1,066 | 833 | 478 | 275 | 190 | 202 | 322 | 506 | 798 | 1,031 | 1,213 | 8,220 |
| Water Take from Bores (m³) | 10,447 | 10,447 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10,447 | 10,447 | 41,788 |
| Inner Tracks Contributing Runoff (m³) | 566 | 488 | 566 | 692 | 775 | 884 | 932 | 799 | 751 | 645 | 593 | 744 | 8,432 |
| Monthly Surplus/Shortage (m³) | -12,171 | -7,493 | -4,485 | -1,367 | 6,228 | 7,390 | 7,854 | 6,419 | -816 | -2,929 | -5,193 | -6,327 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Storage Volume Remaining (m³) | 87,829 | 80,336 | 75,851 | 74,484 | 80,712 | 88,102 | 95,956 | 102,375 | 101,560 | 98,631 | 93,438 | 87,112 | |
| Pond Top Up from Direct Rain (m³) | 5,429 | 4,680 | 5,429 | 6,646 | 7,438 | 8,482 | 8,942 | 7,668 | 7,207 | 6,192 | 5,688 | 7,142 | |
| Total Storage Remaining (m³) | 93,258 | 85,016 | 81,280 | 81,130 | 88,150 | 96,584 | 104,899 | 110,043 | 108,767 | 104,823 | 99,126 | 94,254 | |

**Notes:**

- 1 Mean monthly rainfall retrieved from NIWA and covers the mean monthly values for the 1991-2020 period
- 2 Evaporation losses were estimated by the agronomist and adjusted to account for the use of evaporation-reduction measures
- 3 Evaporation losses provided by argonomist
- 4 Pond area is nominal only and is to be confirmed at detailed design
- 5 A minimum of 1 months worth of irrigation volume (40,000m³) is to be in pond at all times to allow for 1 month of no rainfall.
- 6 Monthly consumption varies throughout the year based on peak summer requirements and minimum irrigation requirements during winter for sand and plough tracks. Irrigation consumption rates have been assumed based on infromation provided by argonomist and have been adjusted to vary inline with mean monthly rainfall
- 7 A net deficiet of 5,746m³ or stored irrigation water per year is expected. This is an operational risk of the development and as such additional water to fill the pond to starting levels every 16 years is to be accounted for

# SSA Model Outputs

## Channel Results

| SN | Element ID | Peak Flow (lps) | Time of Peak Flow Occurrence (days hh:mm) | Design Flow Capacity (lps) | Peak Flow/ Design Flow Ratio | Peak Flow Velocity (m/sec) | Travel Time (min) | Peak Flow Depth (m) | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged (min) | Froude Number | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MainSwale01 | 6249.73 | 0 12:21 | 11012.88 | 0.57 | 0.92 | 0.31 | 0.72 | 0.73 | 0.00 | | |
| 2 | MainSwale02 | 5387.75 | 0 12:32 | 10397.55 | 0.52 | 0.85 | 4.30 | 0.69 | 0.69 | 0.00 | | |
| 3 | MainSwale03 | 4534.75 | 0 12:32 | 9926.98 | 0.46 | 0.77 | 1.07 | 0.64 | 0.64 | 0.00 | | |
| 4 | MainSwale04 | 4535.80 | 0 12:31 | 10480.20 | 0.43 | 0.80 | 2.64 | 0.62 | 0.62 | 0.00 | | |
| 5 | MainSwale05 | 3986.82 | 0 12:32 | 10432.77 | 0.38 | 0.77 | 6.79 | 0.58 | 0.58 | 0.00 | | |
| 6 | MainSwale06 | 3828.50 | 0 12:27 | 10891.17 | 0.35 | 0.78 | 3.64 | 0.55 | 0.55 | 0.00 | | |
| 7 | MainSwale07 | 3525.75 | 0 12:31 | 9325.94 | 0.38 | 0.69 | 3.21 | 0.58 | 0.58 | 0.00 | | |
| 8 | MainSwale08 | 3540.54 | 0 12:25 | 12757.36 | 0.28 | 0.84 | 0.47 | 0.48 | 0.48 | 0.00 | | |
| 9 | MainSwale09 | 3540.51 | 0 12:24 | 10248.83 | 0.35 | 0.73 | 3.16 | 0.55 | 0.55 | 0.00 | | |
| 10 | MainSwale10 | 2714.66 | 0 12:33 | 10340.61 | 0.26 | 0.70 | 15.20 | 0.46 | 0.46 | 0.00 | | |
| 11 | MainSwale11 | 2424.73 | 0 12:26 | 10656.99 | 0.23 | 0.66 | 2.32 | 0.43 | 0.43 | 0.00 | | |
| 12 | MainSwale12 | 2210.94 | 0 12:26 | 14742.42 | 0.15 | 0.79 | 0.14 | 0.34 | 0.34 | 0.00 | | |
| 13 | MainSwale13 | 2210.97 | 0 12:26 | 10391.54 | 0.21 | 0.63 | 2.49 | 0.41 | 0.41 | 0.00 | | |
| 14 | MainSwale14 | 1576.49 | 0 12:25 | 16817.30 | 0.09 | 0.76 | 2.32 | 0.25 | 0.26 | 0.00 | | |
| 15 | MainSwale15 | 1254.05 | 0 12:24 | 7585.46 | 0.17 | 0.45 | 11.88 | 0.35 | 0.35 | 0.00 | | |
| 16 | MainSwale16 | 214.68 | 0 12:23 | 913.01 | 0.24 | 0.06 | 7.08 | 0.43 | 0.43 | 0.00 | | |
| 17 | MainSwale17 | 217.99 | 0 12:17 | 10826.30 | 0.02 | 0.28 | 3.54 | 0.10 | 0.10 | 0.00 | | |
| 18 | MainSwaleOverflow | 1018.08 | 0 11:19 | 1018.08 | 1.00 | 0.23 | 0.13 | 0.50 | 1.00 | 0.00 | | |
| 19 | NorthSwale01 | 2729.40 | 0 12:13 | 2729.40 | 1.00 | 0.27 | 0.18 | 1.00 | 1.00 | 0.00 | | |
| 20 | NorthSwale02 | 6816.33 | 0 12:34 | 8854.19 | 0.77 | 0.82 | 4.15 | 0.86 | 0.86 | 0.00 | | |
| 21 | NorthSwale03 | 6434.30 | 0 12:32 | 8764.35 | 0.73 | 0.84 | 11.70 | 0.83 | 0.83 | 0.00 | | |
| 22 | NorthSwale04 | 6115.24 | 0 12:26 | 10034.57 | 0.61 | 0.88 | 5.37 | 0.75 | 0.75 | 0.00 | | |
| 23 | NorthSwale05 | 5601.64 | 0 12:23 | 8059.17 | 0.70 | 0.80 | 10.95 | 0.80 | 0.80 | 0.00 | | |
| 24 | NorthSwale06 | 1200.99 | 0 12:15 | 8619.80 | 0.14 | 0.45 | 11.11 | 0.32 | 0.32 | 0.00 | | |
| 25 | SouthSwale01 | 3519.98 | 0 12:15 | 8504.91 | 0.41 | 0.64 | 0.25 | 0.61 | 0.61 | 0.00 | | |
| 26 | SouthSwale02 | 1912.71 | 0 12:38 | 11153.41 | 0.17 | 0.65 | 11.77 | 0.36 | 0.36 | 0.00 | | |
| 27 | SouthSwale03 | 2418.12 | 0 12:23 | 11549.53 | 0.21 | 0.74 | 7.64 | 0.40 | 0.40 | 0.00 | | |
| 28 | SouthSwale04 | 1775.35 | 0 12:19 | 10824.48 | 0.16 | 0.61 | 3.57 | 0.35 | 0.35 | 0.00 | | |
| 29 | SouthSwale05 | 1078.37 | 0 12:17 | 16527.71 | 0.07 | 0.65 | 0.46 | 0.20 | 0.21 | 0.00 | | |
| 30 | SouthSwale06 | 1078.58 | 0 12:17 | 11353.26 | 0.10 | 0.52 | 2.94 | 0.25 | 0.26 | 0.00 | | |
| 31 | SouthSwale07 | 261.09 | 0 12:10 | 10906.93 | 0.02 | 0.30 | 3.58 | 0.11 | 0.11 | 0.00 | | |

## Channel Results

| SN | Element ID | Peak Flow (lps) | Time of Peak Flow Occurrence (days hh:mm) | Design Flow Capacity (lps) | Peak Flow/ Design Flow Ratio | Peak Flow Velocity (m/sec) | Travel Time (min) | Peak Flow Depth (m) | Peak Flow Depth/ Total Depth Ratio | Total Time Surcharged (min) | Froude Number | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MainSwale01 | 6538.65 | 0 12:43 | 11012.88 | 0.59 | 0.93 | 0.31 | 0.75 | 0.75 | 0.00 | | |
| 2 | MainSwale02 | 6241.40 | 0 12:44 | 10397.55 | 0.60 | 0.89 | 4.10 | 0.75 | 0.75 | 0.00 | | |
| 3 | MainSwale03 | 5704.62 | 0 12:43 | 9926.98 | 0.57 | 0.83 | 0.99 | 0.73 | 0.73 | 0.00 | | |
| 4 | MainSwale04 | 5705.32 | 0 12:42 | 10480.20 | 0.54 | 0.87 | 2.43 | 0.71 | 0.71 | 0.00 | | |
| 5 | MainSwale05 | 5346.04 | 0 12:41 | 10432.77 | 0.51 | 0.85 | 6.15 | 0.69 | 0.69 | 0.00 | | |
| 6 | MainSwale06 | 5236.85 | 0 12:37 | 10891.17 | 0.48 | 0.87 | 3.26 | 0.66 | 0.66 | 0.00 | | |
| 7 | MainSwale07 | 5052.30 | 0 12:35 | 9325.94 | 0.54 | 0.77 | 2.88 | 0.71 | 0.71 | 0.00 | | |
| 8 | MainSwale08 | 5058.94 | 0 12:34 | 12757.36 | 0.40 | 0.95 | 0.41 | 0.59 | 0.59 | 0.00 | | |
| 9 | MainSwale09 | 5059.10 | 0 12:34 | 10248.83 | 0.49 | 0.82 | 2.82 | 0.67 | 0.67 | 0.00 | | |
| 10 | MainSwale10 | 4326.93 | 0 12:34 | 10340.61 | 0.42 | 0.81 | 13.14 | 0.61 | 0.61 | 0.00 | | |
| 11 | MainSwale11 | 2424.73 | 0 12:26 | 10656.99 | 0.23 | 0.66 | 2.32 | 0.43 | 0.43 | 0.00 | | |
| 12 | MainSwale12 | 2210.94 | 0 12:26 | 14742.42 | 0.15 | 0.79 | 0.14 | 0.34 | 0.34 | 0.00 | | |
| 13 | MainSwale13 | 2210.97 | 0 12:26 | 10391.54 | 0.21 | 0.63 | 2.49 | 0.41 | 0.41 | 0.00 | | |
| 14 | MainSwale14 | 1576.49 | 0 12:25 | 16817.30 | 0.09 | 0.76 | 2.32 | 0.25 | 0.26 | 0.00 | | |
| 15 | MainSwale15 | 1254.05 | 0 12:24 | 7585.46 | 0.17 | 0.45 | 11.88 | 0.35 | 0.35 | 0.00 | | |
| 16 | MainSwale16 | 214.68 | 0 12:23 | 913.01 | 0.24 | 0.06 | 7.08 | 0.43 | 0.43 | 0.00 | | |
| 17 | MainSwale17 | 217.99 | 0 12:17 | 10826.30 | 0.02 | 0.28 | 3.54 | 0.10 | 0.10 | 0.00 | | |
| 18 | MainSwaleOverflow | 1018.08 | 0 11:19 | 1018.08 | 1.00 | 0.23 | 0.13 | 0.50 | 1.00 | 0.00 | | |
| 19 | NorthSwale01 | 2729.40 | 0 12:13 | 2729.40 | 1.00 | 0.27 | 0.18 | 1.00 | 1.00 | 0.00 | | |
| 20 | NorthSwale02 | 6816.33 | 0 12:34 | 8854.19 | 0.77 | 0.82 | 4.15 | 0.86 | 0.86 | 0.00 | | |
| 21 | NorthSwale03 | 6434.30 | 0 12:32 | 8764.35 | 0.73 | 0.84 | 11.70 | 0.83 | 0.83 | 0.00 | | |
| 22 | NorthSwale04 | 6115.24 | 0 12:26 | 10034.57 | 0.61 | 0.88 | 5.37 | 0.75 | 0.75 | 0.00 | | |
| 23 | NorthSwale05 | 5601.64 | 0 12:23 | 8059.17 | 0.70 | 0.80 | 10.95 | 0.80 | 0.80 | 0.00 | | |
| 24 | NorthSwale06 | 1200.99 | 0 12:15 | 8619.80 | 0.14 | 0.45 | 11.11 | 0.32 | 0.32 | 0.00 | | |
| 25 | SouthSwale01 | 3519.98 | 0 12:15 | 8504.91 | 0.41 | 0.64 | 0.25 | 0.61 | 0.61 | 0.00 | | |
| 26 | SouthSwale02 | 1912.71 | 0 12:38 | 11153.41 | 0.17 | 0.65 | 11.77 | 0.36 | 0.36 | 0.00 | | |
| 27 | SouthSwale03 | 2418.12 | 0 12:23 | 11549.53 | 0.21 | 0.74 | 7.64 | 0.40 | 0.40 | 0.00 | | |
| 28 | SouthSwale04 | 1775.35 | 0 12:19 | 10824.48 | 0.16 | 0.61 | 3.57 | 0.35 | 0.35 | 0.00 | | |
| 29 | SouthSwale05 | 1078.37 | 0 12:17 | 16527.71 | 0.07 | 0.65 | 0.46 | 0.20 | 0.21 | 0.00 | | |
| 30 | SouthSwale06 | 1078.58 | 0 12:17 | 11353.26 | 0.10 | 0.52 | 2.94 | 0.25 | 0.26 | 0.00 | | |
| 31 | SouthSwale07 | 261.09 | 0 12:10 | 10906.93 | 0.02 | 0.30 | 3.58 | 0.11 | 0.11 | 0.00 | | |




## Notes

**1. GENERAL**

1.1. Existing subject property boundaries source:
1.1.1. Survey accurate (calculated).

1.2. Areas and measurements are approximate and subject to survey.

1.3. All easements may not be shown.

1.4. Subject Property

1.5. Services have been obtained from Council GIS and may not have been verified.

**2. SURVEY**

2.1. Datum
2.1.1. Horizontal datum: Mount Eden 2000
2.1.2. Vertical datum: NZVD2016
2.1.2.1. Datum Mark: IB I DPS 90398 (E4K6)
2.1.2.2. RL: 57.05

**3. SURFACES**

3.1. Existing contour interval
3.1.1. Major = 2.5m
3.1.2. Minor = 0.5m

3.2. Source:
3.2.1. Survey 17/11/2025
3.2.2. LIDAR - NZ LIDAR 1m DEM
3.2.2.1. LIDAR contours may not have been verified on ground.

**SERVICES NOTE**

EXISTING SERVICES SHOWN ARE INDICATIVE ONLY. ALL SITE SERVICES MAY NOT BE SHOWN. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE AND PROTECT ALL EXISTING SERVICES PRIOR TO AND FOR THE DURATION OF THE ONSITE WORKS.

**KEY:**

- FENCE - EXISTING
- TOP OF BANK - EXISTING
- BOTTOM OF BANK - EXISTING
- DRAIN - EXISTING
- EDGE OF SEAL - EXISTING

Client

Contractor

ISSUED

BCD GROUP

Sheet
# TOPOGRAPHICAL PLAN

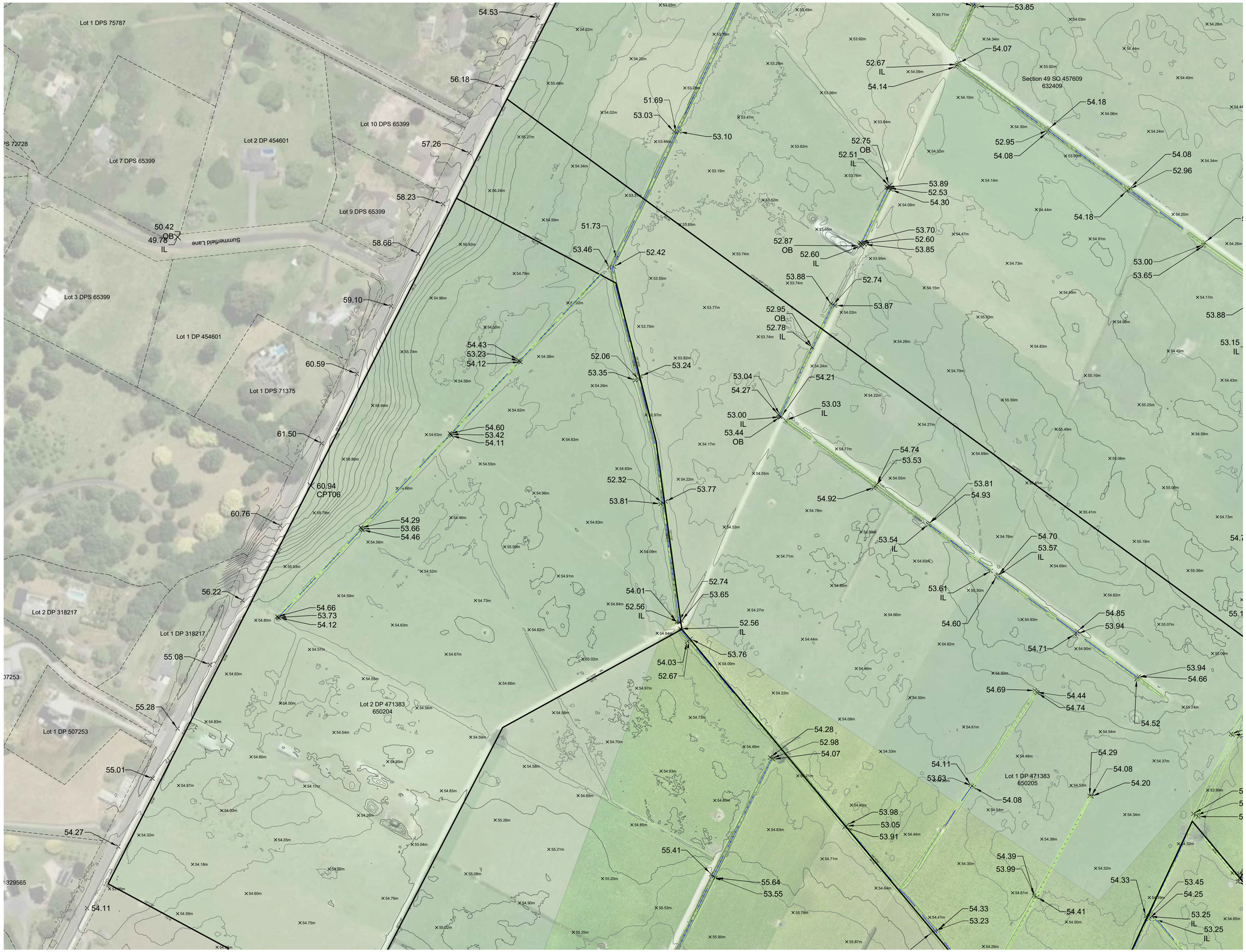
Project Title
## WAIKATO THOROUGHBRED RACING
PENCARROW ROAD, TAMAHERE, HAMILTON

| Rev | Date | By | Reason |
|---|---|---|---|
| 1 | 18/11/2025 | LR | FOR INFORMATION |

Drawn: LR | Scale: 1:2000 | at A1
Engineer: -
Job No: 23-1883 | Sheet No: C-001 | Revision 1

all dimensions to be verified on site before making any shop drawings or commencing any work.

the copyright of this drawing remains with BCD Group


Lot 1 DPS 75787
Lot 10 DPS 65399
Lot 2 DP 454601
Lot 7 DPS 65399
Lot 9 DPS 65399
Summerfield Lane
Lot 3 DPS 65399
Lot 1 DP 454601
Lot 1 DPS 71375
Lot 2 DP 318217
Lot 1 DP 318217
Lot 1 DP 507253
Lot 2 DP 471383
650204
Lot 1 DP 471383
650205
Section 49 SO 457609
632409
CPT06
50.42
OB
49.78
IL
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57.26
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54.06
54.03
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53.92
53.56
53.94
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53.15
53.62
54.02
53.39
54.14
54.44
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## Notes

**1. GENERAL**

1.1. Existing subject property boundaries source:
1.1.1. Survey accurate (calculated).

1.2. Areas and measurements are approximate and subject to survey.

1.3. All easements may not be shown.

1.4. Subject Property

1.5. Services have been obtained from Council GIS and may not have been verified.

**2. SURVEY**

2.1. Datum
2.1.1. Horizontal datum: Mount Eden 2000
2.1.2. Vertical datum: NZVD2016
2.1.2.1. Datum Mark: IB I DPS 90398 (E4K6)
2.1.2.2. RL: 57.05

**3. SURFACES**

3.1. Existing contour interval
3.1.1. Major = 2.5m
3.1.2. Minor = 0.5m

3.2. Source:
3.2.1. Survey 17/11/2025
3.2.2. LIDAR - NZ LIDAR 1m DEM
3.2.2.1. LIDAR contours may not have been verified on ground.

**SERVICES NOTE**

EXISTING SERVICES SHOWN ARE INDICATIVE ONLY. ALL SITE SERVICES MAY NOT BE SHOWN. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE AND PROTECT ALL EXISTING SERVICES PRIOR TO AND FOR THE DURATION OF THE ONSITE WORKS.

**KEY:**

- FENCE - EXISTING
- TOP OF BANK - EXISTING
- BOTTOM OF BANK - EXISTING
- DRAIN - EXISTING
- EDGE OF SEAL - EXISTING

Client

Contractor

ISSUED

BCD GROUP

Sheet
**TOPOGRAPHICAL PLAN**

Project Title
**WAIKATO THOROUGHBRED RACING**
PENCARROW ROAD, TAMAHERE, HAMILTON

| Rev | Date | By | Reason |
|---|---|---|---|
| 1 | 18/11/2025 | LR | FOR INFORMATION |

Drawn: LR | Scale: 1:2000 | at A1
Engineer: -
Job No: 23-1883 | Sheet No: C-003 | Revision 1

all dimensions to be verified on site before making any shop drawings or commencing any work.

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NORTH

Lot 1 DP 471910
Lot 2 DP 471910
Lot 7 DP 315163
Lot 6 DP 315163
Lot 3 DP 471910
Lot 2 DP 404891
Lot 1 DPS 67231
Lot 2 DP 517150
Allot 130 Hautapu PSH

## Notes

**1. GENERAL**

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Client

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ISSUED

BCD GROUP

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| Rev | Date | By | Reason |
|---|---|---|---|
| 1 | 18/11/2025 | LR | FOR INFORMATION |

Drawn: LR | Scale: 1:2000 | at A1
Engineer: -
Job No: 23-1883 | Sheet No: C-004 | Revision 1

all dimensions to be verified on site before making any shop drawings or commencing any work.

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## Notes

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**KEY:**

- FENCE - EXISTING
- TOP OF BANK - EXISTING
- BOTTOM OF BANK - EXISTING
- DRAIN - EXISTING
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Client

Contractor

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BCD GROUP

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**TOPOGRAPHICAL PLAN**

Project Title
**WAIKATO THOROUGHBRED RACING**
PENCARROW ROAD, TAMAHERE, HAMILTON

| Rev | Date | By | Reason |
|---|---|---|---|
| 1 | 18/11/2025 | LR | FOR INFORMATION |

Drawn: LR | Scale: 1:2000 | at A1
Engineer: -
Job No: 23-1883 | Sheet No: C-005 | Revision 1

all dimensions to be verified on site before making any shop drawings or commencing any work.

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# Appendix C Supplier Documents

FILTEC
Making Water Safer

# RESPONSE FORM

In response to Request for Budget Proposals

by: BCD Group Limited

for: **Modular WWTP Packages for Waikato Thoroughbred Racing Greenfield Hub**

from: **Filtec Engineering Ltd.**
on: **16th September 2026**



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# 1. Executive Summary

FILTEC was approached by the BCD Group Ltd (BCD) to provide basic technical and pricing information relating to a range of small borehole Water Treatment Plant (WTP) and Wastewater Treatment Plant (WWTP) packages required as part of the Waikato Thoroughbred Racing (WTR) Greenfield Hub being proposed for development at Pencarrow Road, Tamahere, Hamilton. Project aims to create a unique, world class greenfield racing hub designed for horse training, racing and other equine related activities, while bringing the expertise and strength of the local racing fraternity together in a centralised location. The site is located within the jurisdictions of Waikato Regional Council (WRC) and Waikato District Council (WDC) but will not have connections to council reticulation for potable water, wastewater and stormwater. Treatment, storage and reticulation facilities for these water services would thus have to be established on site as part of the development.

Due to a lack of Council reticulation, onsite wastewater treatment will be required to treat estimated 356$m^3$/day of wastewater expected to be generated via the same racing and residential land usage activities. BCD's Civil Assessment Report advised that a specifically designed wastewater system be developed for this project with input from the council wastewater specialists. The report proposes on-site wastewater treatment with disposal to land. Treatment requirements would be a minimum secondary and discharged to land via disposal beds, likely to be managed locally within the properties via soak holes, septic tanks and wastewater soakage fields. FILTEC has therefore been requested to provide similar budgetary pricing and technical advice for the required wastewater treatment packages.

In accordance with the above, acknowledging the early stage of project development and lack of detailed design and configuration input, FILTEC has prepared this proposal to provide the requested budgetary guidance for the establishment of a centrally located and operated 356 $m^3$/day WWTP. Due to the establishment costs involved and need for reduce erratic inflow to biological treatment processes, the latter single large central WWTP approach is advised over the multiple smaller decentralised approach offered for the WTP packages.

FILTEC is a New Zealand-owned company with over 30 years' experience in delivering water and wastewater treatment solutions. With a strong in-house project team, technical expertise, local service support, and established subcontractor networks, we are well positioned to deliver a successful outcome. We design, supply, integrate, and service water treatment systems with a focus on making water safer—for drinking, for industry, and for the environment.

# 2. On-site Wastewater Treatment: FILTEC Modular MBR

BCD's Civil Assessment Report states that the average daily wastewater flow is assumed to be equivalent to the daily water consumption. The report therefore lists (pg. 11) the following sources of wastewater, expected to be the same volumes as the land usages for water supply:

- Bloodstock Precinct:
  - Operates approx. 30 days per year
  - Total Demand: **60m$^3$/ day**
- Commercial Precinct:
  - Operates 5-7 days a week for different levels of activity
  - Total Demand: **45m$^3$/ day**
- Precinct for Senior Living:
  - Total Demand: **100m$^3$/ day**
- Racing Facilities including race day facilities and training:
  - Facilities: 100m$^3$/day
  - Horse: 50m$^3$/day
  - Peak Race Day: 120m$^3$/day (over and above day to day)
  - Peak Total Demand: **270m$^3$/ day**

FILTEC proposes our Modular Membrane Bioreactor (MBR) packaged plant, pre-engineered, and factory-built to meet the performance requirements of councils and communities that need reliable, compliant treatment without the cost and complexity of a bespoke plant. Our Modular MBR system combines a compact footprint with consistently high-quality treated effluent. Designed for small to medium-sized communities and developments, the system provides a solution where discharge standards are stringent, site constraints exist, or rapid deployment is required. The modular design allows for future expansion via the addition of parallel units without the need for replacement of the core system, protecting capital investment. The system is fully automated, with telemetry to reduce operator attendance requirements and simplify remote management.

## 2.1 FILTEC Modular MBR Treatment Process and Effluent Quality

The FILTEC Modular MBR range is offered in two process configurations, these being MBR-C (Compact) and MBR-N (Nutrient Removal). While the former MBR-C is designed for small communities of up to approximately 1,000 PE where less stringent discharge limits apply, the MBR-N is geared towards larger communities of up to 2,000 PE where advanced Total Nitrogen (TN) and Total Phosphorus (TP) nutrient removal is required under New Zealand Wastewater Environmental Performance Standards. The more advanced MBR-N process is therefore best suited to environmentally sensitive discharge environments and applications where current or future consent conditions require enhanced nutrient removal performance.

The MBR-C and MBR-N processes are designed to achieve typical effluent performances aligned with the most stringent concentration limits within the New Zealand Wastewater Environmental Performance Standards for small to medium wastewater treatment plants. Table 1 below lists the key water quality parameters and expected concentration limits for treated effluent achievable using the FILTEC Modular MBR-C and MBR-N systems.

*Table 1: FILTEC Modular MBR-C and MBR-N effluent quality*

| Parameter | MBR-C | MBR-N |
|---|---|---|
| cBOD | <5 mg/L | <5 mg/L |
| TSS | <1 mg/L | <1 mg/L |
| Ammoniacal Nitrogen | <1 mg/L | <1 mg/L |
| Total Nitrogen | N/A | <4 mg/L |
| Total Phosphorus | N/A | <0.5 mg/L |
| E. coli | < 100 cfu/100 mL | < 100 cfu/100 mL |
| Enterococci | < 2,000 cfu/100 mL | < 2,000 cfu/100 mL |

The MBR treatment process entails a number of fundamental biological wastewater treatment steps, combined with membrane filtration to provide the above consistent and excellent effluent quality. Figure 1 below shows the main treatment steps comprising the MBR process.

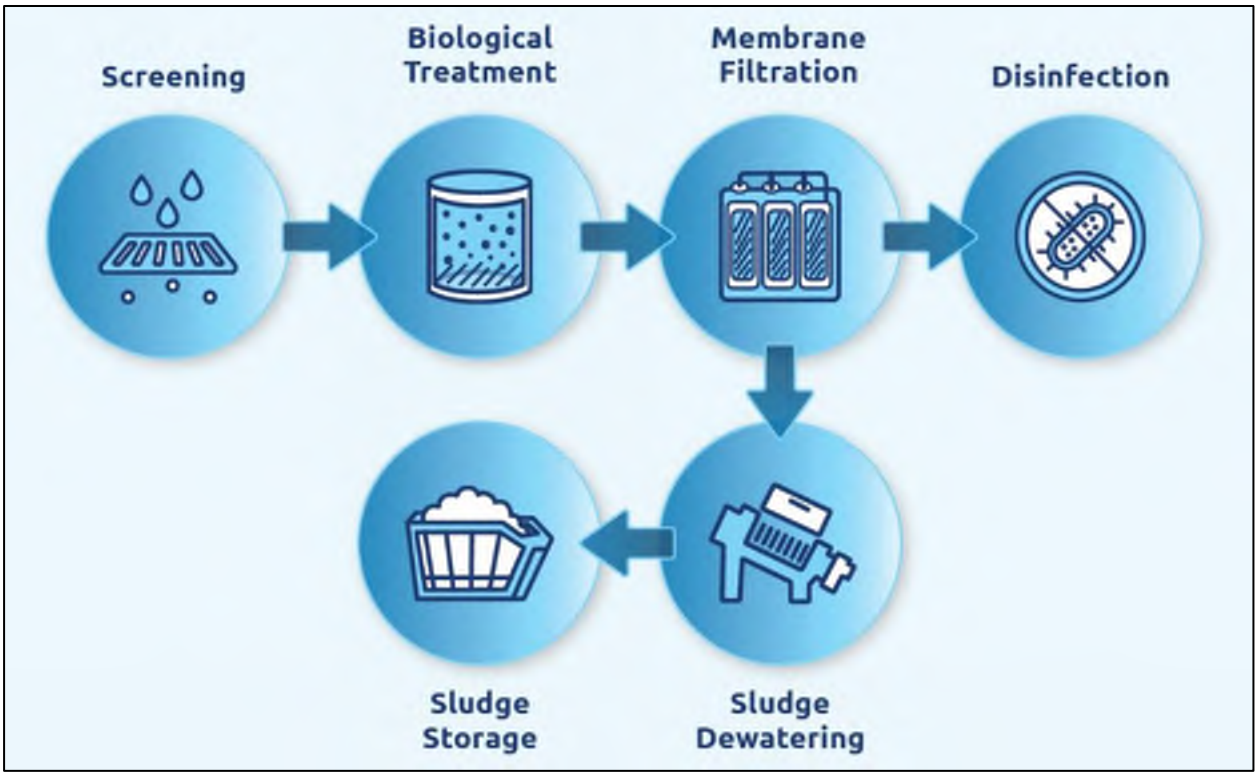



***Figure 1:*** *FILTEC Modular MBR treatment process*

## 2.2 WWTP Site Layout / General Arrangement

For WTR Greenfield Hub development, the WWTP site layout will be dependent on the size and configuration of the available space. The indicative General Arrangement drawings below show how the modular plant is arranged on a flat site. The treatment train is delivered in process modules; a small building (or modular building) houses the electrical cabinets, PLC / control system and plant documentation. FILTEC can also supply a precast-slab modular building at similar cost to containers, fitted out mechanically and electrically in the workshop and erected on site, which operators often prefer and which offers greater longevity than containers.




***Figure 2**: Indicative modular MBR footprint across flow ranges (200 – 250 m³/day)*




***Figure 3:*** *Representative Filtec MBR-250 modular treatment plant*

## 2.3 WWTP Power, Potable Water, Air and Chemical Requirements

While the WWTP design specification for the WTR Greenfield Hub development is still to be detailed, the indicative utility requirements are summarised below. These are INDICATVE ONLY, preliminary for budget purposes and will be confirmed at detailed design against the final configuration and equipment selection.

- Electrical supply: 400 V, 3-phase, 50 Hz; indicative connected load ~50–70 kW (running load lower)
- Potable water: Intermittent / low, used for membrane CIP make-up, chemical make-up, safety shower/eyewash, screen wash water, washdown hoses
- Process air: Blower package housed in acoustic enclosure for biological aeration and membrane air-scour included with package
- Compressed (instrument) air: Required for actuated valves included with package
- Chemicals:
    - Aluminium sulphate (alum) or ferric chloride: Dose-paced for Phosphorus removal, ~18 L/day at 37% $FeCl_3$ or ~ 27 L/day at 27% $Al_2(SO_4)_3$
    - Sodium hypochlorite (NaOCl) and Citric acid: Membrane maintenance & recovery cleaning, periodic CIP only ~850L/clean each (generally every 6 months, depending on sewage quality)
    - pH Correction reagent: Final pH correction if required by consent, ~30 L/day at 30% NaOH

## 2.4 WWTP Sludge Management and Storage

The process produces a waste activated sludge stream. FITEC's standard offer is on-site thickening in a conical sludge holding tank with supernatant return to the head of the plant. The design provides at least two weeks of thickened sludge storage with settled / thickened sludge transferred by tanker to a larger centralised plant for final treatment and disposal.

## 2.5 WWTP Emergency Overflow, Bypass and Buffer Storage

Upstream balance / buffer storage attenuates the high peak-to-average flow ratio, equalises load to the biological process and provides a short ride-through during brief power interruptions. Additional upstream balancing storage can be provided so the plant can continue to process wastewater within consent limits while supply is restored; buffer volume is confirmed at detailed design.

## 2.6 WWTP Indicative Programme

Indicative durations for a standard configuration are shown below. Manufacture is driven primarily by long-lead items (membrane cassettes, blowers, UV and clarifier equipment). Experience on multi-plant programmes shows that production is rarely the bottleneck — site investigation, consenting and stakeholder engagement, and final design sign-off more commonly govern. The programme can be compressed by pre-ordering long-lead equipment.

| Phase | Indicative duration | Notes |
|---|---|---|
| Detailed design | ~10 weeks | Confirm influent, sizing, layout, P&ID |
| Equipment lead time / manufacture | ~22–26 weeks | Membrane, blowers, electrical panels drive lead time |
| Site civils & installation | ~10 weeks | Overlaps manufacture; depends on civil & connection complexity |
| Commissioning & performance proving | ~6 weeks | FAT in workshop; SAT and process proving on site |
| Total brief-to-handover | ~11–12 months | Compressible via pre-procurement of long-lead items |

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# RESPONSE FORM

In response to Request for Budget Proposals

by: BCD Group Limited

for: **Modular WTP Packages for Waikato Thoroughbred Racing Greenfield Hub**

from: **Filtec Engineering Ltd.**
on: **16th September 2026**



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# 1. Executive Summary

FILTEC was approached by the BCD Group Ltd (BCD) to provide basic technical and pricing information relating to a range of small borehole Water Treatment Plant (WTP) and Wastewater Treatment Plant (WWTP) packages required as part of the Waikato Thoroughbred Racing (WTR) Greenfield Hub being proposed for development at Pencarrow Road, Tamahere, Hamilton. Project aims to create a unique, world class greenfield racing hub designed for horse training, racing and other equine related activities, while bringing the expertise and strength of the local racing fraternity together in a centralised location. The site is located within the jurisdictions of Waikato Regional Council (WRC) and Waikato District Council (WDC) but will not have connections to council reticulation for potable water, wastewater and stormwater. Treatment, storage and reticulation facilities for these water services would thus have to be established on site as part of the development.

With the primary source of water on site being bore water supply, BCD approached WRC for consent for use of a 500m3/day water take from the local Hamilton Basin – South aquifer. BCD engaged the services of Brown Bros Drilling & WGA NZ (Hydrogeologist) to complete a test bore and hydrogeological assessment to support the consent application. Testing confirmed that the available groundwater is sufficient to support the development's envisaged demand. Subsequently, BCD approached FILTEC for budget pricing and technical guidance on the establishment of small, decentralised water treatment plant packages to serve the distinct precincts forming the development. All potable water supply will need to be treated to meet NZ public water supply quality requirements, in accordance with Taumata Arowai's T3 Large Supplies Module (501-10,000 PE) Drinking Water Quality Assurance Rules (DWQAR).

In accordance with the above, acknowledging the early stage of project development and lack of detailed design and configuration input, FILTEC has prepared this proposal to provide the requested budgetary guidance for the establishment of 5 precinct specific borehole supplied small WTP packages (30 - 165$m^3$/day)

FILTEC is a New Zealand-owned company with over 30 years' experience in delivering water and wastewater treatment solutions. With a strong in-house project team, technical expertise, local service support, and established subcontractor networks, we are well positioned to deliver a successful outcome. We design, supply, integrate, and service water treatment systems with a focus on making water safer—for drinking, for industry, and for the environment.

## 2. On-site Water Treatment: FILTEC AquaSafe

The Civil Assessment Report. Rev 6 (pg. 6-9) confirms that the potable water demand for the WTR Greenfield Hub development correlates directly to the site's wastewater treatment requirements. The main difference being that smaller, decentralized potable water treatment packages are envisioned to serve the respective precincts comprising the development. Consequently, dedicated WTP facilities are likely to be established for each of the below areas:

- Bloodstock Precinct:
  - Operates approx. 30 days per year
  - Total Demand: **60m$^3$/ day**
- Commercial Precinct:
  - Operates 5-7 days a week for different levels of activity
  - Total Demand: **45m$^3$/ day**
- Precinct for Senior Living:
  - Total Demand: **100m$^3$/ day**
- Racing Facilities including race day facilities and training:
  - Facilities: 100m$^3$/day
  - Horse: 50m$^3$/day
  - Peak Race Day: 120m$^3$/day (over and above day to day)
  - Peak Total Demand: **270m$^3$/ day**

All potable water supply will need to be treated to meet NZ public water supply quality requirements, in accordance with Taumata Arowai's T3 Large Supplies Module (501-10,000 PE) Drinking Water Quality Assurance Rules (DWQAR).

For these applications, FILTEC proposes our AquaSafe range of Modular Drinking Water Treatment Plants. As with our MBR range, FILTEC AquaSafe is a range of packaged potable water plants, pre-engineered and factory-built to be cost effective while meeting New Zealand standards and the Taumata Arowai DWQARs.



***Figure 1:*** *Typical FILTEC AquaSafe packaged WTP installation with treated water storage*

## 2.1 The FILTEC AquaSafe Solution

The FILTEC AquaSafe is a drinking water treatment solution that helps you cost-effectively make water safer. AquaSafe systems are pre-engineered and pre-assembled to reduce cost, installation, and start-up time.

The AquaSafe uses high-quality components and is manufactured in-house by FILTEC to ANZ standards. Each system includes a fully factory-tested, automated control system with remote monitoring capability.




***Figure 2:*** *Examples of typical FILTEC AquaSafe Internal fit-out and enclosure*

### 2.1.1 FILTEC AquaSafe Treatment Processes

Our modular approach ensures that each treatment plant is tailored to the unique water source, quality, and volume needs of the community. FILTEC installations are supported by a network of certified and experienced service technicians providing rapid local service and technical support.

FILTEC AquaSafe systems can treat both primary and secondary water sources — including bore, rainwater, rivers, and lakes. Depending on the characteristics of the source, pre-treatment may be necessary for secondary water sources.

Each system includes the following minimum treatment as standard:

- Water storage
- Pump
- Pre-filtration screen
- Cartridge filtration
- UV disinfection
- Remote monitoring
- Full operational & service documentation

Additional treatment processes can be added based on the water source and the results of water analysis:

- Elective abstraction
- Pre-filtration screen for secondary water sources
- Backwashable multimedia filters
- Granular activated carbon filters
- Water softener
- Iron and manganese removal
- pH correction
- Chlorination

Each plant is configured to the source water — roof, bore, spring, or stream — with only the treatment stages a given site actually needs. The schematic below shows the full range of available stages; asterisked steps are fitted only where water analysis requires them

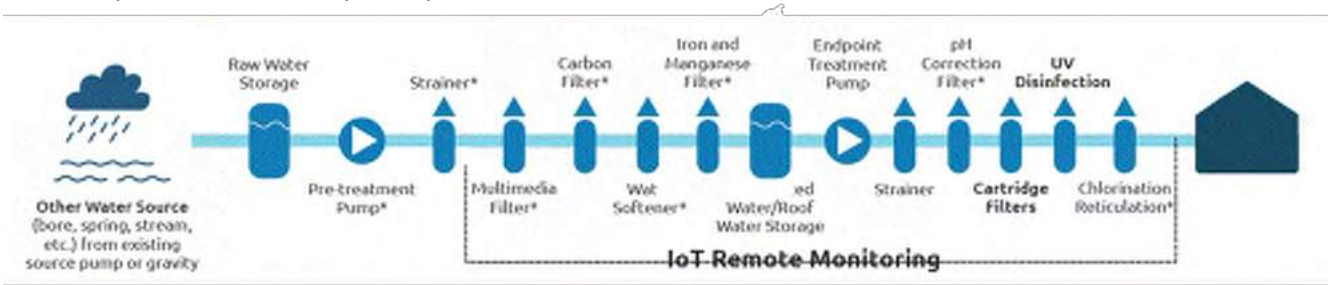



***Figure 3:*** *Process Flow Diagram of possible FILTEC AquaSafe treatment process steps*

## 2.1.2 Containerised AquaSafe Enclosure

AquaSafe plants can also be housed in a standardized, containerized enclosure engineered for durability, compliance, and whole-of-life value. A single enclosure can accommodate multiple treatment processes within one robust structure — reducing site variability and simplifying delivery.




***Figure 4****: Standardized portable container enclosure*

| Feature | AquaSafe Standard Enclosure |
|---|---|
| Construction | Heavy-duty galvanised steel container; high impact resistance |
| Weather resilience | Robust structure engineered to withstand extreme wind and weather events |
| Insulation | 70 mm Rockwool wall and ceiling insulation included as standard — superior thermal and acoustic performance |
| Compliance | EWOF certified for 5 years; PS1 covers a wide catchment of site conditions |
| Security | Proper door handle with cut key |
| Flooring | Plant-grade vinyl flooring with fit-for-purpose drain |
| Scalability | Accommodates variations of pre-treatment options within a single structure; adaptable for future upgrades |

## 2.1.3 AquaSafe Remote Monitoring (IoT)

Every AquaSafe WTP includes an Internet of Things (IoT) monitoring system that provides real-time performance information online — keeping operators informed about plant performance and flagging any issues as they arise. Monitored items can include water meters, tank levels, differential pressure across cartridge filters, line pressure, and UV status.



***Figure 5:*** *FILTEC AquaSafe IoT remote monitoring interface*

## 2.1.4 Delivery, Commissioning & Support

AquaSafe systems are assembled and factory acceptance tested in-house before delivery. On completion of installation, FILTEC undertakes acceptance testing to ensure the Water Treatment Plant functions correctly, followed by drinking water quality compliance testing to confirm the installed solution meets regulatory standards.

Final site records are prepared documenting all aspects of the project, and training and support services are provided to local representatives for operating and maintaining the WTP.

Filtec installations are supported by a network of certified service technicians providing rapid local service across New Zealand, including the Auckland and wider northern region. Ongoing maintenance and servicing can be quoted to suit your requirements.

## 2.2 WTP Packages Proposed

Based on the varying demand across the various precincts, the following AquaSafe potable water treatment packages are proposed for use:

***FILTEC AquaSafe 150:***

- Nominal Treatment Capacity: 150m$^3$/day
- Proposed for: Racing Facilities including race day facilities and training

***FILTEC AquaSafe 100:***

- Nominal Treatment Capacity: 100m$^3$/day
- Proposed for: Senior Living

***FILTEC AquaSafe 50:***

- Nominal Treatment Capacity: 50m$^3$/day
- Proposed for: Bloodstock and Commercial precincts

FILTEC
Making Water Safer

# RESPONSE FORM – FILTEC Capabilities and Processes

In response to Request for Information

by: BCD Group Limited

for: **Modular WTP and WWTP Packages for Waikato Thoroughbred Racing Greenfield Hub**

from: **Filtec Engineering Ltd.**
on: **16th September 2026**



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# 1. Who we are:  A proven water service provider

FILTEC is a New Zealand-owned company with over 30 years' experience in delivering water and wastewater treatment solutions. With a strong in-house project team, technical expertise, local service support, and established subcontractor networks, we are well positioned to deliver a successful outcome. We design, supply, integrate, and service water treatment systems with a focus on making water safer—for drinking, for industry, and for the environment.

FILTEC has been delivering water treatment solutions to customers in New Zealand since 1991, and in Australia since 2017. We operate six branches across New Zealand and Australia, supported by nationwide servicing partners. With offices in Auckland, Wellington, Christchurch, Dunedin, Melbourne, and Brisbane, Filtec delivers water treatment equipment and services throughout Australasia.







Filtec services our customers through two divisions, each with its own teams of specialists:

- **Engineered systems and projects:** Our engineered projects team works on medium to large-scale water treatment systems for diverse customers, such as municipalities, healthcare providers, food and beverage manufacturers, wineries, and more. We have design teams in Auckland and Melbourne, supported by our regional teams for sales and maintenance.
- **Equipment, service and sales:** Our equipment, service, and sales teams source water treatment equipment and provide ongoing servicing to customers for optimal performance and longevity of your water treatment system. Our team is supported by a network of more than 40 local resellers from Kerikeri to Invercargill for installation and maintenance

**We do more than just deliver a WTP:**

- We work to thoroughly understand your marae's water infrastructure requirements to identify your needs and provide a suitable system
- We collect samples from your water sources and evaluate the water quality
- We design and build a WTP with the treatment features needed for your site
- We discuss our design with you to ensure the solution fits your needs and respects your cultural practices
- We arrange the WTP installation and commissioning on site
- We provide regular training on operation and maintenance
- We provide fault response and support services to keep WTP running smoothly
- We assist with completing a Water Safety Plan if required, ensuring compliance and safety
- We provide scheduled operation and maintenance

# 2. Our values and culture

| | | | |
|---|---|---|---|
| | | | |
|  | **Everyone goes home safely** | ▪ we look after each other<br>▪ we follow our H&S rules<br>▪ we protect each other's work life balance | ▪ we don't take H&S shortcuts.<br>▪ we don't overwork our people<br>▪ we don't tolerate drug/alcohol impairment |
| | **Everyone gets opportunity** | ▪ we create development opportunities<br>▪ we coach and grow our team's capability<br>▪ we seek out people's input/ideas | ▪ we don't pigeon hole people<br>▪ we don't neglect our people's ambitions |
| | **Have fun together** | ▪ Celebrate our wins<br>▪ Enjoy each other's company | |
| **WE GO THE EXTRA MILE** | | | |
|  | **We exceed our customers' expectations** | ▪ we partner with our customers<br>▪ we ensure we understand their needs<br>▪ we deliver in full, on time, to specification<br>▪ we add value wherever we can<br>▪ we look for their feedback | ▪ we don't avoid the 'hard' conversations<br>▪ we never badmouth the customer |
| **WE ACT LIKE OWNERS** | | | |
|  | **We take pride in our efforts** | ▪ we work to grow Filtec's reputation<br>▪ we think long term<br>▪ we take responsibility for the whole business | ▪ we never shift blame |
| | **We're smart with our resources** | ▪ we plan carefully. We're well organised<br>▪ we look after our equipment and assets | ▪ we don't waste time, resources or money |
| | **We can be trusted** | ▪ we do what we say we'll do<br>▪ we tell the truth | ▪ we don't hide behind our contract<br>▪ we don't take advantage of our customers |
| **THERE IS ALWAYS A BETTER WAY** | | | |
|  | **We love to innovate** | ▪ we think before we start<br>▪ we question the status quo<br>▪ we encourage our team to challenge | ▪ we don't follow the trend<br>▪ we don't just cut and paste |

| | | | |
|---|---|---|---|
| **WE ARE ALL FILTEC** | | | |
|  | **We work as one team** | ▪ we work for the wider team's success<br>▪ we proactively share information<br>▪ we work hard on communication | ▪ we don't act selfishly<br>▪ we don't let each other down |
| | **We work hard for each other** | ▪ we show each other respect<br>▪ we set high standards<br>▪ we lead by example<br>▪ we give our personal best every day<br>▪ we help each other succeed | |
| **WE CARE FOR OUR ENVIRONMENT AND COMMUNITY** | | | |
|  | **We minimise our environmental impact** | ▪ we leave things as we found them, or better<br>▪ we promote making water safer<br>▪ we clean up our environment | |
| | **We support our community** | ▪ we have a positive impact on our community | |

## 3. Capability and areas of speciality

Filtec has grown strongly in both size and reputation in recent years and now employs a team of more than 120 water professionals. This includes process and mechanical engineers, project managers, service technicians, fabricators, and site managers. We specialise in:






A purpose-built 2,500 m² high-stud fabrication and warehouse facility supports the manufacture, assembly and preparation of water and wastewater treatment systems for projects across New Zealand and Australia. Filtec has an extensive in-house fabrication facility allowing pre-fabrication of 90% of the solution. We find the in-house workshop gives a high level of quality and programme control when compared with outsourcing this portion of work. This approach reduces the risk of onsite inefficiencies and delays and gives an optimised delivery. It also yields benefits in terms of cost savings (avoiding margin on margin for fabrication), faster turnaround times to achieve programme timelines, as well as superior quality control with engineers able to always access the workshop.

Filtec holds over $4,000,000 worth of spares and stock for critical components in WTPs, including UV lamps, cartridge filtration spares, other specialist analysers and instrumentation (Hach and Evoqua). Using Filtec enables our Clients to go right to the source getting the best price and best support available.

Filtec not only focuses on the supply of the treatment plant, but also on the continued service and maintenance of the plant. This means that our Clients can be assured that service and operability are front of mind in our design approach, and we will back this up with a comprehensive servicing and maintenance plan. We have service technicians throughout New Zealand that can readily attend site as and when required.

We are currently undertaking service contract works for 49 municipal councils located across New Zealand. To deliver this level of service and operational support over 30 years Filtec has developed robust systems and procedures with a focus on continuous improvement.

## 4. Design Approach and Standards

Taumata Arowai's Drinking Water Quality Assurance Rules (DWQARs) set out the minimum treatment and monitoring requirements a drinking water supplier must meet, specifying the multi-barrier treatment approach required for each application and population size to ensure safe drinking water. All Filtec solutions are compliant with the latest DWQARs and Acceptable Solutions from Taumata Arowai. Where required by the Client, we assist with completing a Water Safety Plan, ensuring compliance and safety. We will guide the Client to generate a compliant Drinking Water Safety Plan (DWSP) which adequality addresses the control measures put in place to eliminate or reduce public health risks associated with the site's potable water supply.

As far as possible, Filtec employs standard design techniques, concepts, technologies, components and validated systems. This standard design approach enables Filtec to limit the number of different spare parts, consumables to be held and maintain a consistent resourcing levels across the O&M delivery.

## 4.1 Quality Assurance Plan

FILTEC is committed to delivering exceptional quality outcomes that exceed the Principal's Requirements. Our quality assurance processes are built on ISO 9001-certified systems, supported by robust Inspection and Test Plans (ITPs) and a collaborative approach with subcontractors. This ensures compliance with specifications, reduces risks, and adds measurable value to the project.

### 4.1.1 Methodology

Our approach to process optimization and fine-tuning is holistic and comprehensive and starts at early stages of design. During concept design, peer reviews are completed by our Design team on both the process and mechanical aspects of the proposed solution, with a focus on solution optimization and value adding. Jar tests are completed where applicable, and additional sampling/testing is arranged as required.

At **detailed design stage**, with all stakeholders having agreed upon the proposed solution, a constructability review is completed with our Mechanical Design and Operations teams, as well as representatives from all other relevant disciplines. The focus of this review is the assessment and planning of access, cargo handling, equipment placing and installation, sequencing of works for optimized results, and mapping of installation related interfaces. At this stage, our Services team also reviews serviceability and maintenance requirements.
In house Subject Matter Experts (SMEs) of each different technology are involved throughout the design and design reviews to ensure each process is set up for optimal performance and a cohesive and efficient end result will be achieved.

Filtec will undertake the detailed design following our internal design gates process. We will have regular design meeting to touch base with the Client, the design meetings will keep the Client informed of progress and ensure all key discussions and decisions are made in a collaborative best for project fashion.

### 4.1.2 Detailed design & internal design review process

Using the tender design, Process Engineer to complete detailed design.

- Review process flow diagrams, engineer's process calculations and update schematics
- Refine peak/average flows between sized equipment and required pressures.
    - Refine and detail all process calculations and assumptions.
    - Detail calculations for the pipeline sizes required, ensure compliance with the management of change (MOC)
    - If required, re-specify any equipment
- Detailed layout design
    - Issue MOC to draughtsperson for incorporation into design
    - Place major equipment items in the available space, which skeleton detail illustrating:
        - Major plant/equipment (minimum recommended .6m clearance or as per manufacturers recommendation)
        - Pipelines/valve assemblies
        - Access for service of equipment and valves, etc.
        - Control room/switchboard/HMI
        - Any other areas where conflict may occur

- Refine the friction loss calculations using the new (accurate) fittings take off and pipe lengths. Amend any effected documentation to suit.
- Process design/P&ID
    - Select analysers, instruments and actuated valves
        - Apply for compensation if suggesting alternative from contract requirements
    - Detail piping and instrumentation diagrams (P&ID). This should include.
        - All equipment (special units, tanks, pumps, blowers etc)
        - All instruments and analysers required
- All pipework required (include pipeline material and size)
- All valves required
- Ensure that valve position or limit feedback is as per the Clients's technical specification to ensure accuracy between technical specification and drawings. This step is essential for automation procurement.
    - All control & interconnection information
    - Tag numbers
- Complete a detailed Level 1 functional description for control
- Update control philosophy with a list of required alarms
- Document transmittals register to be maintained throughout project duration, detailing all drawings and technical documents with revision number and detail of date and recipients to which have been issued.
- Update working schedules to allow for the easy identification and pricing of the equipment
    - Update and finalise all tags
    - Equipment and electrical schedule (add in I/O as required)
    - Valve schedule (automated valving to include details of feedback control in accordance with Council specification).

### 4.1.3 Design Quality Assurance

Our design process is heavily focused on quality, optimisation, and compliance with all design aspects. Design delivery is managed in line with our overall Project Governance, which includes a Gates process with two gates dedicated to design, which includes:

- Gate 1 – Detailed design & internal design review
- Gate 2 – Client design review & design freeze

The first gate covers concept design and initial internal reviews, including checks to ensure contractual requirements and technical specifications are complied with, materials and chemical compatibilities have been reviewed, relevant testing (e.g. jar testing) has been completed), an internal peer review (including optimisation and value adding) has been completed and design amended as required, individual design deliverables have been produced and internally approved, registers are in place and up to date for version control, constructability review (including serviceability) and SME reviews have been completed.

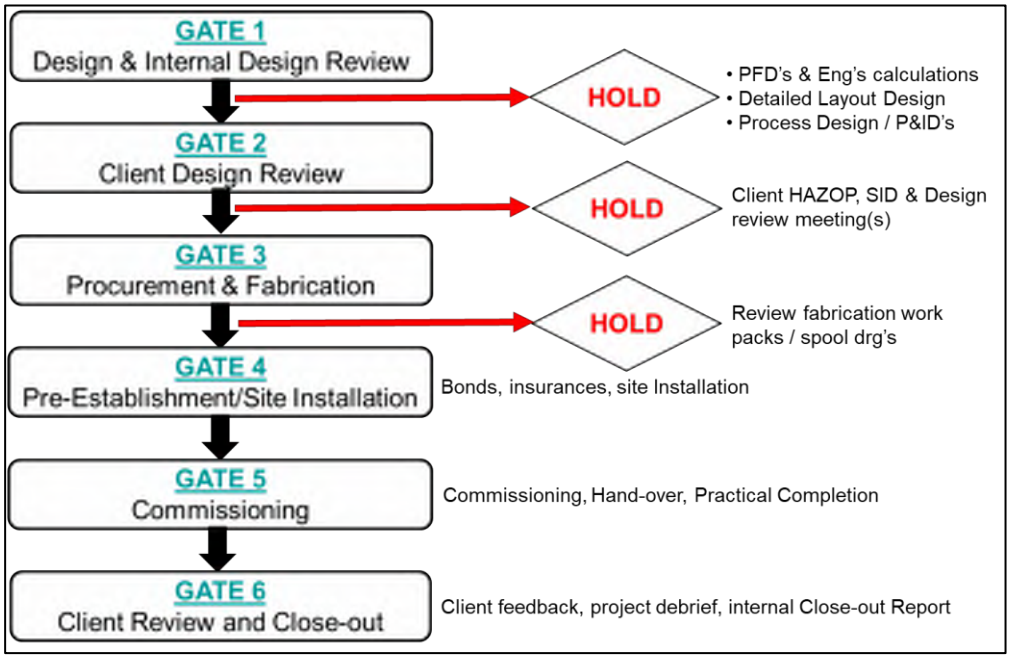
The second design gate covers detailed design and external reviews. Checks include, but are not limited to HAZOP and SiD comments addressed and actions register updated and distributed, Client's comments on design package are addressed and actions register updated and distributed, all deliverables are updated to a "for construction" version, registers are kept up to date for version control, and final design package is issued and approved by the Client prior to fabrication and installation. Once again, other checks are included pertaining to other aspects of the project delivery.

## 4.1.4 Project Governance

Project governance refers to the structured framework that guides decision-making and oversight throughout the project's lifecycle. Its overall goal is to ensure projects align with organisational goals, deliver expected outcomes, and are completed on time and within budget. Our project delivery gates process includes several essential 'hold' points, which require mandatory sign-off from other project stakeholders.

The Project Gates process is outlined as follows:

- **Gate 1** – Detailed design & internal design review
- **Gate 2** – Client design review & design freeze
- **Gate 3** – Procurement & fabrication
- **Gate 4** – Pre-establishment & Site Installation
- **Gate 5** – Commissioning / Handover
- **Gate 6** – Client review and close out.




Key components of our project governance include:

- **Senior leadership team oversight.** The senior leadership team oversees project progress, providing strategic direction and addressing critical issues.
- **Gates review process.** Projects are evaluated at predefined gates to assess their progress against established criteria. Internal gates reviews are held fortnightly and provide an additional checkpoint for identification of roadblocks and risks, enabling early action/mitigation.
- **Risk and outstanding items register.** A dedicated register is established to track project risks and outstanding items.
- **Stakeholder engagement.** Regular progress meetings with the school promote effective communication and engagement.
- **Change control procedure.** Changes to project scope, schedule, or budget must go through the delegated financial authority approvals process.

- **Washup meeting**. Upon project completion, a washup meeting is conducted to assess outcomes and identify lessons learned and recommended improvements for future projects.

### 4.1.5 Commissioning

In preparation for commissioning, the Commissioning Engineer prepares a site specific Commissioning Plan, which includes (in addition to communications, health & safety, SDS, and hazard identification and management details):

(i) a description of all different stages of commissioning and what these are comprised of;
(ii) a breakdown of the P&ID into smaller, manageable systems for commissioning;
(iii) the proposed sequence of commissioning of these systems;
(iv) system check sheets, covering overarching checks;
(v) item check sheets for equipment (e.g. valves, instruments, pumps, etc) covering commissioning of each individual item and records of settings and alarms;
(vi) hot commissioning steps, including any and all procedures for commissioning of specific processes and equipment;
(vii) field parameters to be monitored during commissioning, as well as required field instrumentation;
(viii) chemical systems specific commissioning instructions;
(ix) testing requirements and routine. There are also dedicated sections for recoding control changes and additional comments during commissioning.

The Commissioning Plan is submitted to the Client/consultant at least 60 days prior to commissioning start to enable all stakeholders to review and provide feedback in time for the document to be adjusted if required. Once finalized and approved, the document is issued as “Approved” and a master hard copy is kept on site. This copy is available on request and is used throughout commissioning.

We encourage the Client’s Commissioning and Operations teams to be involved as much as possible and from early stages of commissioning to familiarise themselves with the plant controls and operation. Daily pre-start meetings are held, with attendance of representatives of all disciplines, as well as Client’s Commissioning and Operations teams. During these meetings, all work fronts are discussed, interfaces and tie ins are mapped, roadblocks and snags are noted for action, and risks are re-assessed to current conditions. Tie ins and interfaces are communicated to all stakeholders with appropriate notice, including (but not limited to) details such as: pre-requisites for tie in works (e.g. min. reservoir level) and responsible person for each, proposed date/time and duration, scope of works, main contact(s), risks and potential impacts to stakeholders, processes and community, mitigation plan(s).

A Commissioning Planner is used to plan activities per day with a 2-4 week lookahead. This is updated daily based on pre-start meetings and works completed – these notes are held on site by the Commissioning Engineer and are available on request. An updated Planner is distributed to all stakeholders weekly. All major tasks and inspections are communicated to the Client’s Commissioning Team with appropriate notice to ensure they can be present to witness the activities.

At final stages of hot commissioning the lead Process Engineer attends site for fine tuning of dosing control loops and overall plant performance. While fine tuning the plant, the Engineer reviews water quality parameters via handheld instrumentation to support the performance optimization works.

# 5. Relevant experience

Filtec has delivered hundreds of water treatment plants and upgrades in New Zealand and Australia over the past 30 years. Of these, approximately 80% are design, supply, installation and commissioning water and wastewater treatment plants for municipal councils and government agencies. These include a large range of designs and design and build membrane plants in recent years, e.g.

- Ōwhango WTP (D&B – 1.5ML/d) – Ruapehu DC
- Dannevirke ECI Design (D&B – 6ML/d) – Tararua DC
- Acheron WTP (D&B – 1ML/d) – Selwyn DC
- Springfield WTP (D&B – 4ML/d) – Selwyn DC
- Selwyn Pines WWTP Reuse Plant (D&B – 1.2ML/D) – Selwyn DC
- Allensford WTP (D&B – 1ML/d) – Saputo Dairy
- Tokarahi WTP (D&B – 1.8ML/d) – Waitaki DC
- Awamoko WTP (D&B – 0.6ML/d) – Waitaki DC
- Windsor WTP (D&B – 0.6ML/d) – Waitaki DC
- Kauru Hill WTP (D&B – 0.6ML/d) – Waitaki DC
- Seddon WTP (D&B – 1ML/d) – Marlborough DC
- Paihiatua WTP (D&B – 3 ML/d) – Tararua DC
- Pohara WTP (D&B – .7 ML/d) – Tasman DC
- Wairau Valley (D&B – 2 ML/d) – Marlborough DC
- Puckapunyal (D&B – 2 ML/d) – Australian Defence Force
- Dingo and Duaringa (D&B – 1 ML/d) – Central Highlands Regional Council
- Fonterra Stanhope (D&B – 8ML/d) –
- Cardrona WTP (.5ML/d) – Developer/Queenstown Lakes DC
- Fairlie WTP (D&B – 4ML/d) – McKenzie DC
- Fonterra Tirau (D&B – 5ML/d) – Fonterra
- Horotiu WTP (D&B – 2.4 ML/d) – Open Country Dairy
- Waikouaiti WTP (D&B – 3 ML/d) – Dunedin CC
- West Taiari WTP (D&B – 1.7ML/d) – Dunedin CC
- Visy (D&B – 0.112ML/D) – Visy.

# Sustainable Solutions for

## Small Community Drinking Water

Hastings, New Zealand

FILTEC
Making Water Safer

**Client**
Hastings District Council

**Plant Capacity**
9-180m3/hour

**Technology**
UV Disinfection, Chlorination

**Water Source**
River Water, Reservoir Water

**Quality Issue**
Bacterial contamination

## Customer Need

### Waterborne Disease Prevention for Small Communities

In 2016, Havelock North faced a significant waterborne disease outbreak. The campylobacter contamination prompted the Hastings District Council to address water treatment system deficiencies for the provision of small community drinking water.

The objective was to upgrade systems at six bore water sites with varying water qualities, ensuring reliable solutions for the small communities not connected to the main water network. This initiative aimed to prevent waterborne diseases from recurring, providing consistently safe and high-quality drinking water for affected communities.

## What We Did

### Designed and Built Six Containerised Water Treatment Plants

Responding to the Hastings District Council's requirements, FILTEC undertook the design, construction, and commissioning of six containerised water treatment plants to ensure the provision of small community drinking water.

Following the completion of the water treatment plants, FILTEC continues to provide comprehensive support, including chlorine servicing, calibrations, and preventative maintenance, ensuring equipment longevity and optimal performance of the plants.




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## Installed UV Disinfection and Chlorination Equipment

Tailored to handle bore water with varying qualities and treatment volumes, the water treatment plants ranged in capacity from 9 to 180 cubic metres per hour. Employing ultraviolet disinfection and chlorination in each plant, the goal was to ensure the safety of water from the treatment plant to the tap.

These containerised water treatment plants, housed in modified 40 feet shipping containers, incorporated a dedicated motor control centre room for enhanced operational efficiency.

## Reduced Costs by Constructing the Plants In-House

FILTEC's approach involved constructing the containerised water treatment plants in its Auckland workshop, facilitating increased build efficiency and reduced overheads, thereby minimising overall costs. Importantly, the modular nature of these containerised plants offered the flexibility for potential relocation, meeting the dynamic needs of the small communities served.

# The Result

## Established Safe Drinking Water Solutions for Six Small Communities

The Haumoana site, the initial of the six water treatment containers, was successfully commissioned in October 2020. A ceremonial blessing marked the site's opening, signifying a momentous achievement for the community. The communities of Whirinaki, Eskdale, Haumoana, Clive, Waipatiki, Whakatu, and Waimaramara all benefitted from access to safe and high-quality small community drinking water.

The implementation of the water treatment plants not only addressed the immediate water quality challenge but also provided sustainable solutions for ongoing water safety in the district.

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# UV Water Treatment

## Plants for Pathogen Prevention

Wanaka, New Zealand

FILTEC
Making Water Safer

**Client**
Queenstown Lakes District Council

**Plant Capacity**
626-1,188 m<sup>3</sup>/hour

**Technology**
UV Disinfection

**Water Source**
Lake Water

**Quality Issue**
Pathogen Prevention

## Customer Need

### Pathogen Prevention in Drinking Water Supply

In September 2023, the Queenstown Lakes District Council faced a potential water quality issue stemming from cryptosporidium contamination. The council promptly issued a water boil notice for Queenstown. Recognising the urgency, the council took immediate proactive measures to upgrade key water treatment plants throughout the district, including Wanaka.

This comprehensive approach aimed to mitigate potential risks and protect public health. To meet these critical needs, the council partnered with FILTEC to secure reliable and long-term UV water treatment plant solutions.

## What We Did

### Supplied Comprehensive UV Water Treatment Plants

In collaboration with the Queenstown Lakes District Council, FILTEC efficiently delivered two UV water treatment plants to Wanaka for effective pathogen prevention. For the plant in west Wanaka, FILTEC managed the entire process from design to installation and commissioning, ensuring seamless implementation and operation. For the second plant, FILTEC supplied the UV equipment, with Fulton Hogan handling the installation and commissioning at the site.

In addition to the initial installation, FILTEC provides ongoing support and maintenance to both plants, guaranteeing longevity and optimal performance for years to come.



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## Installed Robust Water Disinfection Systems

Equipped with Trojan UV Swift D06 Systems, these UV water treatment plants ensure thorough disinfection of high volumes of water.

The D06 systems compact design enabled flexible installation within the- shipping containers, accommodating minimal spaces while maintaining maximum flow capacity. These chemical-free plants not only secure Wanaka's water supply but also minimise environmental impact.

## Delivered Sustainable Cost-Effective Solutions

The UV water treatment plant's efficiency is enhanced by advanced UV light technology and a sleeve wiping system, minimising cleaning frequency during operation and reducing maintenance costs.

These low-maintenance features guarantee prolonged system reliability, and provide the customer with a sustainable, hassle-free, and economically efficient water treatment solution.

# The Result

## Established Long-Term and Dependable Disinfection Solutions

Resulting in the lifting of the boil water notice, FILTEC's swift deployment of UV water treatment solutions, in collaboration with Queenstown Lakes District Council, ensured immediate compliance and community safety.

The UV water treatment plants provide long-term solutions, offering ongoing benefits such as reduced maintenance costs, efficient operation, ongoing service support, and a comprehensive warranty. This reinforces the council's and FILTEC's dedication to preserving the community's drinking water supply for years to come.

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# THOROUGHBRED WAIKATO SENIOR LIVING PRECINCT

## PBR WASTEWATER TREATMENT SYSTEM

| | |
|---|---|
| **Prepared for** | BCD Group Limited |
| **Prepared by** | Moeen Gholami, Innoflow Technologies NZ Limited |
| **Date** | 18 September 2026 |

**CONFIDENTIAL**

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# 1.0 INTRODUCTION

Innoflow Technologies NZ Limited has prepared this report for the proposed wastewater treatment and land-disposal system serving the Thoroughbred Waikato Senior Living Precinct. The proposed Senior Living development comprises 80 two-bedroom villas and 200 one-bedroom units. The wastewater system is intended to operate independently from the wider Thoroughbred development system and comprises primary settlement, staged AdvanTex recirculating textile packed-bed reactor treatment, nitrogen removal, chemical dosing, treated-effluent storage, telemetry controls and pressure-dosed conventional bed land treatment.

This report is a preliminary design specification. Final equipment sizing, civil levels, tank structural design, distribution hydraulics, land-treatment suitability and consent conditions must be confirmed during detailed design.

# 2.0 WASTEWATER MANAGEMENT OVERVIEW

## 2.1 Wastewater management concept

The proposed scheme uses central collection and treatment for the Senior Living precinct. Wastewater from kitchens or other grease-producing sources passes through grease traps before combining with domestic wastewater in central septic tanks. Screened primary effluent then enters a pre-anoxic stage, followed by two staged AdvanTex treatment steps with intermediate post-anoxic denitrification. Final treated effluent is stored and pressure-dosed to a sectored conventional bed system.

## 2.2 Proposed Senior Living process train

*Table 1. Proposed Senior Living process train*

| Item | Process | Proposed configuration |
|---|---|---|
| 1 | Grease interception | 3 × 9 m³ grease traps |
| 2 | Primary treatment | 2 × 70 m³ septic tanks with screened outlets |
| 3 | Pre-anoxic treatment | 1 × 70 m³ pre-anoxic tank with nitrified filtrate return |
| 4 | Stage 1 aerobic treatment | 1 × 70 m³ recirculation tank and AX600, comprising 6 × AX100 pods |
| 5 | Post-anoxic denitrification | 2 × 25 m³ tanks with mixing and supplemental carbon dosing |
| 6 | Stage 2 polishing | 1 × 25 m³ recirculation tank and AX200, comprising 2 × AX100 pods |
| 7 | Treated-effluent storage | 1 × 70 m³ treated-effluent tank with pressure-dosing pumps |
| 8 | Land treatment | Approximately 1,440 m² conventional bed system, configured as 15 beds/sectors |
| 9 | Controls | TCOM remote telemetry, alarms, flow recording and pump control |
| 10 | UV disinfection | TBC |

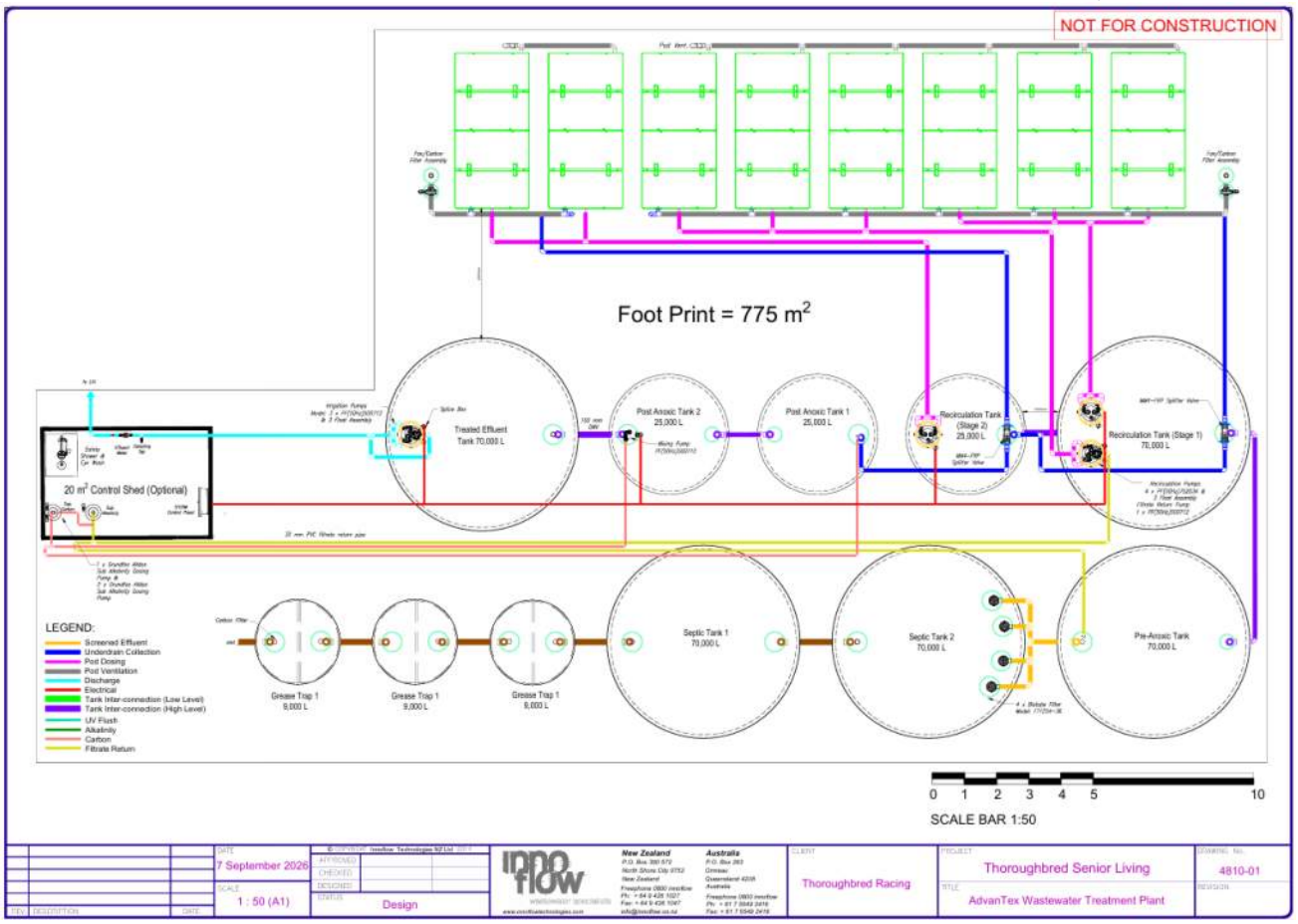



*Figure 1. Proposed Senior Living process train: grease traps -> septic tanks -> pre-anoxic tank -> AX600 -> post-anoxic tanks -> AX200 -> treated-effluent tank -> conventional beds.*

# 3.0 DESIGN PARAMETERS

## 3.1 Design flow basis

*Table 2. Design flow basis*

| Parameter | Design value | Design use |
|---|---|---|
| Average daily flow | 54.12 m³/day | Average mass loading and normal operation |
| Peak daily flow | 72.16 m³/day | Hydraulic sizing and land-treatment dosing |
| Peak event frequency | 1 in 7 day peak basis | Design-sheet assumption |
| Senior Living population basis | 328 persons | 200 × 1-bedroom units plus 80 × 2-bedroom villas at 1.6 persons/villa |

## 3.2 Design influent characteristics

*Table 3. Design influent characteristics*

| Parameter | Maximum design concentration | Average mass load |
|---|---|---|
| $BOD_5$ | 386.4 mg/L | 20.91 kg/day |
| TSS | 431.8 mg/L | 23.37 kg/day |
| TKN | 60.45 mg/L | 3.27 kg/day |
| Ammonia-N | 39.30 mg/L | 2.13 kg/day |
| Total phosphorus | 14.91 mg/L | 0.81 kg/day |
| Alkalinity | 350 mg/L as $CaCO_3$ | To be confirmed by sampling |
| Temperature | >5 °C at recirculation tank | Cold-weather nitrification check required |

## 3.3 Target effluent quality

*Table 4. Target effluent quality*

| Parameter | Design expectation | Comment |
|---|---|---|
| $cBOD_5$ | ≤15 mg/L | Advanced secondary treatment target |
| TSS | ≤15 mg/L | Subject to primary treatment and hydraulic control |
| Total nitrogen | ≤20 mg/L | Requires verified recycle, alkalinity and carbon dosing |
| *E. coli* | Not confirmed | Disinfection excluded from base proposal unless required |
| Total phosphorus | Not confirmed | No dedicated phosphorus-removal stage included |

## 3.4 Wastewater acceptance and toxicity

The design basis assumes predominantly domestic Senior Living wastewater. Trade wastes, concentrated disinfectants, solvents, hydrocarbons, pesticides, pharmaceuticals, excessive fats, oils and grease, and other inhibitory substances must not be discharged without specific assessment. Commercial kitchen discharges must pass through correctly sized and maintained grease traps.

# 4.0 PRE-TREATMENT AND PRIMARY TREATMENT

## 4.1 Grease traps

3 x 9 m³ grease traps are proposed for relevant kitchen and food-service wastewater. The traps provide cooling, flotation and retention of fats, oils and grease before the flow enters the central septic tanks. Final locations, inlet levels, baffle arrangements, access, ventilation and pump-out frequency must be coordinated with the architectural and drainage design.

## 4.2 Central septic tanks

2 x 70 m³ septic tanks are proposed to provide settlement, scum retention, anaerobic digestion and hydraulic moderation. Screened outlets protect downstream pumps, pipework, distribution nozzles and textile media. The final design must confirm working volume, sludge and scum storage, interconnection levels, access risers, structural loading, and groundwater protection.

# 5.0 SECONDARY AND ADVANCED TREATMENT

## 5.1 Pre-anoxic tank

1 x 70 m³ pre-anoxic tank receives screened primary effluent and returned nitrified filtrate. Under anoxic conditions, influent biodegradable carbon is used to reduce nitrate to nitrogen gas. The recycle rate must provide adequate nitrate return while avoiding excessive dissolved oxygen transfer into the anoxic zone.

## 5.2 Stage 1 recirculation and AX600 treatment

1 x 70 m³ recirculation tank blends pre-anoxic effluent with recycled filtrate and doses the AX600 treatment stage. The AX600 comprises 6 x AX100 pods. Four recirculation pumps, timer control, float protection and the splitter-valve arrangement provide frequent, flow-equalised dosing across the textile media.

## 5.3 AdvanTex textile packed-bed treatment principle

Each AX100 pod contains engineered textile media with high specific surface area and open void space. Wastewater is applied through a pressure-distribution network in small, frequent doses. Thin-film flow promotes contact with attached biomass and oxygen transfer through the media. Recirculation maintains biological activity during low-flow periods and moderates variations in hydraulic and organic loading.



*Figure 2. Typical AX100 textile packed-bed reactor arrangement and pressure distribution concept.*

## 5.4 Fresh-air ventilation

The AX100 pods require continuous ventilation through the textile media. Air is drawn through the pod inlet, across the media and discharged through a fan and activated-carbon arrangement. Detailed design must confirm the air path, fan capacity, weather protection, carbon replacement access and alarm strategy.

## 5.5 Post-anoxic denitrification

2 x 25 m³ post-anoxic tanks receive nitrified Stage 1 effluent. Supplemental carbon is dosed and mixed to provide an electron donor for denitrification after readily biodegradable influent carbon has largely been removed. The design must establish nitrate loading, target carbon-to-nitrogen ratio, chemical type and strength, dose control, mixing intensity, safety provisions and storage volume.

## 5.6 Stage 2 recirculation and AX200 polishing

1 x 25 m³ Stage 2 recirculation tank doses an AX200 polishing stage comprising two AX100 pods. The second stage provides an additional aerobic barrier after denitrification, improves final $cBOD_5$ and TSS quality, and oxidises residual reduced nitrogen compounds.

## 5.7 Alkalinity and carbon dosing

Nitrification consumes alkalinity and can depress pH. A controlled alkalinity dose is therefore included. Carbon dosing is included for the post-anoxic stage as a conservative allowance. Chemical systems must include bunding or spill pallets, safe filling access, low-level indication, calibrated dosing pumps, isolation, backflow prevention, safety shower and eyewash facilities, and suitable operating procedures.

### 5.8 Preliminary equipment schedule

*Table 5. Preliminary tank and equipment schedule*

| Component | Quantity / capacity | Principal features |
|---|---|---|
| Grease traps | 3 × 9 m³ | Access risers, lids and internal baffles |
| Septic tanks | 2 × 70 m³ | Screened outlets and interconnecting pipework |
| Pre-anoxic tank | 1 × 70 m³ | Filtrate return pump and fittings |
| Stage 1 recirculation | 1 × 70 m³ | 4 recirculation pumps, splitter valve and float controls |
| AX600 | 6 × AX100 pods | Stage 1 carbon removal and nitrification |
| Post-anoxic tanks | 2 × 25 m³ | Mixing and supplemental carbon dosing |
| Stage 2 recirculation | 1 × 25 m³ | 2 recirculation pumps and splitter valve |
| AX200 | 2 × AX100 pods | Final aerobic polishing |
| Treated-effluent tank | 1 × 70 m³ | Land-treatment pressure dosing |
| Control system | Custom TCOM | Telemetry, logging and alarms |
| UV disinfection | TBC | - |

## 6.0 CONTROLS AND TELEMETRY

A custom TCOM control system is proposed to coordinate pumps, floats, timed dosing, alarm functions, flow measurement and remote telemetry. The panel should record pump run times, pump cycles, process flows, tank levels, alarm history and communication status. Manual, off and automatic operating modes should be provided for maintainable equipment.

- High- and low-level alarms for relevant tanks.
- Pump failure, overload and abnormal-run-time alarms.
- Adjustable timer dosing with high-level override and low-level/redundant-off protection.
- Flow-meter pulse logging and daily flow totalisation.
- Chemical-dosing fault and low-chemical alarms.
- Ventilation or fan-failure alarm where practicable.
- Remote alarm notification and downloadable operating records.

# 7.0 CONVENTIONAL BED LAND TREATMENT SYSTEM

## 7.1 Design concept

Treated effluent is stored in 1 x 70 m³ tank and pressure-dosed to a conventional bed land-treatment system. The current pricing design provides approximately 1,440 m² of bed area divided into 15 beds or sectors and three operating zones. Sequencing valves distribute doses in rotation so that each bed receives controlled loading and a resting period between doses.

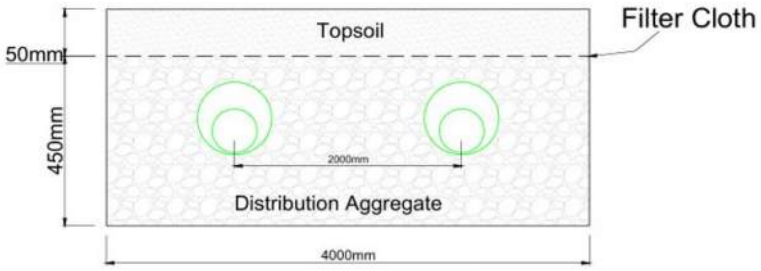



*Figure 3. Conventional bed cross-section.*

## 7.2 Preliminary conventional bed configuration

*Table 6. Preliminary conventional bed configuration*

| Parameter | Preliminary value | Detailed-design requirement |
|---|---|---|
| Total nominal area | Approximately 1,440 m² | Confirm against final design flow and consent loading rate |
| Number of beds/sectors | 15 | Confirm sectoring and resting philosophy |
| Zones | 3 | Coordinate pumps and sequencing valves |
| Bed width | 4 m | Confirm earthworks footprint and setbacks |
| Bed length | 24 m | Resolve dimensional inconsistency before issue for construction |
| Aggregate depth | Approximately 450 mm | Confirm grading, clean aggregate specification and void volume |
| Cover | Approximately 50 mm site soil/topsoil | Confirm erosion protection and vegetation |
| Distribution laterals | 2 per bed | Verify orifice size, spacing and flushing velocity |
| Nominal design loading rate | 50 mm/day noted in project correspondence | Requires geotechnical, hydrogeological and consent confirmation |

### 7.3 Hydraulic distribution

The land-treatment system includes treated-effluent pumps, header pipework, three sequencing-valve assemblies, manifolds, drilled pressure laterals, flushing points, ventilation and filter cloth. A complete hydraulic calculation must verify the pump duty, static head, pipe losses, minimum sequencing-valve flow, distribution uniformity, dose volume, dose duration, resting interval and flushing velocity.

## 8.0 OPERATION AND MAINTENANCE

Preventive maintenance should initially be undertaken at three-month intervals for the treatment plant, with land-treatment inspection frequencies adjusted to consent requirements and operating experience.

*Table 7. Operation and maintenance tasks*

| Component | Maintenance activity | Indicative frequency |
|---|---|---|
| Grease traps | Inspect retained grease and arrange pump-out before carryover | Monthly initially; adjust to loading |
| Septic tanks | Inspect levels, scum, sludge, screens, structures and access lids | Quarterly visual; sludge survey annually |
| Pre-anoxic tank | Check recycle flow, mixing condition, odour and pump operation | Quarterly |
| AX100 pods | Inspect spray pattern, flush laterals, check lids and ventilation | Quarterly |
| Recirculation tanks | Check pumps, floats, splitter valves, timers and levels | Quarterly |
| Post-anoxic tanks | Check mixing and verify carbon dose against nitrate response | Quarterly and during optimisation |
| Chemical systems | Inspect dosing pumps, bunding, eyewash, hoses and stock levels | Monthly / quarterly service |
| Treated-effluent tank | Inspect pumps, floats, flow meter and alarms | Quarterly |
| Conventional beds | Inspect for ponding, breakout, settlement, erosion and vegetation condition | Monthly initially; at least quarterly |
| Distribution network | Operate flushing points and verify sector rotation | Six-monthly or as required |
| Telemetry | Review alarms, trends, communications and data completeness | Monthly remote review |

## 9.0 COMPONENT LIFE EXPECTANCY

Indicative service lives depend on installation quality, loading, environmental exposure and maintenance. The following values are planning allowances rather than warranties.

*Table 8. Indicative component life expectancy*

| Component | Indicative planning life |
|---|---|
| AX textile media and pod shell | More than 50 years |
| Concrete tanks | More than 50 years, subject to structural and exposure design |
| AX pod lids | More than 35 years |
| Splitter and sequencing valves | Approximately 20 to 25 years |
| PVC and PE pipework | More than 20 years |
| Control panel enclosure and major components | Approximately 15 to 25 years |
| Pumps | Approximately 10 to 15 years |
| Float switches and instruments | Approximately 5 to 10 years |
| Activated carbon | Replace based on odour performance and inspection |

## 10.0 DESIGN HOLD POINTS AND EXCLUSIONS

*Table 9. Key design hold points*

| Hold point | Required confirmation |
|---|---|
| Final population and flow | Confirm Senior Living occupancy, inflow/infiltration allowance and peak-flow basis |
| AX process capacity | Obtain current Orenco commercial design review for stage loadings and low-temperature performance |
| Nitrogen removal | Complete nitrification/denitrification mass balance, recycle and chemical-dose calculations |
| Primary treatment | Confirm septic-tank effective volume, retention time, sludge storage and screen sizing |
| Hydraulics | Verify all pump curves, system curves, dose volumes, recirculation ratios and splitter settings |
| Conventional beds | Confirm loading rate, 24 m versus 26 m bed length, aggregate specification and total basal area |

| Hold point | Required confirmation |
|---|---|
| Groundwater and bores | Complete site-specific hydrogeological review and verify vertical/horizontal setbacks |
| Civil/structural | Confirm levels, access, foundations, anti-flotation, groundwater control and traffic exclusion |
| Electrical | Confirm mains capacity, phase, control architecture, telemetry coverage and hazardous-area requirements |
| Disinfection | Confirm whether UV or chlorination is required; both are excluded from the base treatment scope |
| Performance criteria | Confirm consent limits, compliance-point location, testing regime and proof-of-performance requirements |

## 11.0 CONCLUSION

The proposed staged AdvanTex PBR system provides a logical treatment train for the Senior Living precinct. Central septic treatment protects the downstream process, Stage 1 AX600 treatment provides the principal carbon-removal and nitrification duty, post-anoxic treatment supports nitrogen removal, and the AX200 stage provides final aerobic polishing. Treated effluent is then pressure-dosed to a sectored conventional bed system.

The design is suitable for progression to detailed design, subject to resolution of the identified hold points. Priority items are manufacturer verification of AX loading, completion of the nitrogen mass balance, confirmation of the conventional bed dimensions and loading rate, and site-specific confirmation of groundwater and potable-bore separation requirements.

# THOROUGHBRED WAIKATO DEVELOPMENT AREA

# MBBR WASTEWATER TREATMENT SYSTEM

| | |
|---|---|
| **Prepared for** | BCD Group Limited |
| **Prepared by** | Moeen Gholami, Innoflow Technologies NZ Limited |
| **Date** | 22 September 2026 |

**CONFIDENTIAL**

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# 1.0 INTRODUCTION

Innoflow Technologies NZ Limited has prepared this report for the proposed wastewater treatment and land-disposal system serving the Thoroughbred Waikato Development Area. The system comprises upstream event-flow buffering, primary settlement, staged moving bed biofilm reactor treatment, anoxic nitrogen removal, final clarification, chemical dosing, treated-effluent storage, telemetry controls and land treatment.

This report is a preliminary design specification. The MBBR process is conventional; the principal project-specific issue is the highly intermittent event-flow profile and high-strength wastewater. Final equipment sizing, usable buffer volume, event operating rules, civil levels, structural design, process aeration, clarification, distribution hydraulics, land-treatment suitability and consent conditions must be confirmed during detailed design.

# 2.0 WASTEWATER MANAGEMENT OVERVIEW

## 2.1 Wastewater management concept

During normal-day operation, wastewater from the Development Area is directed to the septic tanks for primary treatment before being transferred to the MBBR treatment train. During events, when wastewater flows are significantly higher, the event wastewater is diverted to the three buffer tanks. The buffer tanks temporarily store the event flows and transfer the wastewater at a controlled rate to the downstream septic tanks once treatment capacity is available. Primary treatment then provides solids separation before the wastewater is fed to the MBBR system. The biological treatment train comprises anoxic, organic-removal and nitrification MBBR stages followed by final clarification. Treated effluent is stored and pressure-dosed to the land-treatment system.

The hydraulic and control system must provide clear operating modes for normal-day and event conditions. Automatic valves, pumps and level controls should direct normal wastewater flows to the septic tanks and divert event flows to the buffer tanks. The event operating strategy must maintain sufficient available buffer volume before each event and prevent uncontrolled simultaneous transfer from the buffer tanks to the treatment system.

The design assumes that Bloodstock, Harness and Thoroughbred events do not occur concurrently. This is a fundamental hydraulic and operational assumption unless a revised event-flow and storage model demonstrates that adequate buffering, primary-treatment and biological-treatment capacity is available.

## 2.2 Proposed Development Area process train

*Table 1. Proposed Development Area process train*

| Stage | Process | Proposed configuration |
|---|---|---|
| 1 | Flow equalisation | 3 x 70 $m^3$ event-flow buffer tanks upstream of primary treatment |
| 2 | Primary treatment | 3 x 25 $m^3$ septic tanks with screened outlets downstream of buffer tanks |
| 3 | Anoxic treatment | 1 x 15 $m^3$ pre-anoxic MBBR, 30% media fill, mixer and nitrified-liquor recycle |
| 4 | Organic removal | 1 x 25 $m^3$ aerated MBBR, 30% media fill and fine-bubble diffusers |
| 5 | Nitrification | 1 x 36 $m^3$ aerated MBBR with 10.52 m3 carrier media (42.1% fill) |
| 6 | Final clarification | 1 x 25 $m^3$ clarifier; optional lamella plates |
| 7 | Sludge handling | 1 x 25 $m^3$ sludge storage/digestion tank |
| 8 | Treated-effluent storage | 1 x 25 $m^3$ dosing tank |
| 9 | Land treatment | 5 pressure-dosed conventional beds/sectors, using the same operating philosophy as the Senior Living system, subject to final sizing |
| 10 | Controls | Telemetry, alarms, flow recording and pump control |
| 11 | Disinfection | UV treatment to be confirmed |

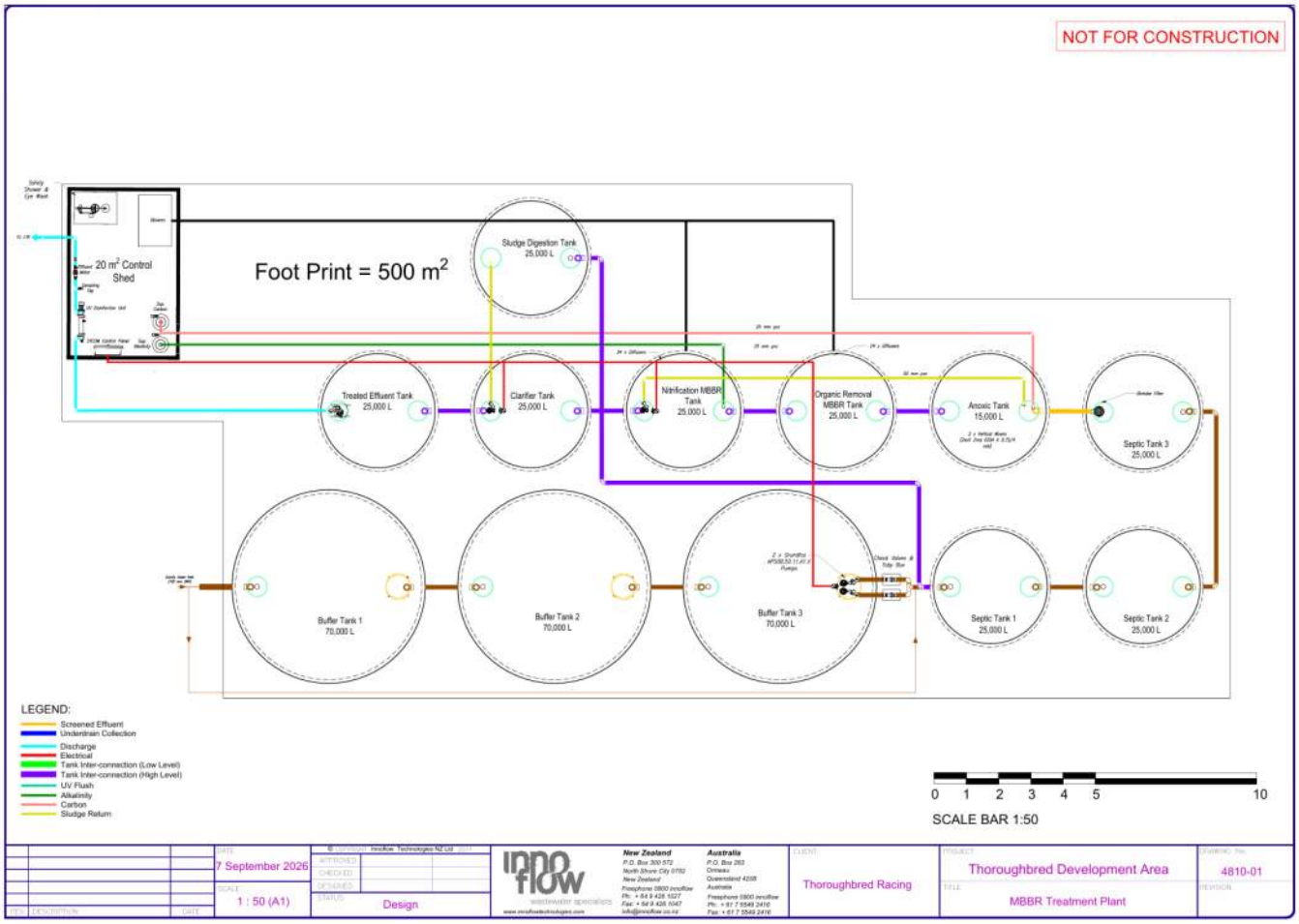



*Figure 1. Proposed Development Area process train.*

# 3.0 DESIGN PARAMETERS

## 3.1 Design flow basis

*Table 2. Design flow basis*

| Parameter | Design value | Design use |
|---|---|---|
| Average daily flow | 24 $m^3$/day | Average mass loading and normal biological feed |
| Peak daily/event flow | 175 $m^3$/day | Buffer-tank hydraulic sizing |
| Required transfer profile | Controlled from buffer tanks through primary treatment | Protects the biological process |

## 3.2 Design influent characteristics

*Table 3. Design influent characteristics*

| Parameter | Maximum concentration | Average mass load |
|---|---|---|
| BOD5 | 852 mg/L | 20.45 kg/day |
| TSS | 952 mg/L | 22.85 kg/day |
| TKN | 133 mg/L | 3.19 kg/day |
| Ammonia-N | 87 mg/L | 2.09 kg/day |
| Total phosphorus | 10 mg/L | 0.24 kg/day |
| Alkalinity | 350 mg/L as $CaCO_3$ | Confirm by sampling |
| Temperature | >5 deg C | Cold-weather check required |

## 3.3 Target effluent quality

*Table 4. Target effluent quality*

| Parameter | Expectation | Comment |
|---|---|---|
| cBOD5 | <=15 mg/L | Advanced secondary target |
| TSS | <=15 mg/L | Dependent on clarification |
| Total nitrogen | <=20 mg/L | Requires nitrification, recycle and carbon dosing |
| *E. coli* | Not confirmed | Confirm UV requirement |
| Total phosphorus | Not confirmed | No dedicated removal stage |

## 3.4 Wastewater acceptance and source control

Horse bedding, straw, hay, soil, grit and similar stable solids must be intercepted and disposed of separately. Concentrated disinfectants, solvents, hydrocarbons, pesticides, veterinary chemicals, excessive fats, oils and grease, and other inhibitory substances must not be discharged without assessment.

# 4.0 FLOW EQUALISATION AND PRIMARY TREATMENT

## 4.1 Event-flow buffering

3 x 70 $m^3$ buffer tanks are located upstream of the septic tanks and provide 200 $m^3$ nominal gross storage before allowances for normal operating level, freeboard, sediment accumulation and emergency reserve. Usable storage must be established using an event-based hydraulic model. The model should define pre-event starting level, hourly inflow, controlled transfer rate to the septic tanks, maximum operating level, drawdown time, recovery period and response to abnormal events.

## 4.2 Primary treatment

3 x 25 $m^3$ septic tanks are proposed downstream of the buffer tanks to provide settlement, scum retention and anaerobic digestion before biological treatment. Screened outlets protect downstream pumps, pipework and MBBR media. Confirm working volume, sludge and scum storage, interconnection levels, access, structural loading, groundwater protection and desludging frequency.

## 4.3 Sludge digestion and handling

1 x 25 $m^3$ anaerobic sludge digestion or storage tank is proposed. The overflow of digestion tank is sent to septic tanks. Final design should confirm sludge production, storage conditions, odour control, decant arrangements, tanker access and disposal route.

# 5.0 MBBR AND ADVANCED TREATMENT

The MBBR process comprises a pre-anoxic stage, an aerobic organic-removal stage and an aerobic nitrification stage. The current Development Area design calculations use carrier media with a specific surface area of 650 m2/m3. The stage specifications are summarised below.

### 5.1 Pre-anoxic MBBR

The pre-anoxic stage receives screened septic-tank effluent and recycled nitrified liquor. A submerged mixer maintains media movement without aeration.

*Table 5. Pre-anoxic MBBR specification*

| Item | Preliminary specification |
|---|---|
| Tank arrangement | 1 x 15 m3 pre-anoxic MBBR |
| Media type | MBBR19 moving carrier media or equivalent |
| Specific surface area | 650 $m^2/m^3$ |
| Media filling ratio | 40% |
| Installed media volume | 6.0 $m^3$ |
| Installed carrier area | 3,900 $m^2$ |
| Nitrified-liquor recycle | Preliminary ratio 4.16 x average influent flow |
| Mixer(s) | 2 x duty/standby submersible non-aerating mixer (0.5 kW) |
| Outlet screen | Stainless-steel media-retention screen suitable for selected carrier |



*Figure 2. MBBR19 carrier media.*

### 5.2 Organic-removal MBBR

The organic-removal stage follows the pre-anoxic tank. Fine-bubble aeration provides oxygen for carbon oxidation and keeps the carrier media in continuous motion.

*Table 6. Organic-removal MBBR specification*

| Item | Preliminary specification |
|---|---|
| Tank arrangement | 1 x 25 $m^3$ aerated MBBR |
| Media type | MBBR19 moving carrier media or equivalent |
| Specific surface area | 650 $m^2/m^3$ |
| Media filling ratio | 40% |
| Installed media volume | 7.50 $m^3$ |
| Installed carrier area | 4,875 $m^2$ |
| Design BOD SALR | 4.0 g BOD5/$m^2$/day |
| Calculated airflow | 83.3 $m^3/h$ |
| Fine-bubble diffusers | 24 units by airflow; final layout to provide full tank-floor coverage |
| Outlet screen | Stainless-steel media-retention screen suitable for selected carrier |

### 5.3 Nitrification MBBR

The nitrification stage oxidises ammonia and returns nitrified liquor to the pre-anoxic stage. The media quantity below is taken directly from the current MBBR design calculation.

*Table 7. Nitrification MBBR specification*

| Item | Preliminary specification |
|---|---|
| Tank arrangement | 1 x 25 $m^3$ aerated MBBR |
| Media type | MBBR19 moving carrier media or equivalent |
| Specific surface area | 650 $m^2/m^3$ |
| Installed media volume | 10 $m^3$ |
| Required filling ratio in selected tank | 45% |
| Required carrier area | 6,500 $m^2$ |
| Design nitrification SALR | 0.486 g $NH_3$-N/$m^2$/day at 5 deg C |
| Dissolved oxygen | 4.0 mg/L design value |
| Calculated airflow | 90 $m^3/h$ |
| Fine-bubble diffusers | 24 units by airflow; final layout to provide full tank-floor coverage |
| Recycle destination | Pre-anoxic MBBR |

## 5.4 Final clarification

The clarifier removes suspended solids and sloughed biofilm. A conventional settling arrangement is adequate for the current hydraulic design; lamella plates may be included as an optional compact enhancement.

*Table 8. Final clarifier specification*

| Item | Preliminary specification |
|---|---|
| Clarifier arrangement | 1 x 25 $m^3$ final clarifier |
| Design surface loading rate | 16 $m^3/m^2$/day |
| Outlet | Level V-notch collection weir or equivalent |
| Sludge removal | Submersible sludge pump to 25 $m^3$ sludge tank |
| Optional lamella angle | 60 degrees |
| Optional lamella spacing | 50 mm |
| Optional lamella plate length | 1.2 m |
| Optional lamella quantity | Approximately 80 plates |

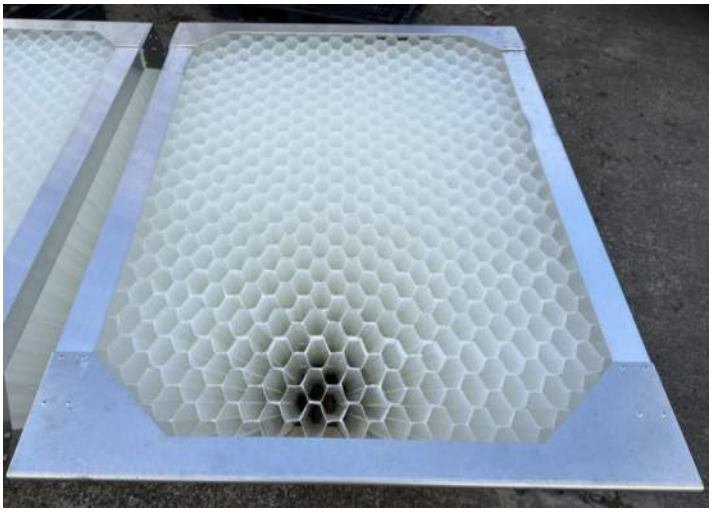


*Figure 3. Lamella sheet modules for the optional clarifier enhancement.*

### 5.5 Aeration and chemical systems

*Table 9. Aeration and chemical-system specification*

| Item | Preliminary specification |
|---|---|
| Blowers | 2 x 200 $m^3$/h side-channel blowers, duty/standby |
| Total calculated process air | 174 $m^3$/h |
| Maximum calculated blower outlet pressure | 350 mbar |
| Air distribution | Balanced branches to organic-removal and nitrification MBBRs with isolation, non-return valves and pressure indication |
| Calculated alkalinity addition | 6.11 kg/day as $CaCO_3$ |
| Sodium bicarbonate equivalent | 10.26 kg/day where $NaHCO_3$ is selected |
| Supplemental carbon | Connection and dosing provision retained; normal pre-anoxic demand to be optimised during commissioning |

## 6.0 CONTROLS AND TELEMETRY

The controls should coordinate buffer transfer pumps, process pumps, blowers, mixers, chemical dosing, tank levels, flow measurement and remote monitoring. Telemetry should show total event inflow, available buffer volume, transfer rate to septic treatment, process status and alarm history.

- High- and low-level alarms for all relevant tanks.
- Pre-event storage-reserve indication.
- Adjustable controlled transfer from buffer tanks to septic tanks.
- Blower, mixer, recycle, sludge-pump and chemical-dosing alarms.
- Remote notification and downloadable operating records.

## 7.0 LAND TREATMENT SYSTEM

### 7.1 Design concept

Treated effluent is stored in one 25 $m^3$ tank and pressure-dosed to a conventional bed land-treatment system similar in design philosophy to the Senior Living system. The current Development Area concept

comprises five beds or sectors. Sequencing valves distribute doses in rotation so that each bed receives controlled hydraulic loading and a resting period between doses. The final bed area, dimensions and loading rate must be confirmed against the Development Area design flow, site-specific soils, groundwater conditions, topography, setbacks and consent requirements.

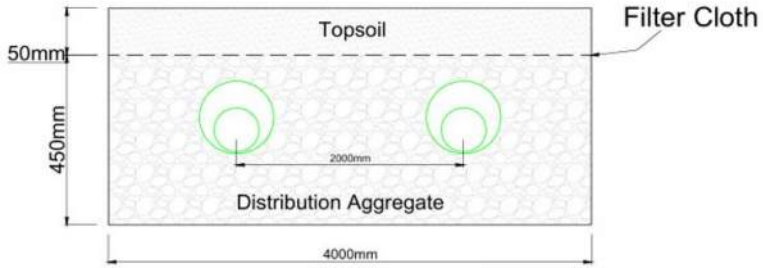



*Figure 4. Typical conventional bed pressure-distribution concept.*

## 7.2 Preliminary configuration

*Table 10. Preliminary land-treatment configuration*

| Parameter | Preliminary value | Detailed-design requirement |
|---|---|---|
| Number of beds/sectors | 5 | Confirm sectoring, operating zones and resting philosophy |
| Total nominal area | Approximately 500 $m^2$ | Size against final Development Area design flow and consent loading rate |
| Bed width | 4.0 m | Confirm earthworks footprint, spacing and setbacks |
| Bed length | 24 m | Coordinate available land area and required basal area |
| Aggregate depth | Approximately 450 mm stated | Confirm clean aggregate grading, specification and void volume |
| Cover | Approximately 50 mm site soil/topsoil, subject to confirmation | Confirm erosion protection, vegetation and finished levels |
| Distribution laterals | 2 per bed | Verify lateral quantity, orifice size, spacing and flushing velocity |
| Treated-effluent storage | 25 $m^3$ | Verify dose storage, wet-weather operation and emergency reserve |
| Distribution method | Pressure-dosed through sequencing valves | Verify pump duty, valve operating range and distribution uniformity |
| Nominal design loading rate | 50 mm/day noted in project correspondence | Requires geotechnical, hydrogeological and consent confirmation |

## 7.3 Hydraulic distribution

The land-treatment system is to include treated-effluent dosing pumps, header pipework, sequencing-valve assemblies, manifolds, drilled pressure laterals, flushing points, ventilation where required and filter cloth. A complete hydraulic calculation must verify pump duty, static head, pipe losses, minimum sequencing-valve flow, distribution uniformity, dose volume, dose duration, resting interval and flushing velocity. The arrangement should follow the same pressure-dosed, rotating-sector operating philosophy adopted for the Senior Living conventional bed system, while using the Development Area flow and site constraints for final sizing.

# 8.0 OPERATION AND MAINTENANCE

*Table 11. Operation and maintenance tasks*

| Component | Activity | Frequency |
|---|---|---|
| Buffer tanks | Check available volume, transfer pumps, levels and alarms | Before events and quarterly |
| Septic tanks | Inspect scum, sludge, screens and structures | Quarterly; sludge survey annually |
| MBBR tanks | Inspect media movement, screens and aeration/mixing | Quarterly |
| Blowers | Check airflow, pressure, filters, noise and alarms | Monthly / quarterly |
| Clarifier | Check weirs, sludge blanket and effluent clarity | Monthly initially |
| Sludge tank | Check sludge volume, odour and tanker access | Monthly |
| Chemical systems | Inspect pumps, bunding, eyewash and stock | Monthly / quarterly |
| Land area | Inspect ponding, breakout, erosion and vegetation | Monthly initially |
| Telemetry | Review events, alarms, trends and communications | Monthly and after events |

# 9.0 COMPONENT LIFE EXPECTANCY

*Table 12. Indicative component life expectancy*

| Component | Planning life |
|---|---|
| Concrete tanks | >50 years subject to design |
| MBBR media | Typically >20 years |
| PVC/PE pipework | >20 years |
| Blowers | 10-15 years |
| Pumps and mixers | 10-15 years |
| Control components | 15-25 years |
| Instruments | 5-10 years |
| Dosing pumps | 5-10 years |

**WTR GREENFIELDS RACECOURSE**
**TRACK WATER USE - ANNUAL ESTIMATE**

Date 14/08/2026
Rev 2

**1. GRASS TRACK (SAND BASED) - GENERIC ANNUAL IRRIGATION DEMAND ON 1HA OF GRASS TRACK**

| Month | Rainfall Depth per Month | Rainfall Factor | Evap - Pan per Month | Net Evap per Month | Area | Volume Per Month with Rain / ha | Depth of Irrigation per day with Rain | Depth of Irrigation per day no Rain | |
|---|---|---|---|---|---|---|---|---|---|
| | (mm) | 0.5 | (mm) | (mm) | Ha | (ML) | (mm/m2) | (mm/m2) | |
| January | 76 | 38.0 | 145.2 | 107.2 | 1.0 | **1.43** | 4.6 | 5.8 | 127% |
| February | 73 | 36.5 | 118.4 | 81.9 | 1.0 | **1.09** | 3.5 | 4.7 | 133% |
| March | 83 | 41.5 | 92.5 | 51.0 | 1.0 | **0.68** | 2.2 | 3.5 | 161% |
| April | 101 | 50.5 | 53.1 | 2.6 | 1.0 | **0.03** | 0.1 | 1.7 | 1783% |
| May | 107 | 53.5 | 30.6 | -22.9 | 1.0 | **-0.31** | -1.0 | 0.7 | -73% |
| June | 119 | 59.5 | 21.1 | -38.4 | 1.0 | **-0.51** | -1.6 | 0.3 | -17% |
| July | 121 | 60.5 | 22.4 | -38.1 | 1.0 | **-0.51** | -1.6 | 0.3 | -19% |
| August | 104 | 52.0 | 35.8 | -16.2 | 1.0 | **-0.22** | -0.7 | 1.0 | -136% |
| September | 95 | 47.5 | 56.2 | 8.7 | 1.0 | **0.12** | 0.4 | 1.9 | 496% |
| October | 92 | 46.0 | 88.7 | 42.7 | 1.0 | **0.57** | 1.8 | 3.3 | 181% |
| November | 77 | 38.5 | 114.5 | 76.0 | 1.0 | **1.01** | 3.3 | 4.5 | 138% |
| December | 94 | 47.0 | 134.8 | 87.8 | 1.0 | **1.17** | 3.8 | 5.3 | 140% |
| Total | 1142.0 | 571.5 | 913.3 | 342.3 | | **4.55** | | | |

Note: 1. Irrigation demand from Evergreen Turf's Agronomist - Refer "Evergreen Irrigation Demand 7 Aug" tab
Rainfall mm: Sourced from NIWA national climate data base- Mean Monthly Rainfall

**2. GRASS TRACKS - ANNUAL IRRIGATION DEMAND**

| Month | Volume Per Month with Rain / ha | Course Proper | No 2 Grass | No 3 Grass (3) | Total for Grass Tracks |
|---|---|---|---|---|---|
| | (ML) | (ML) | (ML) | (ML) | (ML) |
| **Area (ha)** | | **9.22** | **6.10** | **0** | **15.32** |
| January | 1.43 | 13.18 | 8.72 | 0.00 | 21.91 |
| February | 1.09 | 10.05 | 6.65 | 0.00 | 16.70 |
| March | 0.68 | 6.27 | 4.15 | 0.00 | 10.42 |
| April (2) | 0.60 | 5.53 | 3.66 | 0.00 | 9.19 |
| May (2) | 0.60 | 5.53 | 3.66 | 0.00 | 9.19 |
| June (2) | 0.60 | 5.53 | 3.66 | 0.00 | 9.19 |
| July (2) | 0.60 | 5.53 | 3.66 | 0.00 | 9.19 |
| August (2) | 0.60 | 5.53 | 3.66 | 0.00 | 9.19 |
| September (2) | 0.60 | 5.53 | 3.66 | 0.00 | 9.19 |
| October (2) | 0.60 | 5.53 | 3.66 | 0.00 | 9.19 |
| November | 1.01 | 9.31 | 6.16 | 0.00 | 15.47 |
| December | 1.17 | 10.79 | 7.14 | 0.00 | 17.92 |
| **Total** | 9.58 | 88.33 | 58.44 | 0.00 | **146.77** |

Note: 2. Where the monthly irrigation demand / ha is less than 0.6ML (900,000L) allow for 0.6ML / month
e.g. 10 days of 5.8mm depth over 1.0ha = 580,000L = 0.6ML
3. No 3 Grass is not irrigated

**3. OTHER TRACKS - ANNUAL WATER DEMAND**

| Month | Water Depth per Day /m2 (5) | Water Depth per Month /m2 | No 1 Sand | No 1 Plough | No 2 Sand | No 2 Plough | Total for Other Tracks |
|---|---|---|---|---|---|---|---|
| | (mm) | (mm) | (ML) | (ML) | (ML) | (ML) | (ML) |
| **Area (m2)** | | | **12,200** | **11,800** | **12,100** | **11,700** | **47,800** |
| January | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| February | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| March | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| April | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| May (4) | 0.0 | 0.0 | 0.10 | 0.00 | 0.10 | 0.00 | 0.20 |
| June (4) | 0.0 | 0.0 | 0.10 | 0.00 | 0.10 | 0.00 | 0.20 |
| July (4) | 0.0 | 0.0 | 0.10 | 0.00 | 0.10 | 0.00 | 0.20 |
| August (4) | 0.0 | 0.0 | 0.10 | 0.00 | 0.10 | 0.00 | 0.20 |
| September | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| October | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| November | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| December | 1.2 | 37.2 | 0.45 | 0.44 | 0.45 | 0.44 | 1.78 |
| **Total** | 9.6 | 297.6 | 4.03 | 3.51 | 4.00 | 3.48 | **15.03** |

Note: 4. No need to water these tracks in late autumn / winter - however have assumed a nominal amount on the sand to keep the dust down during dry weather
5.Water is applied by these track via water tanker as per existing Cambridge Racecourse - refer Cambridge tab

**3. HARNESS TRACKS - TOTAL ANNUAL WATER DEMAND**

| | Water Depth per Day /m2 (6) | Water Volume per Day | Water Volume per month | Season Total |
|---|---|---|---|---|
| | (mm) | (L) | | |
| Summer | 5 | 104,000 | 3.22 | 19.34 |
| Winter | 3 | 62,400 | 1.93 | 11.61 |
| **Total Annual** | | | | **30.95** |

Note: 6. Harness track water demand estimated from Copilot AI query (refer Harness Tab)
Track area 1040 20 20,800 m2

**4. THOROUHGBRED AND HARNESS TRACKS - TOTAL ANNUAL WATER DEMAND ESTIAMTE**

| Track Type | Volume |
|---|---|
| | (ML) |
| Grass Tracks | 146.77 |
| Other Tracks | 15.03 |
| Harness | 30.95 |
| **Total Annual Track Water Demand** | **192.74** |

# Appendix D FENZ Support

**Fire and Emergency New Zealand**

Waikato Fire District
189 Anglesea Street
PO Box 1343
Hamilton 3240

Phone +64 7 858 7600

10 August 2026

Sam Simpson
BCD Group
Level 1, 220 Tristram Street,
Hamilton, 3204

**BY EMAIL:** sam@bcdgroup.nz

Kia ora Sam

**Subject: Waikato Thoroughbred Racing Greenfields**

Thanks again for the opportunity to meet on 30 July 2026 and talk through the early thinking for the Waikato Thoroughbred Racing Greenfields development. We appreciate you sharing the updated masterplan; from what we can see, it aligns closely with what was discussed and provides a helpful basis for understanding the overall layout and intended functions across the site.

As mentioned during our discussion, we are comfortable continuing this pre-engagement as you work through the RMA process, recognising that any formal application submitted to Fire and Emergency will still need to be assessed against the relevant fire safety legislation at the time of lodgement. Early engagement like this is valuable, and we are always keen to support partner agencies and developers to achieve good fire safety outcomes for their communities.

From a water supply perspective, it is useful to understand the direction you are heading with multiple bores and supplementary storage via ponds. The inclusion of test bore locations in the masterplan is helpful, and we support the intent to maximise on-site collection and storage to reduce draw on groundwater. When the design progresses, we will be looking for confirmation of available firefighting water volumes and delivery methods to ensure they align with the requirements of SNZ PAS 4509 and our local operational capabilities.

Regarding the buildings, we understand the final scale and function of the main events and bloodstock facilities are still being refined, including whether sprinklers will be incorporated. Once the building forms and uses are confirmed, we can provide more specific technical advice on fire safety systems, access and water supply needs.

At this stage, our general suggestions are:

- Firefighting water supply requirements should be considered early, particularly given the size and public-facing nature of the proposed facilities.

- Maintain clear and compliant fire appliance access throughout the site, noting the multiple precincts and internal circulation routes shown in the masterplan.
- Consider the benefits of automatic fire sprinkler systems for life safety and property protection, especially for large-scale event or auction spaces.
- Continue integrating water storage and reticulation planning with the overall site layout to ensure reliable delivery of firefighting water where required.

Based on the information shared to date, Fire and Emergency is comfortable to provide *in-principle* support for the direction of the project, noting that any formal support or agreement will be subject to review once the relevant applications are lodged and assessed through the required statutory processes. As always, our advice reflects the information available at this point in time.

If you need further detail or wish to workshop any specific design elements as they evolve, please feel free to get in touch.

Ngā mihi,



Mark Tinworth
**Community Risk Manager – Waikato**