CIVILPLAN CONSULTANTS

STORMWATER ASSESSMENT REPORT

Project Name:	The Ardmore Business Park ('the Project')
Client:	Knight Investments Ltd
CP Project No:	2672-01
CP Document No:	2672-01-ER03-stormwaterassessment-aja-20251218
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1. Introduction & Project Description

This technical report has been prepared to support a fast track referral application by Knight Investments Ltd for the proposed Ardmore Business Park ('the Project').

The purpose of this Project is to deliver a regionally significant industrial and employment hub. The Project capitalises on its location surrounding (and including) Ardmore Airport, its accessibility to major transport networks (particularly the planned Mill Road corridor), and its proximity to the growing residential areas of Takaanini, Manurewa, Papakura and Drury.

The Project Area is approximately 511 hectares.

Of this total, it is anticipated that:

a) The net developable area will be between 193-276 hectares, which excludes significant ecological areas ("SEAs"), streams, stormwater management areas and that part of the Airport either used for existing operations/runways or already under construction.

b) The likely gross floor area for future activities / buildings would be between 67 hectares and 136 hectares, with additional land required for yards, individual site landscaping and car parking etc.

At a broad level the Project includes:

a) The construction and development of a business park for light industry/service type activities.

b) A green / blue network providing riparian planting, stormwater management and wastewater disposal and protection of existing SEAs.

c) Upgrades to existing roads and intersections.

d) New roading connections to the Airport and the wider site.

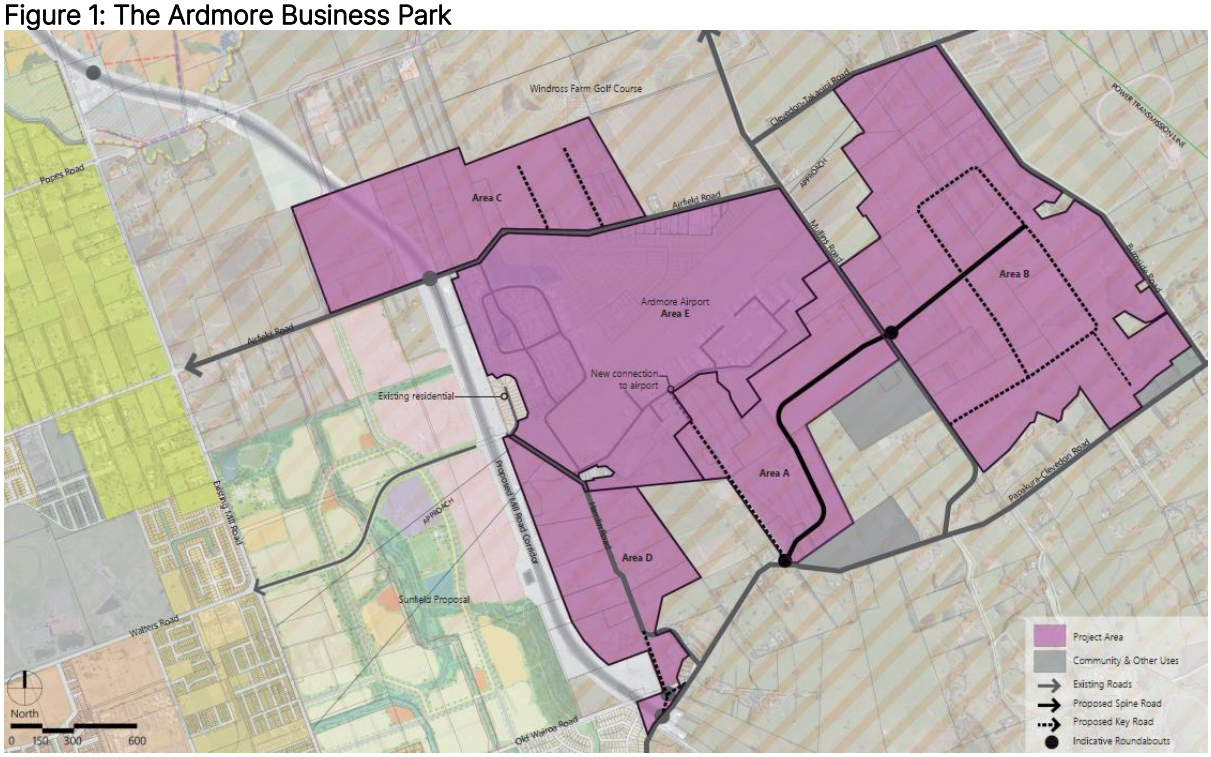
e) Land modification works and infrastructure.

The sites that form part of the Project are set out in Appendix B to this report/assessment.

This stormwater assessment report examines existing Project Area conditions, identifies likely stormwater mitigation solutions, and describes, at a high level, the known and anticipated stormwater effects of the project on the environment (for the purposes of the referral application). This report also provides an analysis of hydrological factors and strategies to address known and anticipated flood risks. A more detailed analysis, consistent with the requirements for resource consent applications under the Fast-Track Approvals Act 2024, will be provided with any substantive application.

Our qualifications and experience are provided in Appendix C.

Figure 1: The Ardmore Business Park



2. Existing Stormwater Environment

The Project area is located within two separate catchments, the Papakura Stream catchment and the Taitaia Stream catchment. The Papakura Stream drains to the Manukau Harbour via the Pahurehure Inlet and the Taitaia Stream ultimately drains to the Tamaki Strait/Hauraki Gulf via the Wairoa River.

These catchments are generally separated by Mullins Road, though culverts under Mullins Road allow low flows to flow from part of Area A beneath Mullins Road into Area B. Area's A, C, D and E are located within the Papakura Stream catchment. Area B is located at the uppermost part of the Taitaia Stream catchment. The sites are predominantly flat and stormwater within these sites is conveyed by a network of open farm drains channels.

Both the Papakura Stream and the Taitaia Stream catchments are considered to be prone to flooding. Review of the Auckland Council Geomaps (including mapping associated with Auckland Council's Plan Change 120) and preliminary 2D flood modelling suggests that significant portions of the Project area are susceptible to flooding during 1% Annual Exceedance Probability ('AEP') storm events and, to a lesser degree, also during smaller 10% and 50% AEP flood events. Much of the flooding is shallow and considered low hazard with a flood depth during the 1% AEP storm event of less than 300mm.

Refer to the below Figures 1 to 3 as well as Appendix A for a pre-development catchment plan of the Project. We have also reviewed the indicative ecological mapping prepared by Ecological Solutions which identifies permanent, intermittent and artificial streams.

The site falls outside the Auckland Council - Healthy Waters Regionwide Network Consent for the discharge of stormwater.

Figure 2: Papakura Stream Catchment

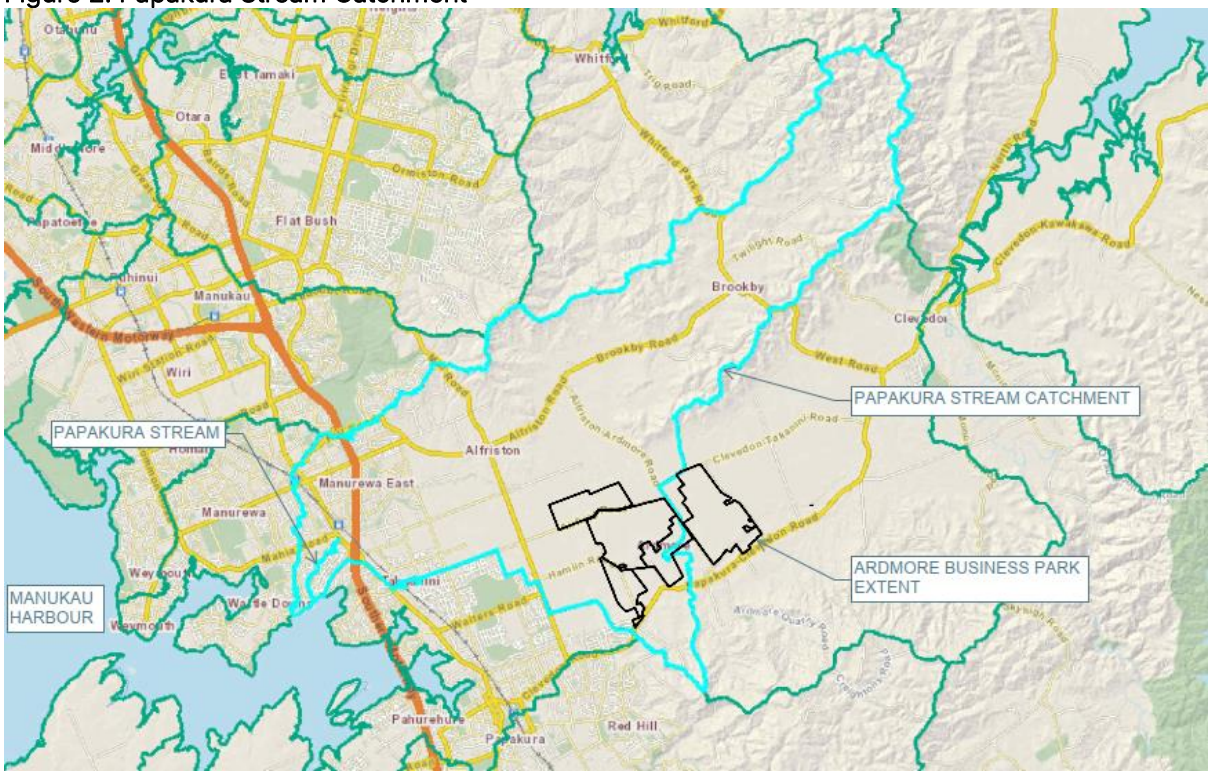


Figure 3: Taitaia Stream Catchment

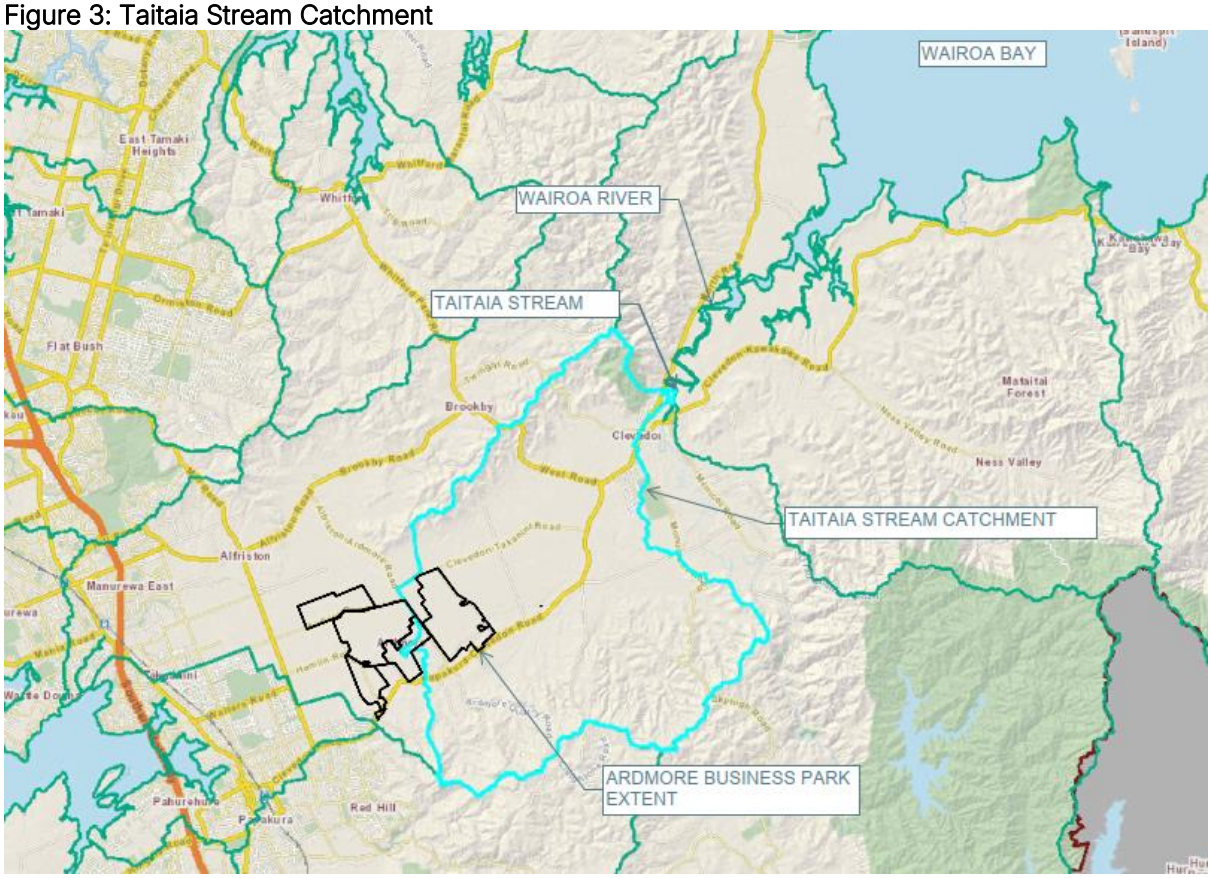
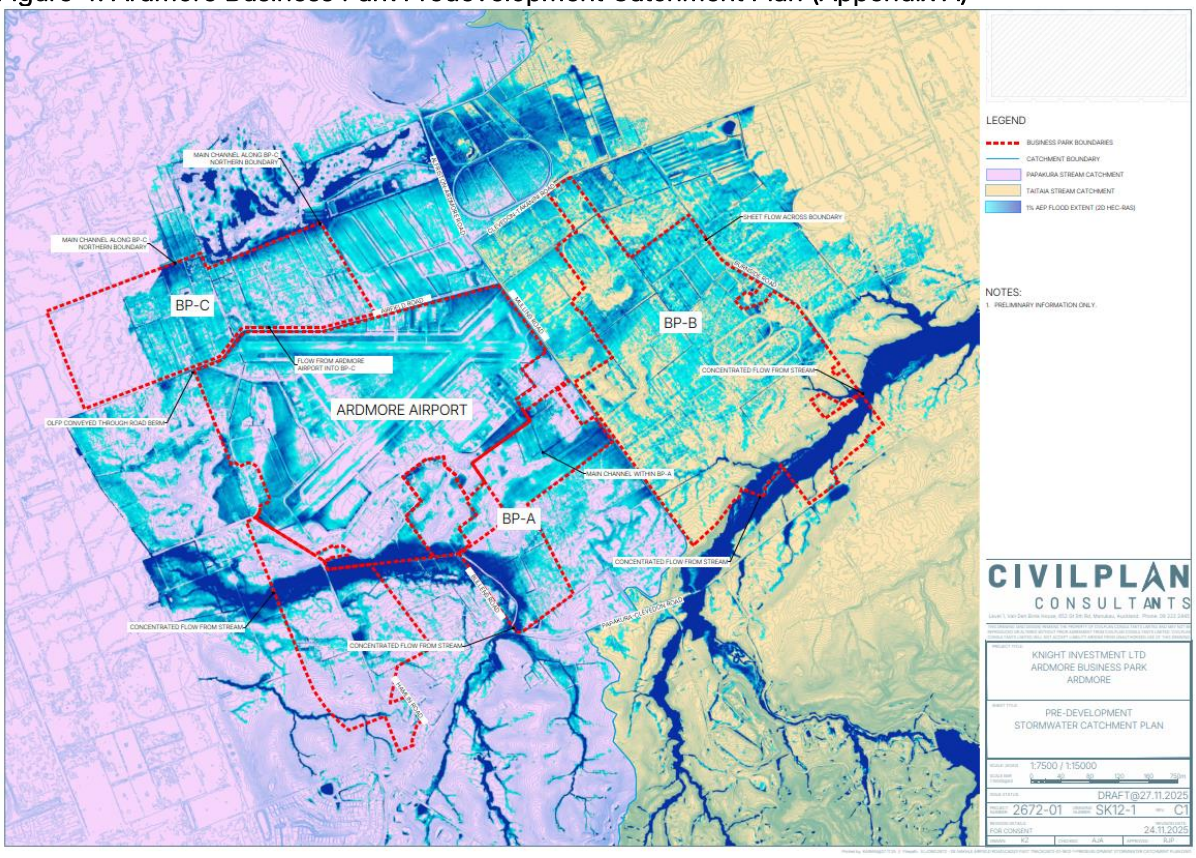


Figure 4: Ardmore Business Park Predevelopment Catchment Plan (Appendix A)



As outlined by EcoLogical Solutions in the ecology assessment, the majority of watercourses within the Project Area are likely to be classified as 'artificial watercourses' in accordance with the AUP because they appear to have been constructed to drain the land and contained no natural portions from their confluence with a river or stream to their headwaters.

Modified but natural watercourses within the Project Area are limited to a tributary of Papakura Stream that originates to the south-west of the Project Area and a tributary of Taitaia Stream that originates in the Hunua Ranges and flows through the south-east portion of the Project Area. These watercourses were classified as intermittent or permanent streams because they have natural portions in the headwaters. The tributary of Papakura Stream was highly modified through channelisation and provided poor quality habitat for aquatic biota that is typical of artificial watercourses (e.g., farm drains). The tributary of Taitaia Stream that flows through the south-eastern portion of the Project Area was in a more natural state with a meandering flow path within gully landforms. Both watercourses had highly modified (predominantly exotic) riparian vegetation and were poorly shaded.

The Project Area is set in a low gradient landscape with very poorly drained peat soils (according to Landcare Research Smap). Auckland Council Geomaps identifies some of the Project Area as historically a Bog/Fen mosaic ecosystem and there are also areas identified as potential flood plains and flood prone.

Despite historic drainage and vegetation removal, inundated and saturated areas were present in a number of locations. EcoLogical Solutions consider that these areas (putative wetlands) may meet the definition of natural inland wetland.

2.1. Topography

The below text generally outlines the topography of the Project Area (and this is also shown on the existing contour plan included in Appendix A).

Area A

Area A encompasses the land to the west of Mullins Road to Bullens Road and generally falls from a maximum RL of 38m near Mullins Road to a minimum level near the Bullens Road stream RL 34m. This Area discharges overland to the Papakura Stream to the north along the airport boundary to Mullins Road and also to the west via the stream that crosses under Bullens Road. Existing culverts under Mullins Road allow low flows from 51 and 53 Mullins Road to flow beneath Mullins Road into Area B and to the Taitaia Stream Catchment.

Area B

Area B is located within the Taitaia Stream Catchment and includes the block of land between Mullins Road and Burnside Road. This area falls from a maximum RL of 39m near Mullins Road mainly towards Burnside Road at an average gradient of 0.5%-1%. The southern portion of Area B grades to the south to the tributary of the Taitaia Stream. The lowest areas of the Area are located along this stream near Burnside Road at a minimum RL 19m.

Area C

Area C is located within the Papakura Stream Catchment and includes land north of Airfield Road and generally falls from a maximum RL of 31m near Airfield Road to a minimum level at the north-western corner of the site of RL 21m. This Area discharges north to an farm drain running along the

northern edge which flows along the boundary towards the west. A number of other farm drains flow to this drain from the south. Two of these channels connect from Airfield Road.

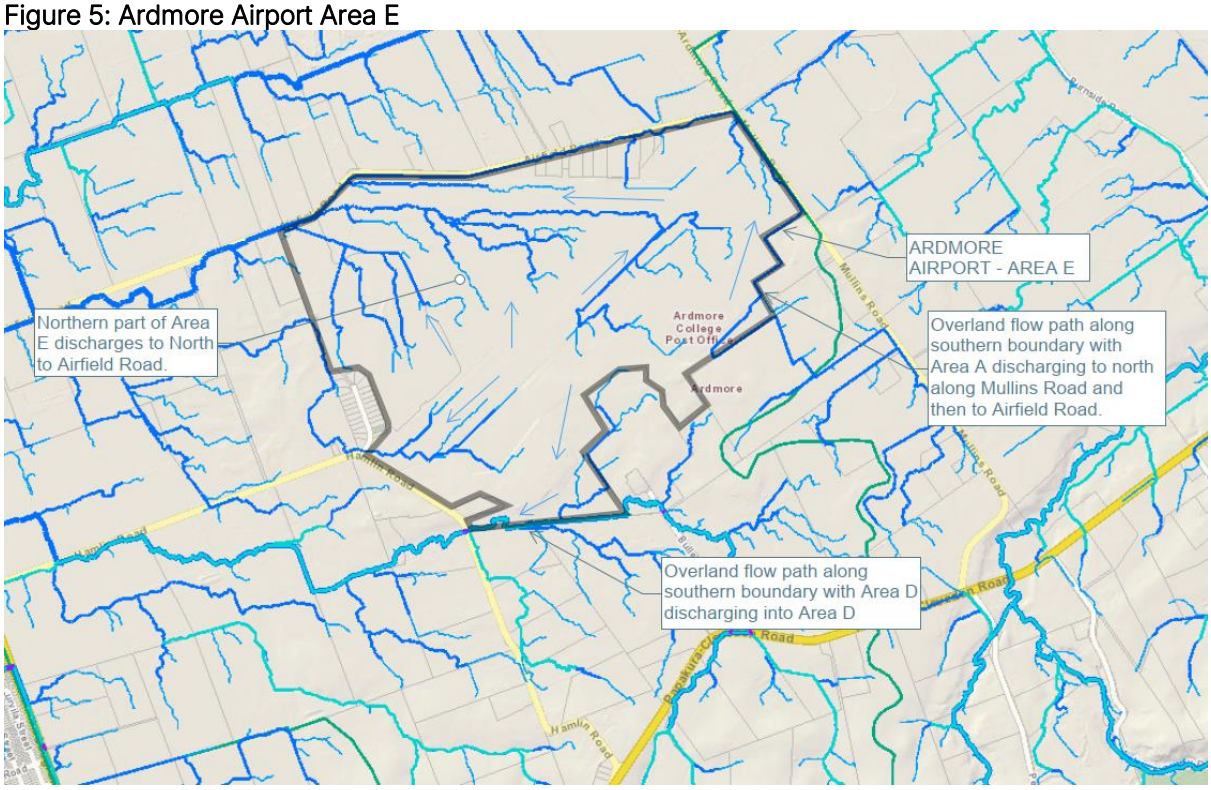
Area D

Area D is located within the Papakura Stream Catchment and encompasses land on either side of Hamlin Road. This area falls from a maximum RL of 55m near Papakura-Clevedon Road to a minimum RL of 31 to the north. The first 400m of Hamlin Road falls at a steeper grade of around 5% before the area flattens out. The same overland flow that transgresses Area A to the south, enters Area D and flows along Hamlin Road within the northern part of this area.

Area E

The Airport is relatively flat. The northern half of the site falls in a north-west direction towards Airfield Road, whilst southern parts of the Airport fall towards Area A and D. Along the southern boundary of the Airport, overland flows are conveyed along the boundary within the Airport Area E or within the adjacent Area's A and D.

Figure 5: Ardmore Airport Area E



The Ardmore Business Park Area's are predominantly low gradient with slopes of less than 5%. Areas exceeding 5% slope tend to be restricted to natural streams and farm drains. Existing contours and site slopes for the Project are included within Appendix A.

2.2. Geotechnical

Detailed geotechnical investigations will be carried out at the substantive application stage. LDE in the geotechnical assessment identify the existing geology of the Project Area. Published geological mapping indicates that the Project Area is underlain by three geological units — the Puketoka

Formation, the younger Tauranga Group alluvium, and the East Coast Bays Formation (Waitemata Group) residual soils.

The Puketoka Formation comprises moderately consolidated mixtures of clay, silt, and sand, sometimes containing organic-rich layers or inclusions, and may locally include discontinuous sensitive pumiceous silt horizons. The overlying Tauranga Group alluvium consists of organic-rich alluvial and colluvial soils, typically sands, silts, and clays with localised gravel and deep fibrous peat deposits.

The East Coast Bays Formation geology comprises rock weather to hard 'transitional' soils before forming a completely weathered residual clay and silt mantle with a typically sharp contact between materials of various weathering states.

3. Development Summary and Planning Context

Regulatory requirements are outlined in Table 1 below. The Planning Memorandum prepared by Tollemache Consultants will address resource consent triggers.

Table 1: Summary of design requirements

Requirement	Relevant regulatory / design to follow
Unitary Plan – SMAF hydrology mitigation	The site is not in a SMAF area. The objective and policies related to stormwater direct that runoff from an impervious areas discharged to a stream environment should be managed by a stormwater management device to meet the hydrology mitigation requirements which are the same as those specified for SMAF 1.
High Contaminant Generating Areas	The development may contain high contaminant generating carparks (being those servicing more than 30 carparks) or high use roads. Treatment of stormwater from these areas will be required to accord with the relevant provisions.
Industrial Trade Activities	Any Industrial Trade activities require specific stormwater treatment to accord with the relevant provisions of the AUP.
Natural Hazards	There will not be any habitable building platforms, as the application is for an industrial park. There is no need to ensure that dwellings are located outside floodplains and with minimum freeboards as per Stormwater Code of Practice ('SWCOP'). Carparking, roading and trafficked areas need to be designed to ensure flood depths and velocities do not pose a risk to the safety of people and property. Earthworks in 1% AEP floodplain are required not to exacerbate flooding of upstream or downstream sites, not to reduce conveyance capacity, and should remedy or mitigate flood hazards where practicable. Buildings in the 1% AEP should not create flooding of upstream or downstream sites and should not reduce conveyance capacity. Infrastructure in the 1% AEP needs to be designed to be flood tolerant. The existing farm drain network is known to flood during smaller flood events and so post-development peak flow during smaller events will also need to be checked to ensure that flood nuisance is not exacerbated. Maintain the capacity of overland flow paths.

Table 1: Summary of design requirements

Auckland Unitary Plan Precinct	N.A.
Existing Catchment Management Plan	N.A.
Auckland Council Regionwide Network Discharge Consent	N.A. This site is outside the Network Discharge Consent area and hence approval for the discharge of stormwater will be sought as part of the substantive application.
Auckland Council Stormwater Code of Practice	All design to allow for climate change. Primary network comprising pipes or open channels to have capacity for 10-year storm. Overland flow paths to have capacity for 100-year storm. Overland flows to comply with Austroads safety requirements. Stormwater management devices to be designed in accordance with GD01. Note: The Code of Practise is applicable to infrastructure that is to be "vested" to Council. Where infrastructure is private then GD01 can be used as a best practice guideline.

4. Proposed Stormwater Strategy

Post-development stormwater objectives are summarised as:

- Ensure flood risk is not exacerbated for upstream and downstream properties during 50%, 10% and 1% AEP + climate change storm events.
- Post-development peak flow to be less than or equal to pre-development peak flow for each respective storm event outlined above.
- Stormwater quality treatment (90th percentile storm) provided for impervious areas in general accordance with GD01 as well as for industrial and trade activities as required.
- Retention (5mm) and extended detention (95th percentile 24-hour rainfall event minus retention volume) of post development runoff volumes for all impervious areas.
- Groundwater recharge of underlying peat soils.
- Private channels and piped network to cater for stormwater runoff up to the 10% AEP storm (with Percentage Increase in Depth for Climate Change accounted for).
- Overland flow paths for up to the 1% AEP storm (with Percentage Increase in Depth for Climate Change accounted for) to be conveyed via roads and/or well-defined channels.
- Ensure all infrastructure, carparking area, trafficked areas (including pedestrian areas) are designed to be clear of flood risk (or where this cannot be achieved appropriate depths and velocities for safety are achieved).

These objectives will be achieved through implementation of the following across the Project Area:

- Stormwater devices (likely ponds or wetlands) sized to attenuate post-development peak flow to less than pre-development levels for 50%, 10% and 1% AEP storm events (factoring in effects of climate change in accordance with SWCOP).
    - Stormwater devices will be designed to mitigate against backflow effects.
    - Discharge outlets and spillways to be located above downstream discharge flood levels for each respective design storm.
    - Pumping of flows may be required. Should this solution proceed, resilience of the infrastructure shall be allowed for.
- All proposed building floor levels are likely to be located outside of the 1% AEP flood extents.
    - At the minimum, floor levels will need to meet the minimum freeboard requirements under the SWCOP. (300mm for Less Vulnerable Activities, 500mm for More Vulnerable Activities).
- Earthworks and building placement are to be designed to ensure upstream and downstream flood risk is not exacerbated.

- Earthworks are likely to include widening existing channels to maintain flood waters within the business parks and prevent exacerbation of flood effects on upstream or downstream properties during 1%, 10% and 50% AEP storm events.
- Existing overland flows shall be maintained through or around the development sites via designated flow paths.
- Downstream discharges when exiting the site catchment shall replicate existing conditions as far as practicable. Flows may need to be discharged uniformly across downstream boundaries (as opposed to concentrated outlet flow).
- Buildings are likely to be located outside of the 1% AEP.

- Hydrology mitigation is likely be achieved through some or all of the following:
  - Use of infiltration stormwater devices where possible to allow recharge of underlying peat soils.
  - Water reuse on industrial sites (retention can be provided where reasonably practicable as part of any reuse tank)..
  - Extended detention through private devices such as stormwater tanks, raingardens, treepits, swales and/or ponds.
- Stormwater treatment will likely be achieved through both proprietary devices as well as green infrastructure.
- Primary stormwater conveyance is likely to comprise of both swales and piped networks.
- Secondary stormwater conveyance is likely to comprise public/private roads as well as dedicated channels and swales.
- All infrastructure, carparking area, trafficked areas (including pedestrian areas) are designed to be clear of flood risk (or where this cannot be achieved, appropriate depths and velocities for safety are achieved).

4.1. Primary Stormwater Network

The final design is likely to incorporate a mixture of both piped and swale reticulation systems to convey flows up to the 10%+cc AEP storm event. Swales are likely to be located within the berm area of the private accessways and/or public roads. Where suitable cover and grade can be achieved, piped reticulation will be considered. The proposed swales also have the potential to provide water quality treatment, groundwater recharge and hydrology mitigation.

4.2. Secondary Stormwater Network (Overland Flow)

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

Overland flow paths will be located within the private access or public road reserve areas or within dedicated channels/swales. Design will account for safe overland flow conveyance, including risk

mitigation for road users (pedestrians and vehicles) and any buildings adjacent to the road corridor. Detailed design will be completed as part of the substantive application. Where peak overland flow rates exceed the safe conveyance capacity of road reserves, channels may be proposed and widened to accommodate the flow. The substantive application's design will incorporate swales and channels to ensure that overland flows resulting from upstream sites are maintained.

4.3. Stormwater Management Devices

The following table outlines acceptable stormwater management devices that may be incorporated into the final design. These devices will provide for water quality treatment, hydrology mitigation, attenuation of 2-year, 10-year and 100-year peak flow and peat recharge.

Stormwater devices will be designed in general accordance with GD01.

Table 2: Stormwater Mitigation Devices

	Purpose	Suitability
Rainwater Tanks	Retention / Extended Detention[1]	Private lots within all catchments.
Cartridge Filters	Treatment	Private lots within all catchments.
Rain Gardens / Bioretention Devices	Treatment/Retention/Extended Detention	All catchments
Swales / Vegetated Channels	Treatment	All catchments
Constructed Wetlands	Attenuation/Treatment/Retention/Extended Detention	All catchments
Detention Basins	Attenuation - Temporarily store runoff to reduce peak flow	All catchments
Energy Dissipation Structures	To reduce velocities at outfalls and therefor prevent erosion	All discharges to streams or wetlands.

The substantive application will address device selection.

As part of the referral application, stormwater ponds/wetlands/devices have been preliminarily sized for each area and an allowance for the space needed for these devices has been made within the Project Area.

[1] Note that individual onsite reuse would apply in the event that the Project is serviced from a public supply. If the Project is serviced via private supply as per the GWE Water Supply Report individual reuse tanks would be unlikely as all roof water would be piped to a centralised treatment plant for distribution back for water supply.

4.3.1. Water Quality Treatment

Water quality treatment devices will be designed in accordance with GD01 to treat the 90th percentile water quality storm. Stormwater devices and sizing calculations shall be provided as part of the substantive application.

Treatment of all impervious areas will be via water quality devices designed in accordance with GD01 for the relevant contaminants (except roof water which will be captured for re-use. Should any roof water not be captured for reuse, then the roof water will be required to be stormwater quality treated). These are likely to be devices contained within each lot such as stormfilters, raingardens, SW360 cartridge filters (or similar type underground devices) and underground vaults (or similar).

The proposed activities may contain activities which are listed as low, moderate or high risk "industrial or trade activities" (noting that it is expected, as part of this assessment, that only activities listed as "permitted" will be catered for). Each activity will be provided with appropriate stormwater management controls/devices for each activity (eg. 360 cartridge filters or similar type underground devices etc).

4.3.2. Hydrology Mitigation

Hydrology mitigation will be provided by the stormwater management devices and will be calculated considering a runoff depth of the difference between the pre-development and post development runoff volumes of the 95th percentile, 24 hours rainfall event minus the retention volume, to be discharged into the primary stormwater network over a period of 24 hours via tanks and orifice flow.

4.3.3. Attenuation

Attenuation will be required to ensure that post-development peak stormwater flows do not exceed pre-development levels for the 50%, 10%, and 1% AEP events, with allowances for climate change. This approach will ensure that exacerbation of flood risks downstream of the Project Area are avoided.

Attenuation will be provided via dry or wet ponds that shall be sized to temporarily store and gradually release runoff, reducing peak flows to levels at or below those observed prior to development.

During substantive application's design phase, the attenuation devices will be based on the principles of SWCOP, GD01 guidelines and industry best practice guidelines.

Discharge outlets and spillways will be designed to avoid backflow from flood waters into the attenuation devices and measures such as diversion bunds and level spreaders will be used to replicate natural discharge regimes and avoid concentrated flows that could increase erosion or downstream flood risk.

Detailed attenuation design, including device selection and sizing calculations, will be provided as part of the substantive application. The preliminary assessment confirmed that effective attenuation solutions are available to support the proposed development and protect both the site and surrounding sites from increased flood risk.

4.4. Flood Modelling

A preliminary 2D flood model has been completed to assess the feasibility of the Project. The high-level flood model assessment has enabled comparison of pre-development and preliminary post-development flood extents for 1%, 10% and 50% AEP storm events. This has enabled high flood hazard risk areas to be identified within the Project Area and the preliminary assessment of engineering strategies, providing confidence that, at the substantive application stage, design solutions can be developed to mitigate flood risks both within the Project Area and for upstream and downstream properties.

The preliminary flood model was based on the following parameters:

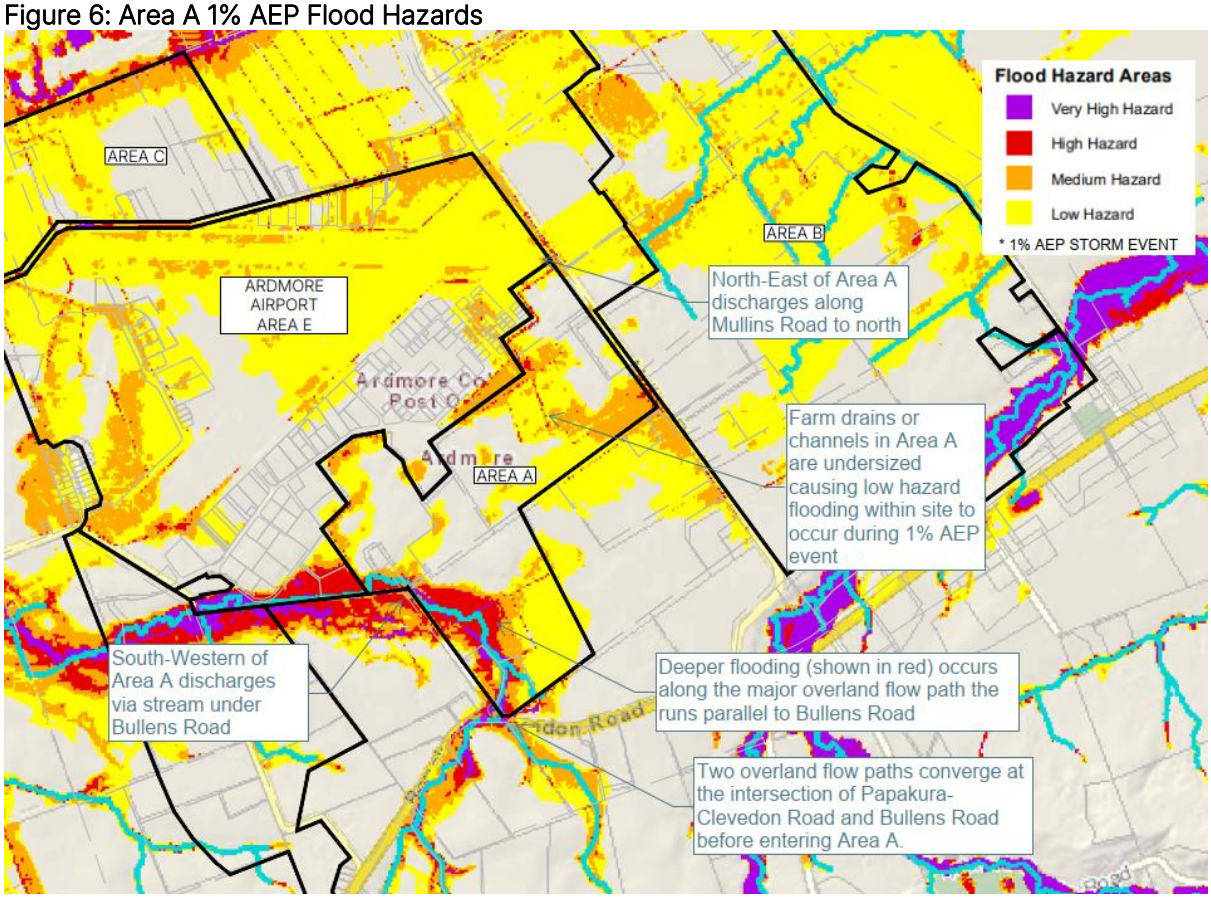
- Tailwater conditions and flow time series data supplied by Auckland Council Healthy Waters Department.
- Modelled rainfall and CN data supplied by Auckland Council Heathy Waters and/or from Auckland Council TP108 maps.
- Cells grid size of 14m. Refined grid sizes will be used as part of the substantive application's design phase.
- Existing ground levels and terrain sourced for the latest publicly available Lidar.

The preliminary flood modelling indicates that suitable engineering solutions will be available to ensure post-development flooding impacts can be managed without exacerbating downstream or upstream flooding. Measures to manage storm events within each sub-area of the Project Area is outlined in the subsequent sections. As the Project progresses into the substantive application stage, more detailed modelling will be developed to more accurately represent the development effects and any necessary mitigation.

4.4.1. Area A

Area A is located within the Papakura Stream Catchment and during a 1% AEP storm event the, water from this catchment discharges to the stream that crosses Bullens Road and also to the north via Mullins Road. Pre-development flood modelling indicates that approximately 50% of the site is currently covered by shallow floodplains during the 1% AEP event, with deeper flooding occurring along the major overland flow path that runs parallel to Bullens Road. There is an overland flow path that traverses the southern Area boundary prior to exiting to Mullins Road. It travels along Mullins Road for less than 80 metres before re-entering the Area A eastern boundary. The overland flow path is conveyed internally through a shallow farm drain channel, heading north before entering the southern boundary of Ardmore Airport. The overland flow path flows along the site boundaries of Area A and the airport before re-entering the road corridor (Mullins Road) further north. Within the southern part of Area A, two major overland flow paths converge at the intersection of Papakura-Clevedon Road and Bullens Road, continuing north through Area A before exiting the Area via twin culverts under Bullens Road.

Figure 6: Area A 1% AEP Flood Hazards



The pre-development flood modelling indicates that during a 50% AEP event:

- The informal farm drain network in Area A is generally at or slightly above capacity.
- Depths within the farm channels are generally no greater than 1m.
- There are small areas of ponding throughout Area A, generally associated with depressions, with most depths not exceeding 0.5m.
- The stream channel along Bullens Road is at capacity, and the culverts under Papakura-Clevedon Road are at capacity.

During a 1% AEP event, the pre-development flood modelling indicates that:

- Existing drains within Area A are over capacity and runoff inundates significant portions of Area A, especially the northern portion. This runoff is typically shallow sheet flow, although specific areas can reach up to 0.5m.
- The intersection between Bullens Road and Papakura Clevedon-Road becomes inaccessible with a flood depth up to 1m due to flows from upstream of Area A.

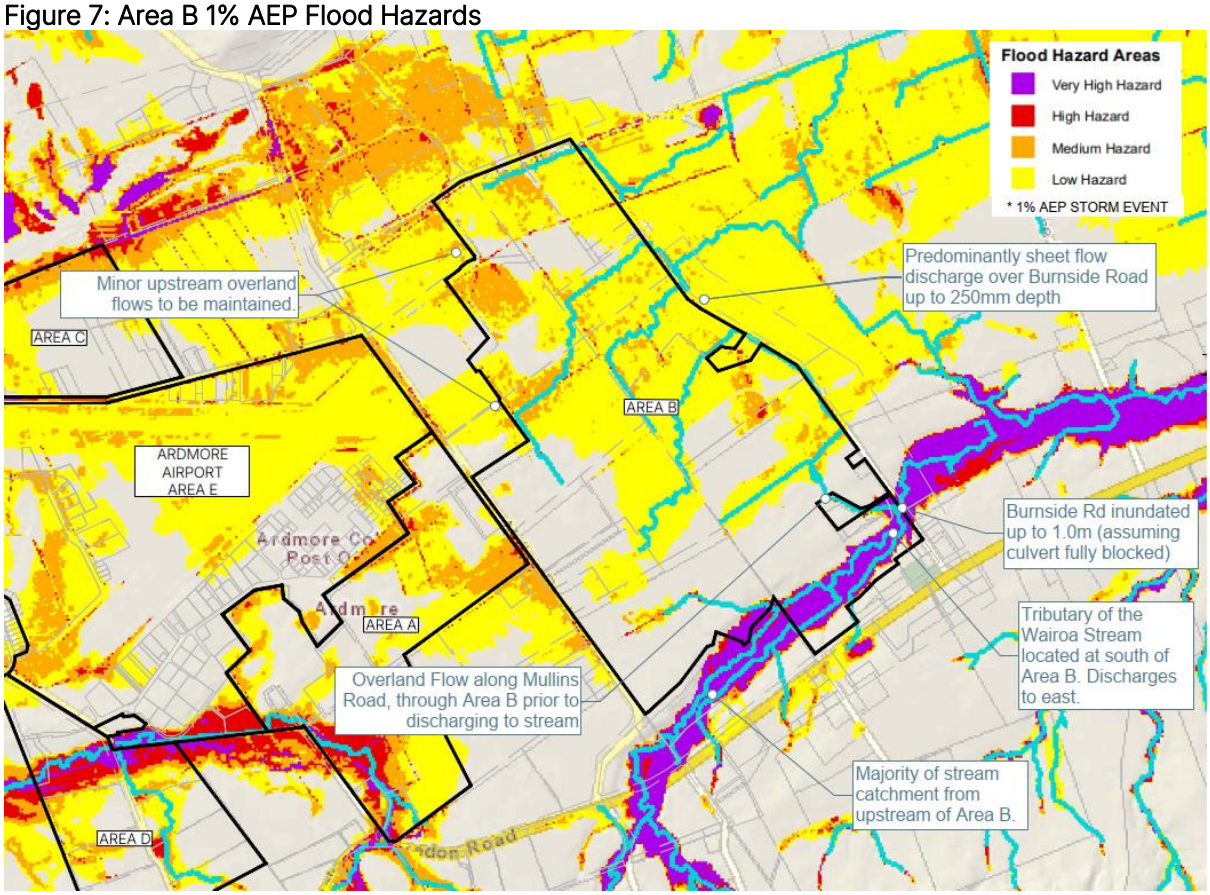
Based on the preliminary flood model and engineering assessment, the design solution for post-development flows will likely include:

- Allowing upstream flows to be conveyed through Area A via widened existing channels and the creation of new channels to mitigate flood impacts both within the site
- Directing runoff to a series of stormwater devices to provide attenuation for up to a 1% AEP storm event. These stormwater devices are likely to also provide for extended detention requirements.
- The Papakura-Clevedon Road and Bullens Road intersection will require appropriate upgrades (which may include stream works and culverting) to manage the flood depths.

4.4.2. Area B

Area B is located at the head of the Taitaia Stream Catchment, which discharges to the Wairoa River. Our preliminary flood modelling indicates that during rainfall events, approximately half of the Area is covered by shallow flood plains with deeper areas of flooding occurring along Burnside Road and within the natural tributary of Wairoa Stream located towards the southern end of the Area.

Figure 7: Area B 1% AEP Flood Hazards



The pre-development flood modelling indicates that during a 50% AEP event:

- Flows are mostly contained within informal farm drains and the tributary of Wairoa Stream within Area B.
- The drains within Area B are operating at or near capacity, at around 0.5m deep.
- The remainder of Area B is generally not flooded, although some low points experience ponding due to localised depressions of up to a maximum depth of 0.3m.

Currently, during a 1% AEP event:

- Flow depths across Area B are generally at or less than 0.2m .
- The farm drain network in Area B is undersized for the 1% AEP flows.
- Area B discharges via sheet flows of less than 250mm across Burnside Road with flows eventually entering the tributary of Wairoa Stream either through Area B or after flowing through private sites located to the east of Burnside Road.
- Flood depths within the stream at the southern end of the site are up to 3m.
- Due to existing upstream flows, Burnside Road becomes inaccessible where the stream at the southern end crosses Burnside Road. Modelling indicates that during a 1% AEP event and with fully blocked culverts, flood depths within Burnside Road are up to 1.0m.

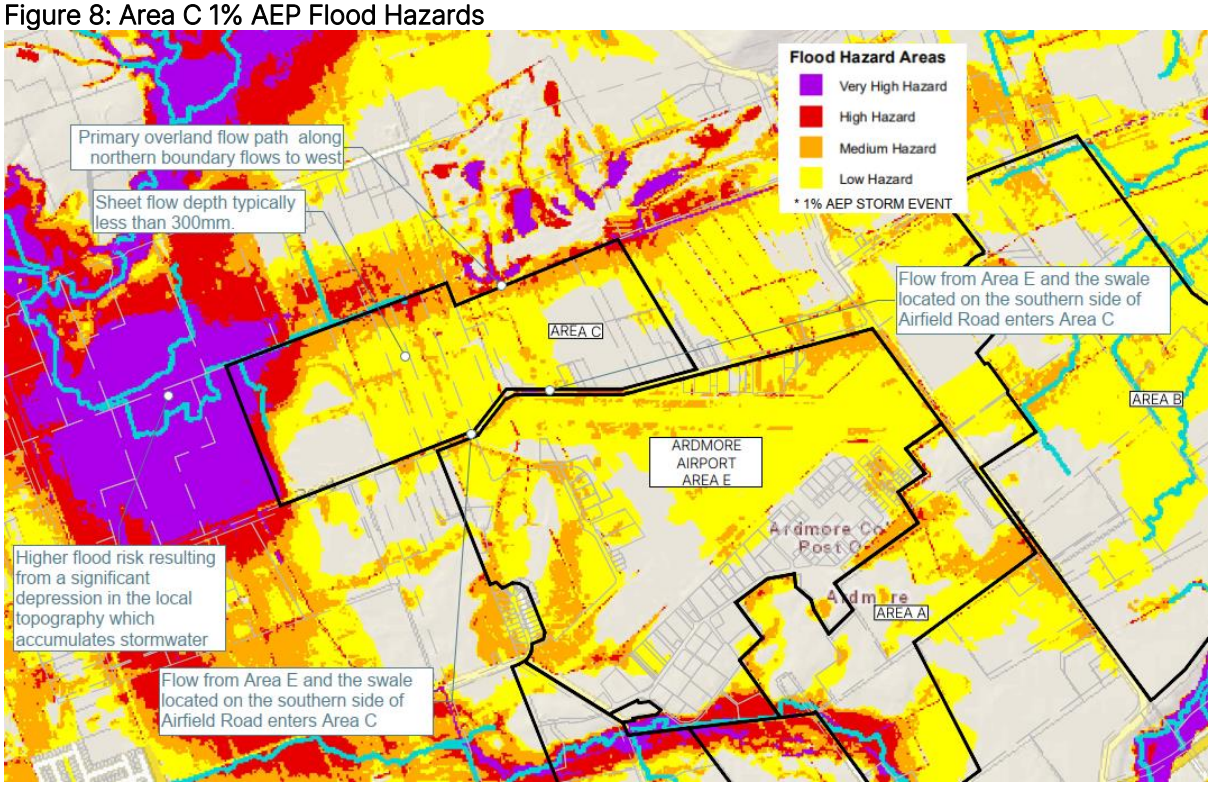
Based on the preliminary flood model and engineering assessments, the design solution for post-development flows in Area B is likely to encompass:

- Earthworks are expected to avoid the tributary of Wairoa Stream, though we note that during the substantive application phase, some watercourses may require modification and/or diversion to accommodate flood storage, roading upgrades etc.
- Uniform dispersal of runoff downstream through a channel/spillway/level spreader to replicate the existing downstream stormwater discharge regime as far as practicable.
- Widening existing channels and creating new channels within Area B to convey upstream flows across the site.
- Runoff is directed into stormwater devices that shall attenuate for the 1%, 10% and 50% AEP storm events.
- Allowance of upstream flows to be conveyed via appropriately sized channels to mitigate upstream ponding.

4.4.3. Area C

Area C is located within the Papakura Stream Catchment. Area C has an upstream catchment of approximately 127ha, with flows directed via an existing drainage channel traversing along the northern boundary. The channel is undercapacity, which results in flooding throughout the Area. Due to the flat terrain, the flood flows are particularly slow moving and significant areas of ponding occur due to localised depressions. There is a swale drain along Airfield Road, located within the road reserve to the east of Area C prior to crossing into Airport land. This swale continues until culverts located at 394 Airfield Road which take low flows to a channel flowing to the north joining to the previously mentioned existing channel located along the northern edge of Area C.

Figure 8: Area C 1% AEP Flood Hazards



The pre-development flood modelling for Area C indicates that during a 50% AEP event:

- Internal flows are generally conveyed along informal farm drains to a primary channel drain located along the northern boundary. Flows within this primary drain are typically at a depth slightly exceeding 1m.
- The swale along Airfield Road is at capacity.

In Area C, preliminary modelling shows that during the 1% AEP:

- The primary channel along the northern boundary and internal channel drains are below capacity with excess flow inundating Area C.
- Primary channel depths reach up to approximately 1.5m.
- With the exception of the channels (and immediately near the channels), flood levels generally remain under 300mm.
- The roadside channel located on the southern side of Airfield Road is below capacity. During the 1% AEP, flows from this channel overtop Airfield Road and enter the Area C southern boundary.
- Airfield Road depths can reach up to approximately 0.4m deep.
- The western most extent of the site has a very high flood hazard resulting from a large, localised depression which accumulates stormwater.

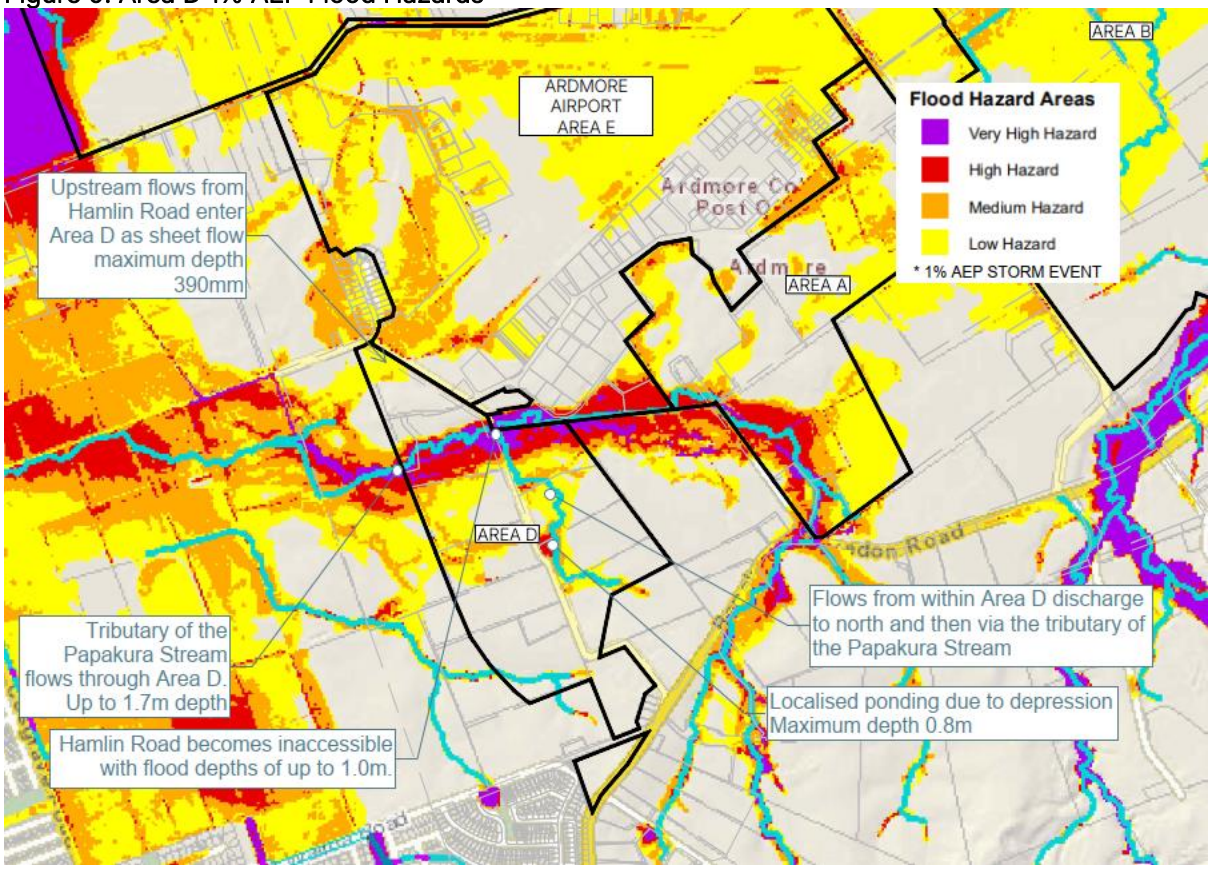
Based on the preliminary flood model and engineering assessments, the design solution for post-development flows in Area C likely encompasses:

- Widening existing channels (primarily the channel on the northern boundary) and creating new channels within Area C to convey upstream flows across the site.
- Replicating the downstream discharge regime as far as practicable by introducing diversion bunds and flood storage areas.
- Forming channels to allow for flows from Airfield Road.
- Directing runoff into downstream stormwater devices that shall provide attenuation for 1%, 10% and 50% AEP storm events.
- Allowing upstream flows to be conveyed through appropriately sized channels to mitigate upstream ponding.

4.4.4. Area D

Area D is located within the Papakura Stream Catchment along Hamlin Road. Area D has an upstream catchment of approx. 274 hectares, including part of Area A. Flows are primarily directed via an existing stream which flows along the boundary between the airport and Area D. During a 50% AEP storm event, the pre-development flood modelling indicates this stream channel is above capacity. Other than this main flow path, smaller overland flows with catchments, limited to the extent of Papakura Clevedon Road, traverse the area.

Figure 9: Area D 1% AEP Flood Hazards



The pre-development flood modelling indicates that in Area D, during a 50% AEP event:

- The primary stream channel is above capacity and the culverts under Hamlin Road are at capacity.
- The informal farm drain network is generally at or slightly above capacity.
- There are small areas of ponding throughout the site, generally associated with depressions, with most depths not exceeding 0.3m.

The pre-development flood modelling indicates that in Area D, during a 1% AEP event:

- Existing drains are above capacity, and runoff inundates portions of Area D, especially in the north. Other than the primary stream channel, this runoff is typically shallow flow, although specific areas such as the area of localised ponding can reach up to 0.8m.
- At the primary stream channel, the width of land inundated by the flood waters is approximately 150m with a maximum depth of 1.7m.
- Due to flows within the tributary of the Papakura Stream and the upstream catchments, Hamlin Road becomes inaccessible with a flood depth of approximately 1m.

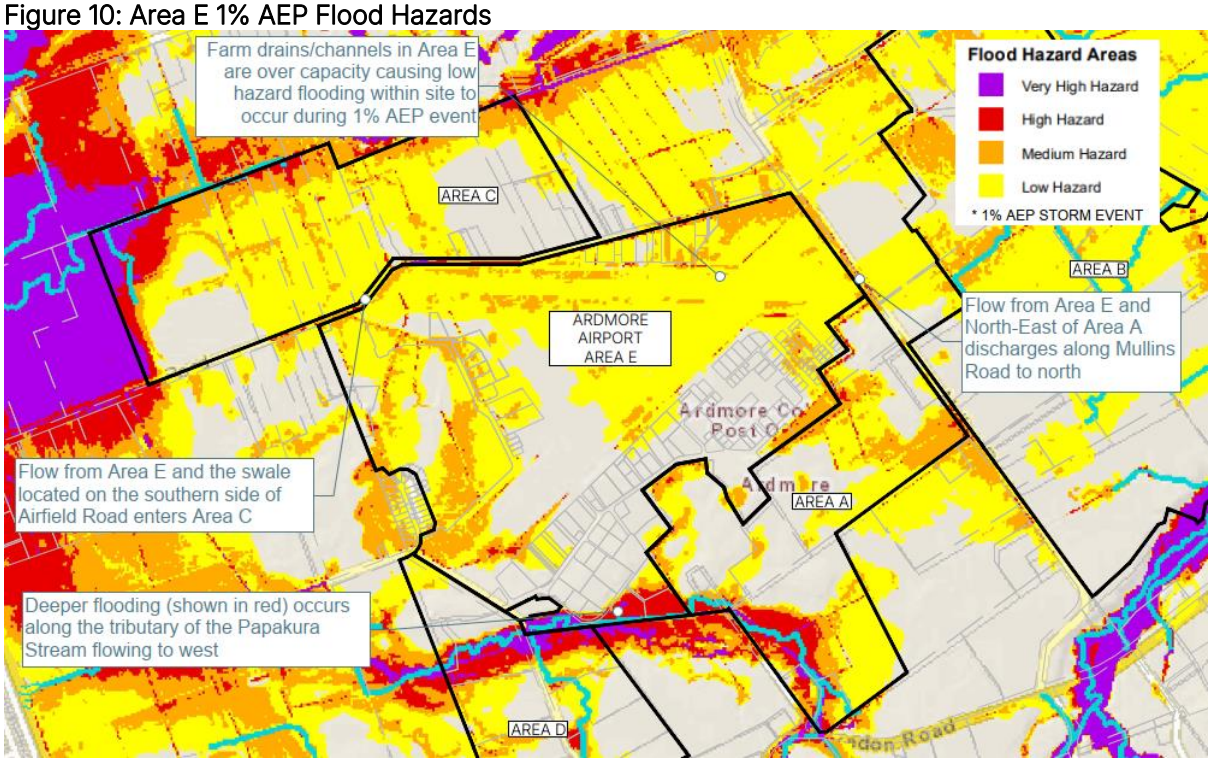
Based on the preliminary flood model and engineering assessment, the design solution for post-development flows for Area D will likely include:

- Allowance of upstream flows to be conveyed through Area D via widened existing channels and creation of new channels to mitigate flood impacts within the site as well as upstream and downstream.
- Directing runoff to stormwater devices to provide attenuation for up to a 1% AEP storm event including climate change. These stormwater devices are likely to also provide for extended detention requirements.
- Hamlin Road will require upgrades to manage flood depths.

4.4.5. Airport/Area E

The Airport is located within the Papakura Stream Catchment and much of the area is already inundated by shallow flood waters during a 1% AEP storm event (in pre-development modelling). Upstream flow paths tend to be contained to areas near the perimeter of the airport site.

Figure 10: Area E 1% AEP Flood Hazards



The pre-development flood modelling indicates that for the airport, during a 50% AEP event:

- The drain network is generally at or slightly above capacity.
- There are small areas of ponding throughout the site, generally associated with depressions, with most depths not exceeding 0.3m.

The pre-development flood modelling indicates that for the airport, during a 1% AEP event:

- Existing channels are above capacity.
- Runoff inundates the Airport, especially in the north. This runoff is typically shallow flow, although specific areas can reach up to 0.5m.

Based on the preliminary flood model and engineering assessment, the solution for the Airport will likely include:

- Widening existing channels and creating new channels to mitigate flood impacts within the site as well as upstream flows around the perimeter of the Airport.
- Directing runoff to stormwater devices to provide attenuation for up to a 1% AEP storm event including climate change. These stormwater devices are likely to also provide for extended detention requirements.

5. Summary of Effects

Stormwater impacts will be managed through a catchment-based approach, with drainage areas refined during detailed design to protect wetlands and avoid upstream and downstream flooding.

A range of devices, including tanks, raingardens, constructed wetlands, and detention basins will be used to treat and attenuate runoff.

Overall, the flood potential across the site is manageable, with existing low-lying areas identified as prone to water accumulation due to limited soil permeability and undersized drainage area. The proposed stormwater design includes engineered overland flow paths and retention/detention systems to ensure that post-development flows do not exacerbate downstream or upstream flooding.

6. Ownership

As the site falls outside the Regionwide Network Discharge Consent, the stormwater management devices may not vest to Auckland Council. Where possible, the concept design has endeavoured to ensure compliance with the relevant engineering standards so that vesting of the devices could be achieved in the future, however, should vesting not occur, all devices will remain in private ownership.

7. Auckland Council Healthy Waters Consultation

Preliminary discussions have been held with Andrew Chin, Head of Healthy Waters Strategic Initiatives. The matters discussed largely raised related to flood impacts.

It was noted that Healthy Waters have identified that an integrated option for the wider catchment (inclusive of other future developments in the area such as Mill Road and the Sunfield development) could be beneficial for managing flood effects within the Papakura Stream Catchment. The feasibility of this option is currently being assessed by Healthy Waters. Notwithstanding this potential integrated catchment solution, the contents of this report demonstrate there are stormwater engineering solutions available to service the Project Area.

8. Conclusion

The preliminary stormwater assessment for the Ardmore Business Park demonstrates that effective stormwater management solutions are feasible for the proposed development.

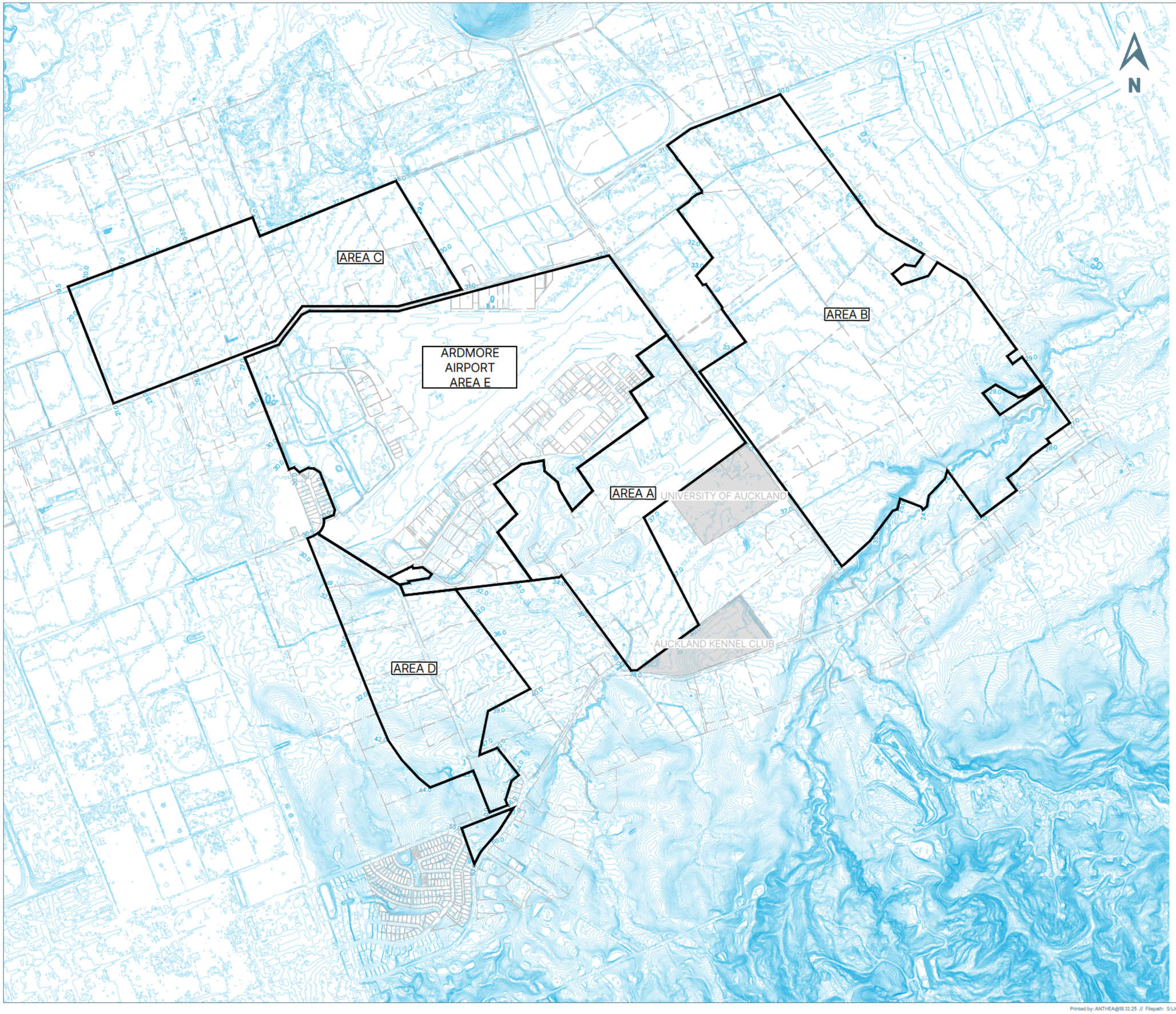
The Project, which spans five distinct areas (Areas A, B, C and D and the Airport), is subject to flooding primarily resulting from undersized farm drains, large catchments, and flat terrain. The preliminary flood modelling confirms that, with appropriate design of earthworks and sizing of stormwater infrastructure, post-development impacts can be effectively managed, ensuring that flood risk during 50%, 10%and 1% AEP storm events can be minimised within the site boundaries as well as ensure that the flood impacts upstream and downstream are not exacerbated.

As part of the substantive application, a comprehensive stormwater management plan will be developed. It is expected that the stormwater management plan will incorporate stormwater management principles for the proposed development which will (broadly):

- provide best-practice stormwater quality treatment for the 90th percentile storm;
- provide retention of a minimum of 5mm runoff depth for all impervious areas discharging to streams;
- provide extended detention for the 95th percentile storm with a drain-down period of 24hrs for the difference between the pre-development and post-development runoff volumes minus the retention volume for all impervious areas discharging to streams/wetlands;
- manage and/or mitigate the 50%, 10% and 1% AEP+cc peak flow to match pre-development flow rates;
- provide flood hazard assessments to ensure that flood impact resulting from 50%, 10% and 1% AEP storm events on downstream and upstream properties is not exacerbated and is appropriately managed within the site; and
- all infrastructure, carparking area, trafficked areas (including pedestrian areas) will be designed to be clear of flood risk (or where this cannot be achieved appropriate depths and velocities for safety are achieved).

APPENDIX A

Drawings



LEGEND

10.0 EXISTING CONTOUR

BUSINESS PARK EXTENT

CIVILPLAN CONSULTANTS

Level 1, Van Den Brink House, 652 Gt Sth Rd, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:

KNIGHT INVESTMENT LTD
ARDMORE BUSINESS PARK
ARDMORE

SHEET TITLE:

EXISTING CONTOURS PLAN
OVERALL LAYOUT

SCALE: (A1/A3)	1:7500 / 1:15000
SCALE BAR 1:15000@A3	0 40 80 120 160 750m
ISSUE STATUS:	DRAFT@18.12.2025
PROJECT NUMBER:	2672-01
DRAWING NUMBER:	200-1
REV:	-
REVISION DETAILS:	-
REVISION DATE:	dd.mm.yyyy
DRAWN:	-
CHECKED:	-
APPROVED:	-

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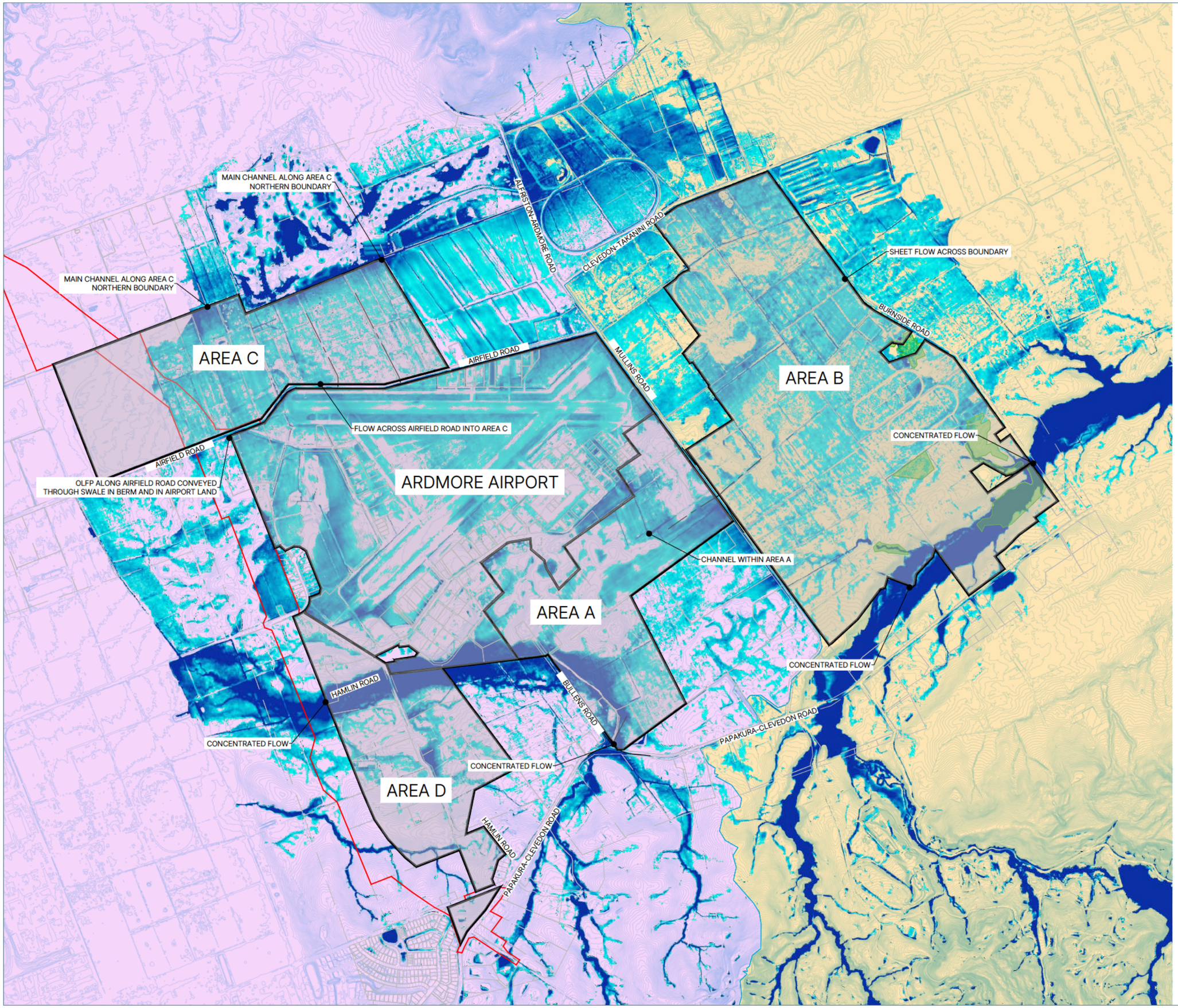

LEGEND

- BUSINESS PARK BOUNDARIES
- CATCHMENT BOUNDARY
- PAPAKURA STREAM CATCHMENT
- TAITAIA STREAM CATCHMENT
- 1% AEP FLOOD EXTENT (2D HEC-RAS)

NOTES:

1. PRELIMINARY INFORMATION ONLY.

CIVILPLAN CONSULTANTS
Level 1, Van Den Brink House, 652 Gt Sth Rd, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
KNIGHT INVESTMENT LTD
ARDMORE BUSINESS PARK
ARDMORE

SHEET TITLE:
PRE-DEVELOPMENT
STORMWATER CATCHMENT PLAN

SCALE: (A1/A3)	1:7500 / 1:15000
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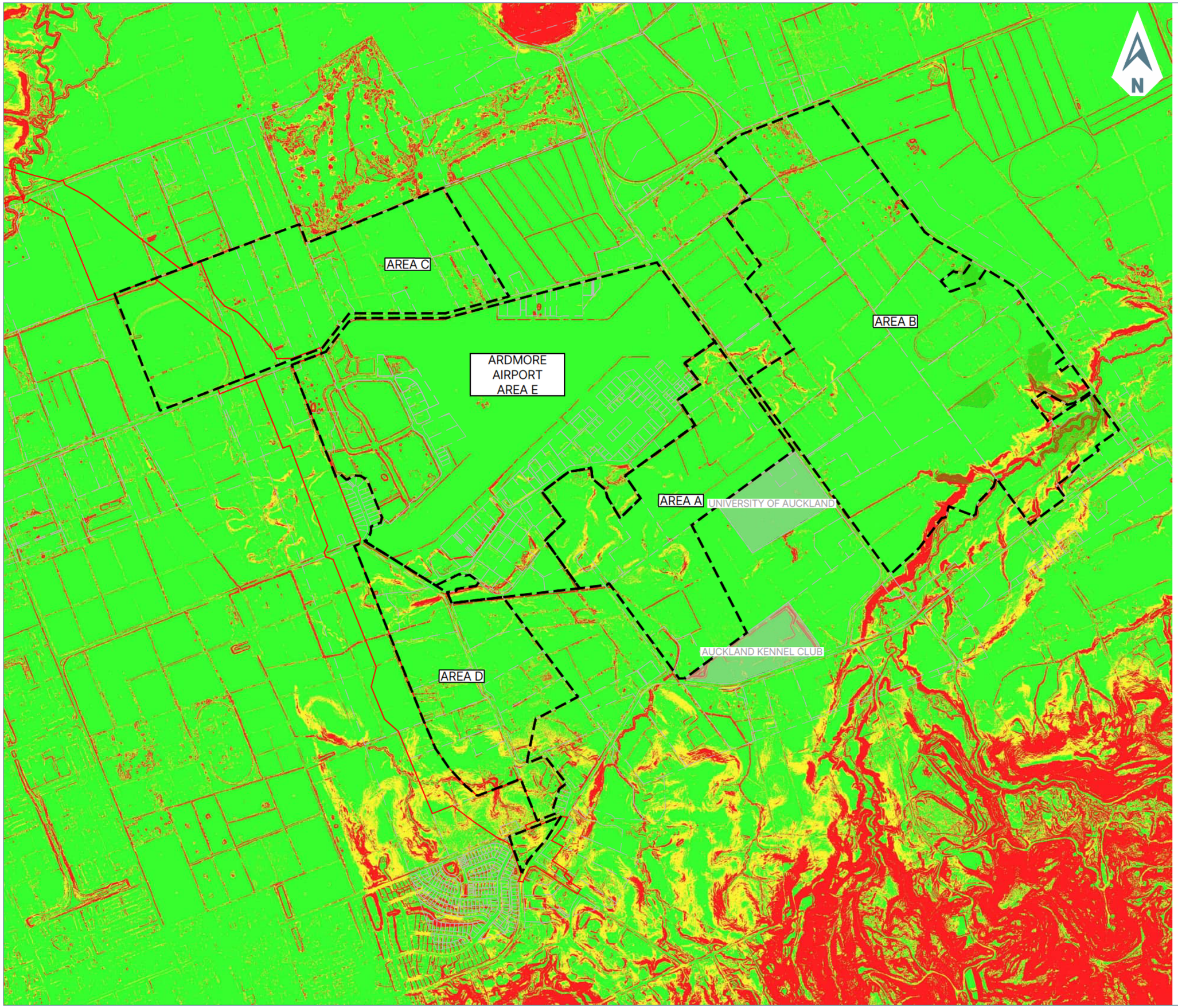
ISSUE STATUS:	DRAFT@18.12.2025
PROJECT NUMBER:	2672-01
DRAWING NUMBER:	SK12-1
REV:	C1
REVISION DETAILS:	FOR CONSENT
REVISION DATE:	24.11.2025
DRAWN:	KZ
CHECKED:	AJA
APPROVED:	RJP

Printed by: ANTHEA@18.12.25 // Filepath: S:\JOBS\2672 - DE NAKHLE AIRFIELD ROAD\CAD\01 FAST TRACK\2672-01-SK12-1-PREDEVELOPMENT STORMWATER CATCHMENT PLAN.DWG



LEGEND

- SITE BOUNDARY
- SLOPE <5%
- SLOPE BETWEEN 5 AND 9%
- SLOPE >9%

CIVILPLAN CONSULTANTS
Level 1, Van Den Brink House, 652 Gt Sth Rd, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
KNIGHT INVESTMENT LTD
ARDMORE BUSINESS PARK
ARDMORE

SHEET TITLE:
EXISTING SITE SLOPE PLAN

SCALE: (A1/A3)	1:7500 / 1:15000
SCALE BAR 1:15000@A3	0 40 80 120 160 750m
ISSUE STATUS:	DRAFT@18.12.2025
PROJECT NUMBER:	2672-01
DRAWING NUMBER:	SK13-1
REV:	-
REVISION DETAILS:	-
REVISION DATE:	30.09.2025
DRAWN:	AJA
CHECKED:	RJP
APPROVED:	RJP

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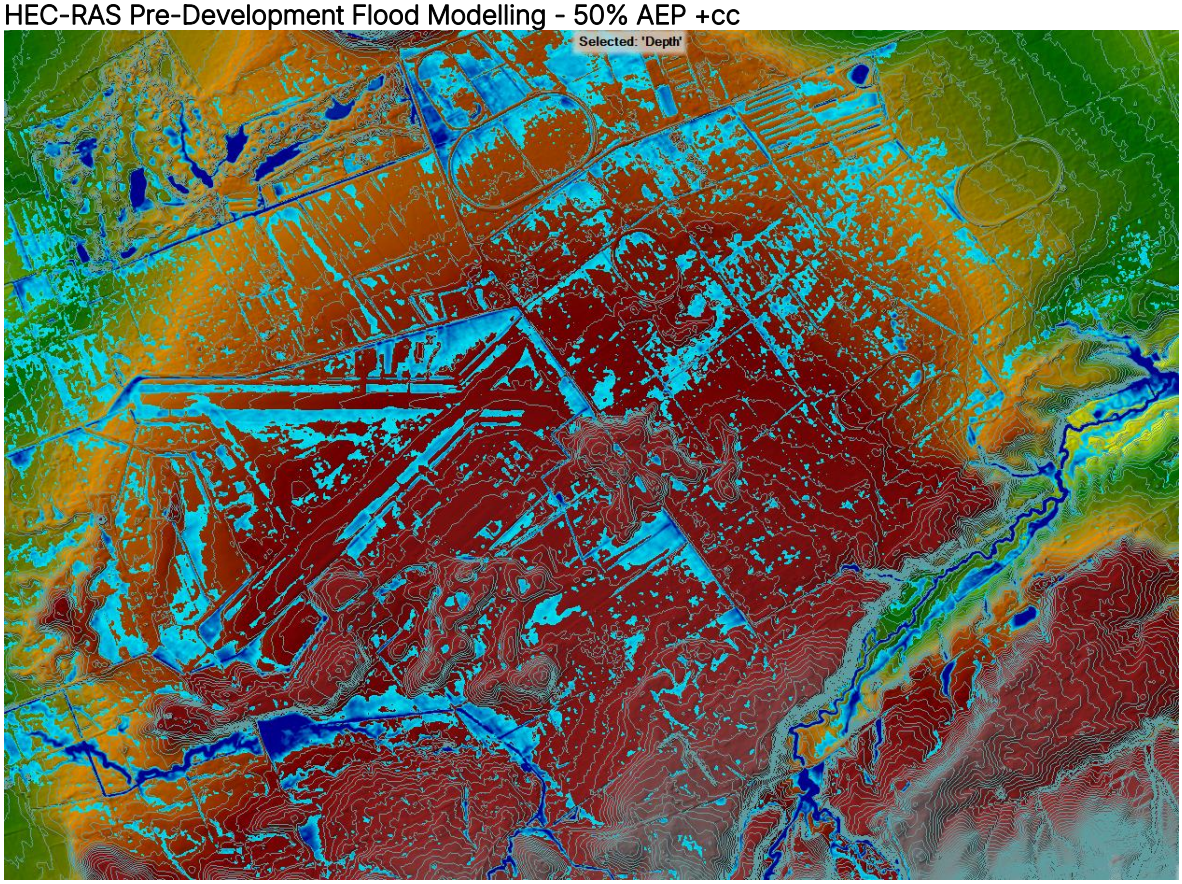
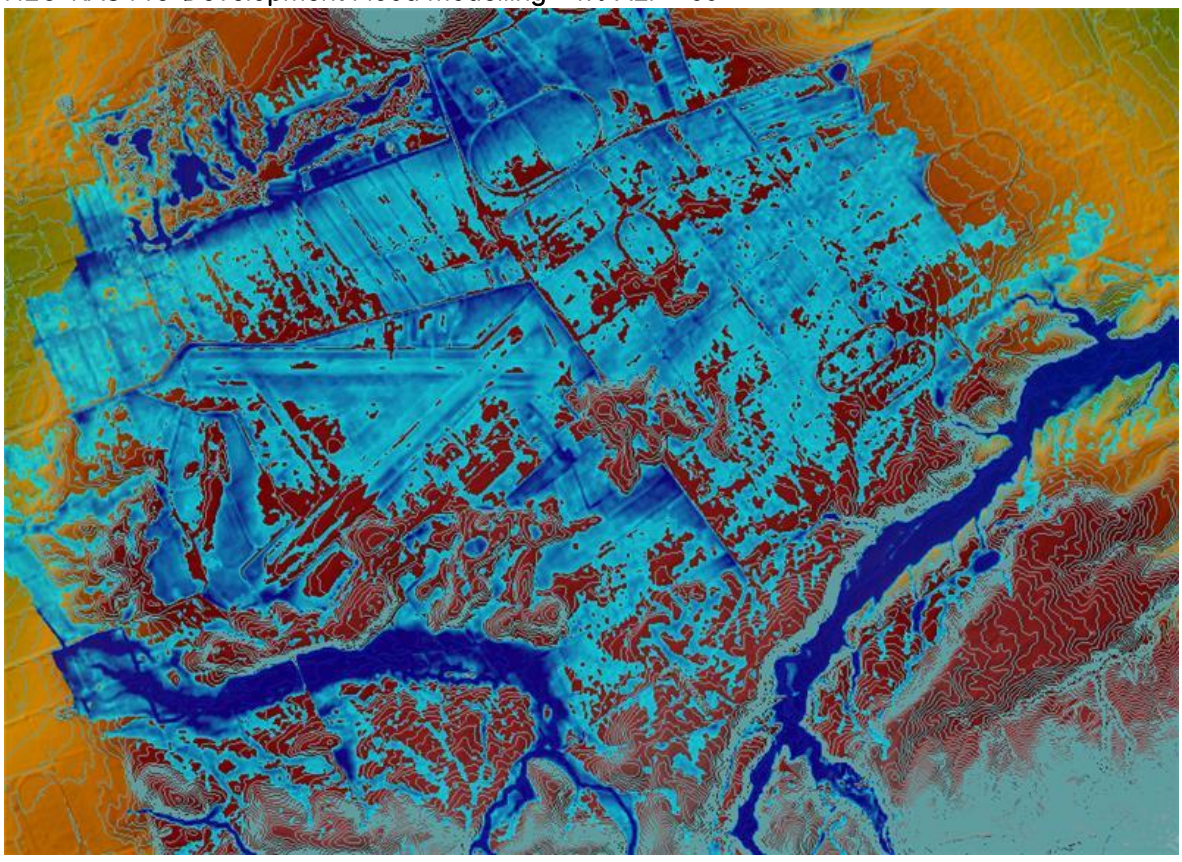
APPENDIX B

Pre-Development Flood Modelling

HEC-RAS Pre-Development Flood Modelling - 50% AEP +cc



HEC-RAS Pre-Development Flood Modelling - 1% AEP +cc



APPENDIX C

Qualifications and Experience

Ryan James Pitkethley - Senior Civil Engineer, Director and Engineering Manager at CivilPlan Consultants Limited.

Ryan James Pitkethley holds a Bachelor of Engineering (Civil, Hons) and has been a Chartered Professional Engineer (CPEng) as well as a Chartered Member of Engineering NZ (CMEngNZ) since 2008.

His professional experience encompasses project management and active participation in multi-disciplinary infrastructure and land development projects, collaborating with clients, local authorities, and contractor organisations. He possesses expertise in the planning, design, co-ordination, and delivery of projects covering earthworks, erosion and sediment control, roading, three waters, and utilities infrastructure related to land development.

Employed by CivilPlan Consultants Limited since February 2015, Ryan serves as the Engineering Manager and Director at the Manukau, Auckland office.

His previous involvement at the Yes Valley, Pokeno West, and Havelock sites includes advising on infrastructure development and design from 2018 onwards. He has also provided expert witness evidence on utilities, three waters, roading, and earthworks design and upgrades necessary to support development and proposed rezoning sought by HVL as part of the Proposed District Plan hearings. His evidence addressed infrastructure concepts and constraints as they specifically relate to the site and its servicing potential.

Ryan's previous experience includes:

- Providing land development and infrastructure evidence, which included preparing a Stormwater Management Plan, to support the rezoning of approximately 50 hectares of the Clarks Beach Special Housing Area from rural to urban and securing Stormwater Discharge Consents.

- Contributing to the large-scale residential land development project known as Riverside Grove, Escotts Road, Tuakau, where he undertook the design to obtain resource consent and engineering plan approval and managed the implementation through to title issuance.

- Working on the large-scale residential development of over 380 lots at Pokeno, including preparing Stormwater Management Plans (used as the basis for Stormwater Discharge Consents) for various stormwater catchments in Pokeno.

- Delivering land development and infrastructure services, including the preparation of a Stormwater Management Plan, to support the rezoning of approximately 36 hectares known as the "Graham Block" from rural to urban (about 150 lots) and obtaining Stormwater Discharge Consents.

Anthea Abbott - Senior Land Development Engineer and Team Leader at CivilPlan Consultants Limited.

Anthea holds a Bachelor of Engineering (Civil, Hons) since 2002 and is a Member of Engineering NZ (MEngNZ).

Anthea has extensive knowledge and experience interacting with teams of engineers working on complex multi-disciplinary infrastructure projects. She has worked closely alongside client organisations, understanding their needs and providing cost effective technical solutions. She has also worked with many civil contractors to ensure high quality construction is completed in a timely manner. Anthea is skilled in project management, design, and contract administration with practical experience in a broad range of civil engineering disciplines including land development, roading, transportation planning, geotechnical engineering and asset management.

Anthea's areas of expertise includes:

- Project management of land development projects;
- Contract management;
- Resource consent and engineering plan approval applications for civil works;
- Earthworks and levels design
- Erosion and sediment control design and implementation
- Roading and pavement design
- Stormwater catchment analysis, hydrology and hydraulics, 1D/2D modelling, and stormwater management plans
- Three waters and utilities infrastructure design
- Civil contract administration and site management
- Council compliance, certification of works, and 224c applications
- 12d drainage modelling and AutoCAD drafting

Anthea has been the engineering lead responsible for the detailed design and construction management for the 50 ha Clarks Beach development adjacent to the existing rural township. This included the construction observations of the usual residential subdivision components as well as a large central amenity conveyance channel, discharging to a new coastal outfall.

Anthea completed the engineering design for the successful fast track consent application for the Te Puru Business Park located on the site of the existing quarry site at Beachlands.

Anthea is also the lead engineer for the resource consent application process for the Whangarata Road Industrial Park. This has involved 12d modelling of earthworks, flood modelling, wetland, stormwater and wastewater reticulation and roading design and utility coordination.

APPENDIX D

Ardmore Business Park Application Sites

Address	Legal Description	Address	Legal Description
308 Airfield Road	Lot 5 BLK XV DP 20982	115 Hamlin Road	Pt Lot 1 DP 50029 Pt Lot 2 DP 50029
348 Airfield Road	Lot 1 BLK XV DP 192819	120 Hamlin Road	Lot 1 BLK XV DP 53384
360 Airfield Road	Lot 2 DP 192819	125 Hamlin Road	Lot 1 BLK XV DP 53136
368 Airfield Road	Lot 2 DP 96780	130 Hamlin Road	Lot 2 DP 53384
371 Airfield Road	LOT 1 DP 578804	135 Hamlin Road	Lot 2 BLK XV DP 53136
382 Airfield Road	Lot 1 DP 96780	140 Hamlin Road	Lot 3 DP 53384
394 Airfield Road	Lot 1 DP 198874	143 Hamlin Road	Lot 1 DP 11032
396 Airfield Road	Lot 2 DP 208957	146 Hamlin Road	Pt Lot 4 DP 53384
398 Airfield Road	Lot 1 DP 208957	151 Hamlin Road	Lot 1 DP 316491
448 Airfield Road	Lot 1 DP 336380	155 Hamlin Road	Lot 2 DP 316491
453 Airfield Road	Lot 200 DP 319290	161 Hamlin Road	Lot 6 DP 39433
457 Airfield Road	Lot 202 DP 458277	40 Mullins Road	Lot 2 DP 169281
460 Airfield Road	Lot 2 DP 336380	47 Mullins Road	Lot 2 DP 206430
463 Airfield Road	Lot 203 DP 458277	50 Mullins Road	PT ALLOT 50 PSH Papakura
469 Airfield Road	Lot 204 DP 458277	53 Mullins Road	Lot 3 DP 206430
470 Airfield Road	Lot 1 DP 92845	61 Mullins Road	Lot 1 DP 75641
473 Airfield Road	Lot 205 DP 458277	66 Mullins Road	Lot 1 DP 22687
479 Airfield Road	Lot 206 DP 458277	90 Mullins Road	LOT 2 DP 598608
487 Airfield Road	Lot 207 DP 458277	100 Mullins Road	LOT 1 DP 598608
495 Airfield Road	Lot 208 DP 458277	114 Mullins Road	Lot 1 DP 95196, Lot 1 DP 81758
499 Airfield Road	Lot 209 DP 458277	124 Mullins Road	Lot 2 DP 129748
1 Burnside Road	Lot 1 DP 165259	7 Bullens Road	Lot 1 DP 141367
37 Burnside Road	Lot 2 DP 165259	19 Bullens Road	Lot 2 DP 450259
51 Burnside Road	Lot 2 DP 112997	49 Bullens Road	Lot 2 DP 111591
61 Burnside Road	Lot 2 DP 311910	51 Bullens Road	Lot 2 DP 473510
93 Burnside Road	PT ALLOT 1 DP 94470	52 Bullens Road	Lot 1 DP 473510
133 Burnside Road	LOT 2 DP 533681	99 Corsair Lane	LOT 2 DP 578804
803 Papakura-Clevedon Road	Lot 1 DP 450259	45 Clevedon-Takanini Road	Lot 3 DP 169281
881 Papakura-Clevedon Road	Lot 1 DP 483053	61 Clevedon Takanini Road	Lot 1 DP 112997
95 Hamlin Road	Pt Lot 1 DP 50029		