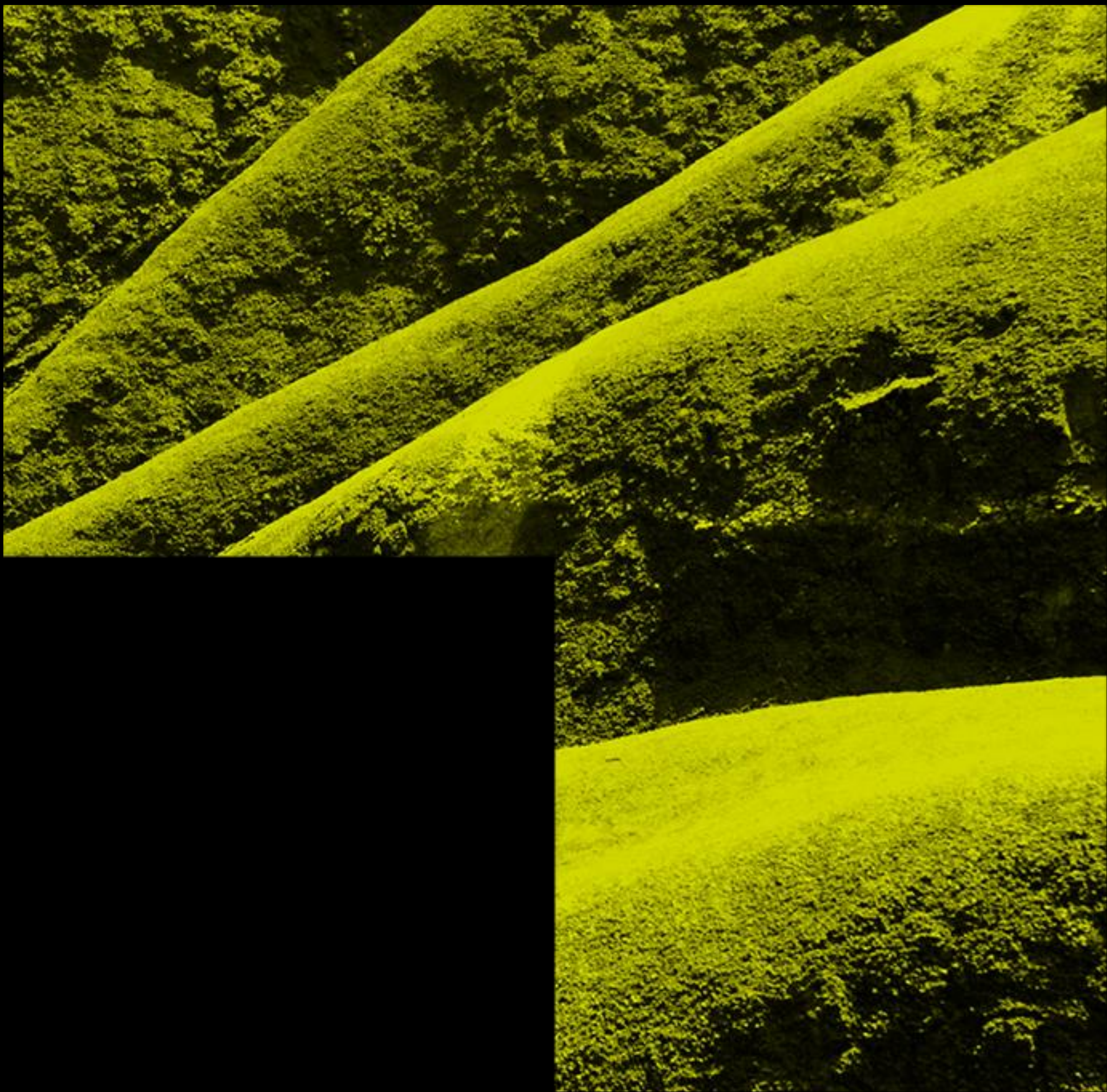
NORTHERN PRECINCT REZONING

Infrastructure Assessment

Titanium Park Limited & Rukuhia Properties Limited



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1.0 INTRODUCTION

Harrison Grierson have been engaged by Titanium Park Limited (TPL) and Rukuhia Properties Limited (RPL) to carry out an infrastructure assessment in support of a private plan change request to Waipa District Council (WDC). The private plan change request seeks to enable the expansion and development of the Northern Precinct of the Airport Business zone.

The Northern Precinct comprises of approximately 130ha of land to the north of the Hamilton Airport. It is bordered by the Airport's main runway to the east, the secondary grass runway to the south, Ohaupo (SH3) and Narrows Road to the west and Raynes Road (SH21) to the north. There is already 40ha (approximately) that is zoned Airport Business, and the balance (approximately 90ha) is zoned Rural under the Waipa District Plan (WDP).

The assessment is based on a review of the available information on the Northern Precinct, consultation with Waipa District Council, service providers and information commissioned and provided by the applicants.

The information has been obtained from the following sources:

- Waipa District Council (WDC) – website and GIS maps
- Waikato Regional Council (WRC) – online GIS hazard maps
- Hamilton City Council (HCC) – online 3Waters Viewer
- Information provided by the applicants
- Information provided from meetings with WDC staff
- Information provided in meeting with Jack Ninnes, WEL Networks

This assessment covers stormwater, water supply, wastewater and power. It highlights available infrastructure, constraints and possible solutions for the development of the Northern Precinct as an industrial development node.

Our assessment demonstrates that Northern Precinct is capable of being serviced and is appropriate to be rezoned and developed from an infrastructure perspective. We found that:

- Stormwater can be managed with a combination of road swales and on-lot soakage for smaller storm events. Larger events up to the 100-year storm can be attenuated within communal soakage basins with controlled discharge to the Nukuhau Stream network to the west and to existing road drains along Raynes Road to the east.
- Potable water supply and firefighting can be provided from the Pukerimu Water Supply scheme with onsite reservoirs and booster pumps; and
- In the short to medium term, wastewater can be serviced via a low pressure wastewater system discharging to collection manholes, with untreated wastewater then being trucked to the Cambridge Wastewater Treatment Plant. In the long term, the collection chambers can be retrofitted with the addition of pump stations and emergency storage chambers and be connected via pumped rising mains to the planned metro wastewater scheme that is intended to cater for the long-term wastewater servicing of the area. In the situation of significant delay (or abandonment) of the provision of the metro wastewater scheme, the alternative long-term solution for wastewater would be to provide the wastewater collection chambers with privately owned on-site package treatment plants discharging to on-site land disposal beds.

2.0 SITE OVERVIEW

2.1 SITE LOCATION

The site (referred to as the 'Northern Precinct') comprises of approximately 130ha of land to the north of the Hamilton Airport. It is bordered by the Airport's main runway to the east, the secondary grass runway to the south, Ohaupo (SH3) and Narrows Road to the west and Raynes Road (SH21) to the north.

There is already 40ha (approximately) that is zoned Airport Business within the Northern Precinct, and the balance (approximately 90ha) is zoned Rural under the Waipa District Plan (WDP).

The two applicants are the predominant landowners of the Northern Precinct, with TPL owning 105 Middle Road, 77 Middle Road and having the property at 208 Narrows Road under contract. RPL own the western portion of Northern Precinct located at 3463 Ohaupo Road. The extent of the landholding is identified in **Figure 1** below.

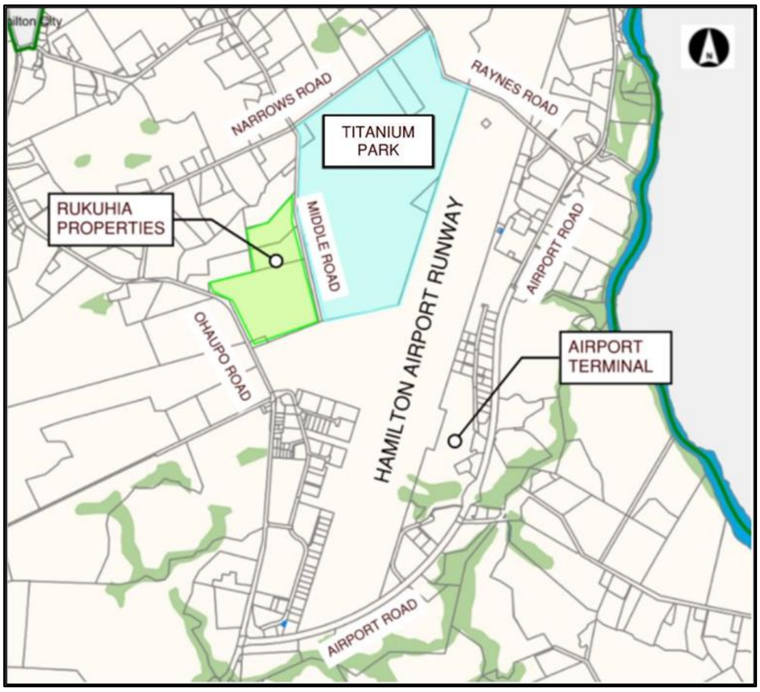

FIGURE 1 – SITE LOCATION

2.2 MASTERPLAN

The applicants have commissioned a Masterplan for the Northern Precinct that has been used to guide the development of the precinct. The Masterplan provides useful context by demonstrating how Northern Precinct is capable of being developed as well as co-ordinating the relevant infrastructure to enable the development.

An image of the current Masterplan is included in **Figure 2**.

FIGURE 2 MASTERPLAN

3.0 STORMWATER

3.1 TERRAIN AND EXISTING DRAINAGE

3.1.1 TPL BLOCK

The TPL block consists of farmland; gently sloping east to west with two isolated hills that stand about 10m higher than the surrounding land. 40Ha along the eastern boundary has already been rezoned for commercial development.

The farms have a network of drains (**Figure 3**) flowing north-west through neighbouring farmlands to a small gully (which forms the upper reaches of the Nukuhau Stream), before discharging into the Waikato River just south of Peacockes. A large portion of the fields (on the north-western portion of the development area) have a network of subsoil drains that discharge into the farm drains. A small portion (about 5 ha) in the north-eastern corner of the precinct drains into a farm drain that flows east to the road drain along Raynes Road.

From a review of the *Preliminary Geotechnical Report* (Coffey, 2011), the soils underlying the TPL block offer variable rates of soakage, with the southern side of the precinct having good natural drainage and the remainder having lower soakage rates. The soils underlying the two hills are expected to have poor soakage. The report also identifies better draining soil strata at a depth of about 9m below ground level. The latest geotechnical report *Preliminary Geotechnical Investigation* (CMW, 2021) uses the same information provided by Coffey's Preliminary Geotechnical Report.

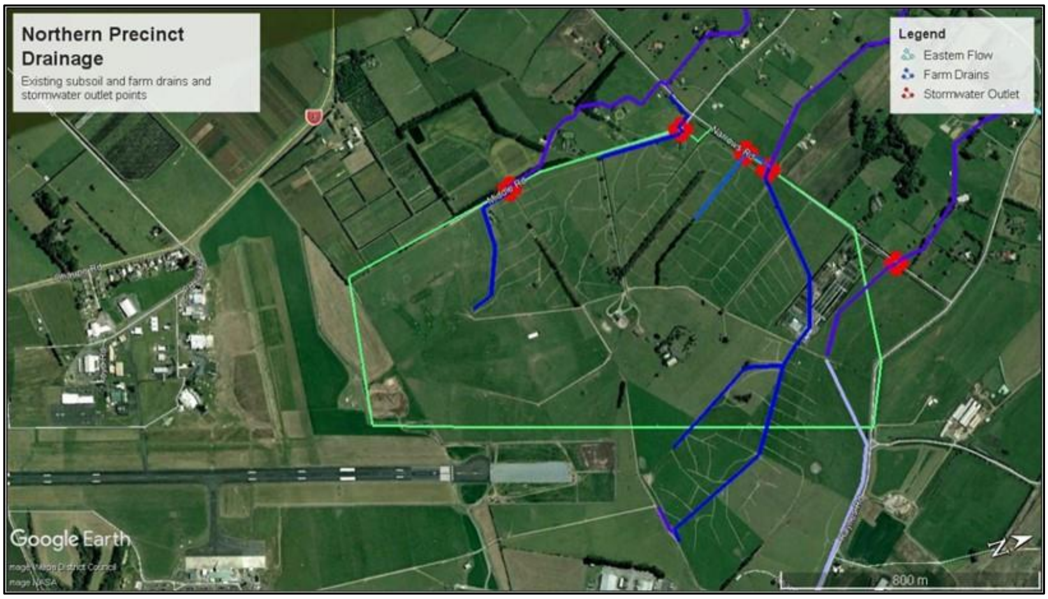

FIGURE 3: EXISTING FARM DRAINS, OUTLET POINTS AND SUBSOIL DRAINS WITHIN THE TPL BLOCK

3.1.2 RPL BLOCK

The RPL block consists of agricultural land, which gently slopes south-west and north-east. Existing artificial drains have been constructed in the north-eastern part of the site.

From a review of the *Ecological Opportunities and Constraints Assessment* (Tonkin & Taylor, 2022), the artificial drains flow into the Nukuhau Stream which flows into the Waikato River. While Nukuhau Stream is shown to extend into the property on the WRC maps, the Tonkin & Taylor Ecological investigation found no evidence of the stream on the property. The Nukuhau Stream appears to only start downstream of the site. There are two artificial drains within the RPL block. The first is located along the eastern boundary of the site and flows in a northernly direction to the northern boundary. The second drain is located along the north-eastern boundary and flows in an easterly direction.

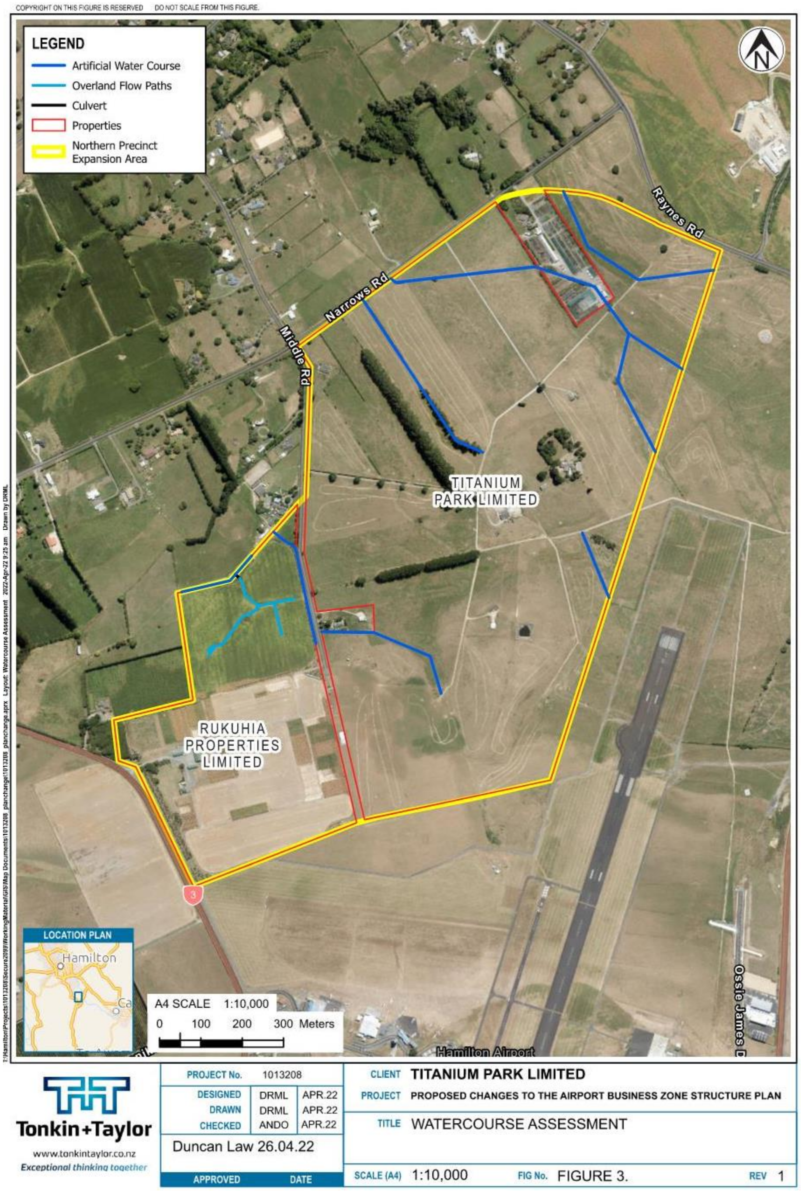

FIGURE 4: RPL PROPERTY EXISTING WATERCOURSES (TONKIN & TAYLOR)

From a review of the *Preliminary Geotechnical Investigation (CMW, 2022),* the soils underlying the RPL block offer good natural drainage. The report also identifies groundwater at 0.8m below ground level at the proposed stormwater reserve area.

3.2 FLOOD HAZARDS

As shown in **Figure 5** (from the Waikato Regional Hazards Portal), there is no risk of flooding to the private plan change area from the Waikato River.

The *Preliminary Geotechnical Report (Coffey, 2011)* highlights high groundwater levels within the TPL block that will likely need to be managed with subsoil drains to avoid any localised flooding. This is also confirmed in the latest *Preliminary Geotechnical Investigation (CMW, 2021).* The use of subsoil drains has proven to be effective in the fields where a network of subsoil drains has already been installed (**Figure 3**) over areas that historically experienced extended periods of surface ponding from high groundwater table.

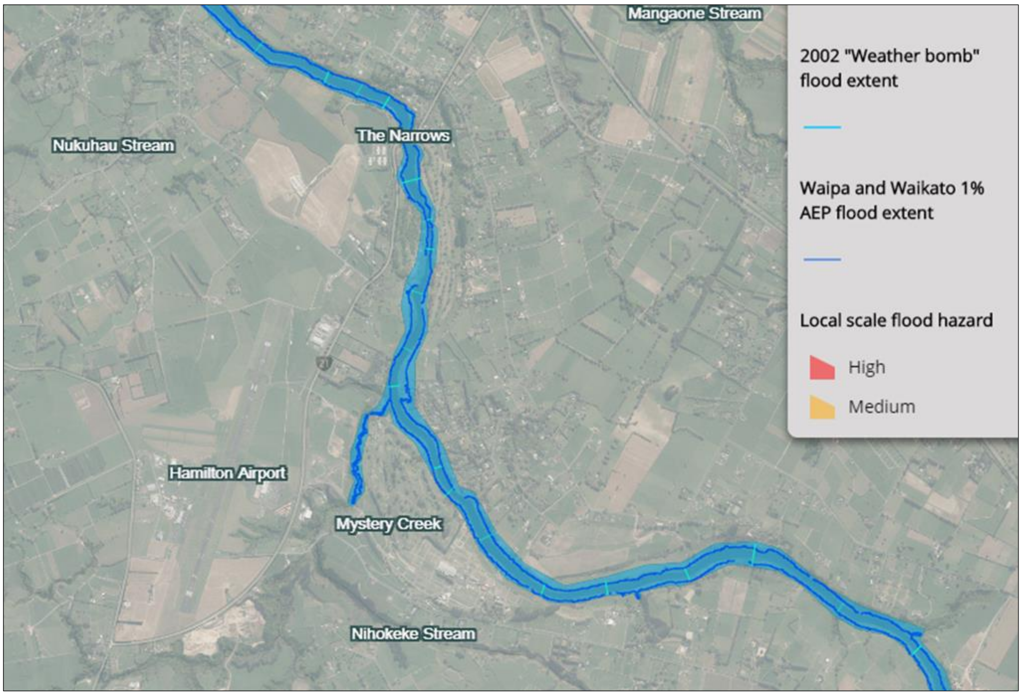

FIGURE 5: RIVER FLOODING ZONES (WAIKATO REGIONAL HAZARDS PORTAL)

3.3 STORMWATER MANAGEMENT

As per the regional guidelines, stormwater runoff from any development will need to be treated to acceptable standards before discharge from the site.

The regional guidelines also require that post-development stormwater flows are managed within the development to ensure that there is no peak flow increase downstream of the development.

The recommended stormwater quality, quantity and discharge management approach for the site is described in item 3.3.1, and the scale, and indicative locations, of the areas required to provide suitable stormwater management are identified.

We understand the development intention for the Northern Precinct is to create amenity values from stormwater devices and for it to be included as part of the development.

The proximity of the development to the airport runway makes wetlands or ponds unfavourable as they create habitats for birdlife, and as such, any stormwater treatment and detention would be best carried out using 'dry systems' (i.e systems without any permanent water body). Such 'dry systems' include swales, soakage systems and attenuation basins.

The preliminary geotechnical report indicates that generally the site is suitable for limited soakage to ground in the Northern Precinct. Any flows that exceed the soakage capacity would flow through the existing adjacent farm drains before reaching the Nukuhau Stream gullies and the Waikato River. Any post development peak flows would need to be detained on site to match (or lower) pre-development peak flows, thus avoiding any impact to the drains and streams outside the development area.

3.3.1 RECOMMENDED APPROACH

Our recommended approach for the stormwater system is to maximise soakage to ground at source where possible and control the larger storm events with detention systems at the existing discharge points. The development zone is relatively flat, making a reticulated pipe network difficult to tie into the existing road and farm drains downstream. As such any stormwater conveyance system provided would ideally consist of shallow surface swales. Swales would provide the functions of water quality treatment, soakage to ground, and also conveyance of flows to the detention areas. Further detail is provided below:

1. On-lot Stormwater Management

We expect that future lot owners would need to manage the post development flows for the 10-year events within each lot. There are multiple ways to do this, and this detail would be developed as part of the resource consent / building consent process, but we expect this would most commonly be achieved via soakage (potentially with the requirement for pre-treatment – via a proprietary treatment device on the lot – prior to soakage, depending on the nature of the activities on the lot).

The preliminary Geotechnical Report prepared by Coffey calculated indicative backfilled trench type soakage systems. It shows that a modular crate system would have an approximate footprint of 2% of lot area and granular filled trenches would require about 10% of the lot area. The calculations were confirmed verbally by CMW, who prepared the latest geotechnical report, in a plan change team meeting in April 2021. These devices can be incorporated under accesses and parking areas if there are space constraints.

For larger storm events these soakage trenches would fill and overflow onto the roads.

2. Road Network Stormwater Management

The treatment and management of the roadways should incorporate similar soakage devices along the length of the roads, incorporating grass swales for additional stormwater treatment. Stormwater would flow along these grass swales as pre-treatment and into grated catchpits connected to the subsoil soakage systems (refer **Figure 6**). They would need to be designed to convey the 10-year storm events. Any events in excess of the 10-year event would overflow into the roads where they would be conveyed overland to larger communal detention devices.

FIGURE 6: EXAMPLE OF STORMWATER SWALE AND SOAKAGE GRATE ALONG OSSIE JAMES DRIVE, CENTRAL PRECINCT

3. 100-year storm Stormwater Management

Overflow from the on-lot and road soakage devices would need to be controlled and conveyed within the roads to larger dry detention basins. These basins could incorporate soakage systems, but their primary function would be as detention ponds for the 100-year event peak flows and 10-year conveyance and discharge to ground of the road catchments.

The basins would be located with controlled outlets into the existing stormwater channels. The roads and lot layout influence the location and shape of these basins, however the discharge location is fixed by the existing stormwater outlets and drains outside the development (refer **Figure 3** and **Figure 4**).

3.3.2 HYDROLOGY

The Rational Method was used to calculate the stormwater flows. Climate change effects were taken into consideration with increase in temperature of 2.1˚C by 2090, with a resulting percentage increase in temperature of 16.8%.

Table 1 shows the rainfall values used in the design calculations.

TABLE 1: RAINFALL INTENSITIES

STORM EVENT	RAINFALL (MM/H)	DEPTH (MM)
10-year 24h	4.7	115.52
100-year 24h	7.2	177.54

3.3.3 TPL BLOCK STORMWATER MANAGEMENT OPTIONS

This section provides a solution for managing stormwater within the TPL block and demonstrates that an appropriate stormwater management outcome for the block can be achieved. Further refinement of the management approach would only be undertaken as part of the resource consent process.

In the proposed solution, the site grades west and east, following the existing ground. A ridge is proposed to divide the site in the north-south direction (refer **Figure 7**), where the existing high points are currently located. The boundaries tie in with the existing ground.

Different stormwater management device options were analysed, such as soakage basins, dry detention basins and wetland swales. The stormwater devices would be located across the east and west boundaries of the site.

Infiltration basins with below ground soakage devices were considered the preferred option for the site. Below ground detention and soakage options on the eastern boundary may be considered to allow for airside access and reduced bird habitat adjacent to the runway. The northeast corner of the site is the only exception, where a dry detention basin has been proposed, due to the lower soakage rates found in the area. Further investigations should be undertaken in detailed design to reassess the infiltration rates at the pond locations. Wetland swales were not preferred due to the increased bird habitat and the proximity of the to the airport runway.

It is proposed to use soakage basins for the 10-year conveyance and discharge to ground of the road catchments and attenuation of the 100-year volume. The east basins are proposed to discharge east into the existing drains that ultimately flow into the Waikato River. The west basins are proposed to discharge west into the existing farm drains that ultimately flow into the Nukuhau Stream.

This design will need to be confirmed with modelling at detailed design stage, which might lead to change in the required basin size.

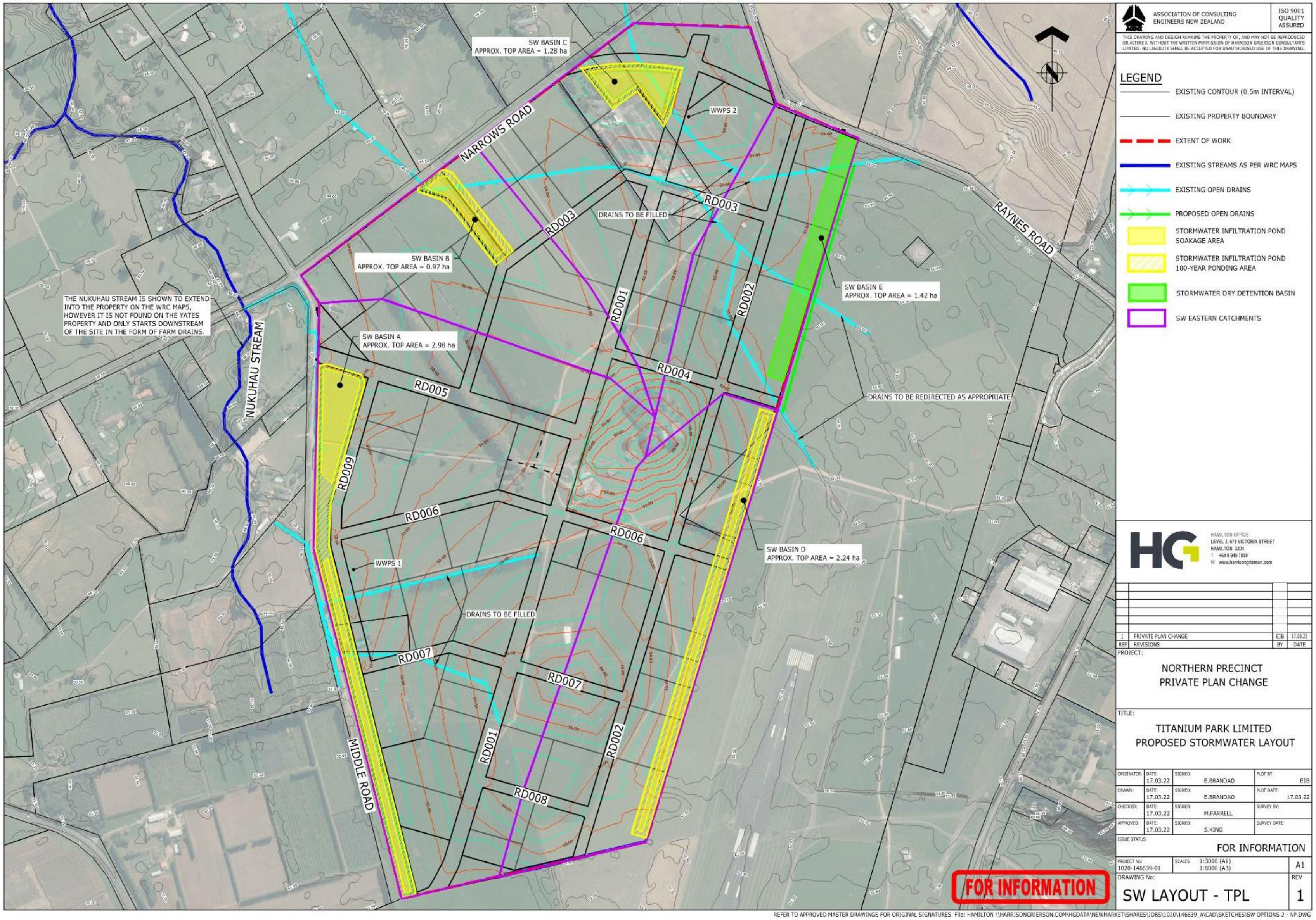

FIGURE 7: TPL BLOCK PROPOSED STORMWATER LAYOUT

The hydrology parameters used in the proposed basin designs are listed in the following tables. The 100-year storage volume was the controlling factor for the basin' sizes.

TABLE 2: PRE-DEVELOPMENT HYDROLOGY PARAMETERS

BASIN	CATCHMENT AREA (HA)	RUNOFF COEFFICIENT	100-YEAR 24H VOLUME (M^3)
A	45	0.30	20,088
B	12.09	0.30	5,397
C	19.17	0.30	8,557
D	19.62	0.30	8,758
E	11.91	0.30	5,317

TABLE 3: POST-DEVELOPMENT 100-YEAR HYDROLOGY PARAMETERS SOAKAGE BASINS

BASIN	CATCHMENT AREA (HA)	RUNOFF COEFFICIENT	SOAKAGE RATE (MM/H)	100-YEAR VOLUME REQUIRED AFTER SOAKAGE (M^3)
A	45	0.65	36	36,916
B	12.09	0.65	36	10,178
C	19.17	0.65	36	15,566
D	19.62	0.65	36	16,075

TABLE 4: POST-DEVELOPMENT 100-YEAR HYDROLOGY PARAMETERS DRY BASIN

BASIN	CATCHMENT AREA (HA)	CURVE NUMBER	100-YEAR VOLUME (M^3)
E	11.91	94	19,851

Table 5 is a summary of the designed basins' dimensions.

TABLE 5: BASINS' DIMENSIONS

STORM EVENT	RAINFALL (MM/H)	TOP AREA (HA)
A	2.0	2.98
B	2.0	0.97
C	2.0	1.28
D	2.0	2.24
E	2.0	1.42

3.3.4 RPL BLOCK STORMWATER MANAGEMENT OPTIONS

This section provides the solution for managing stormwater within the RPL block and demonstrates that an appropriate stormwater management outcome for the block can be achieved.

In the proposed solution, the whole site will fall towards the north-east. This will involve earthworks predominantly in the southern portion to create the required fall (refer **Figure 8**).

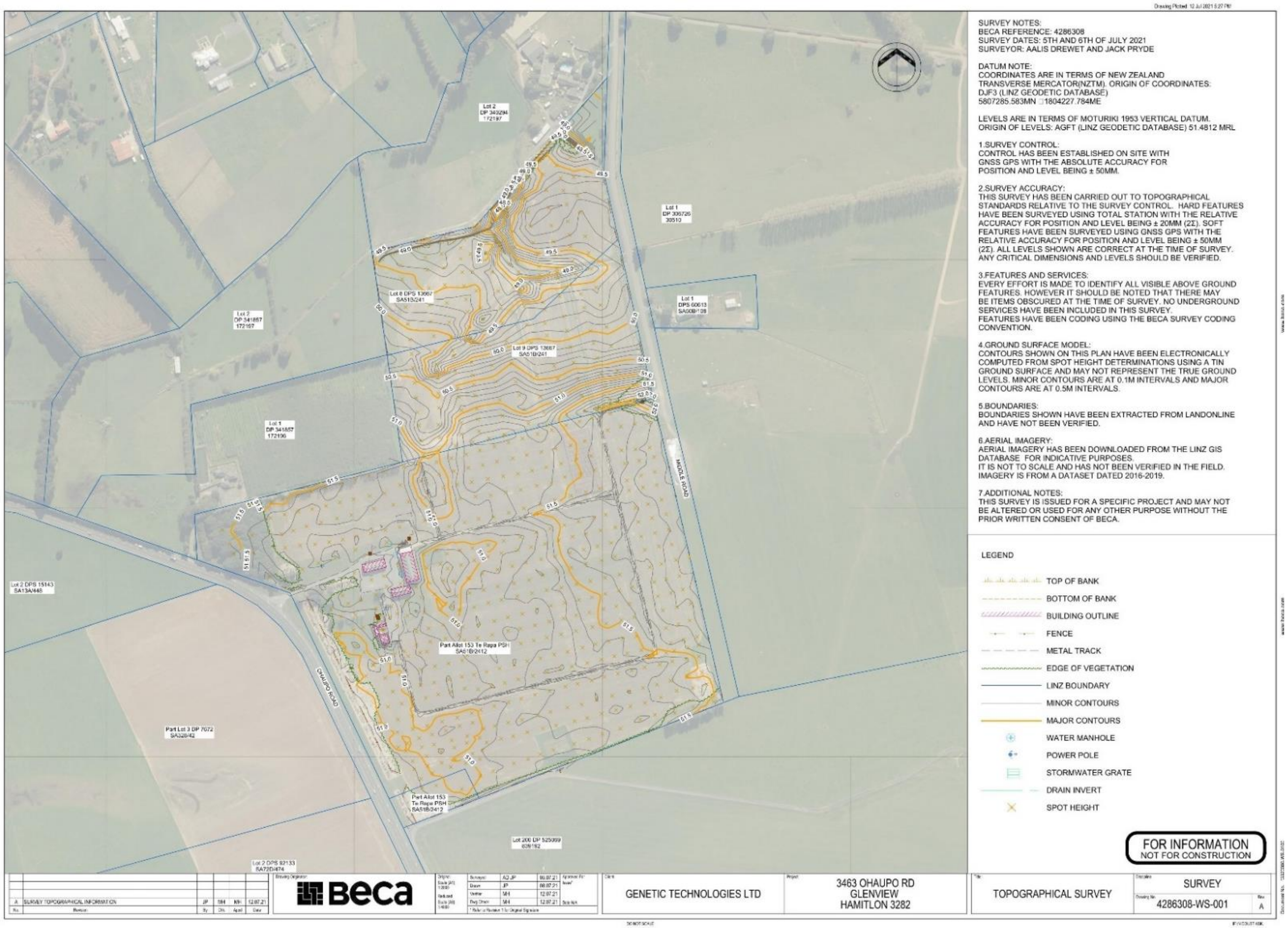

FIGURE 8: RPL BLOCK EXISTING GROUND (BECA, 2021)

It is proposed to use a centralised soakage and attenuation basin for the 10-year conveyance and discharge to ground of the road catchments and attenuation of the 100-year volume.

The basin is proposed to discharge into the existing farm drains which drain into the Nukuhau Stream.

This design will need to be confirmed with modelling at detailed design stage, which might lead to change in the required basin size.

A layout for a single catchment and basin is shown on **Figure 9**, however multiple basins may be utilised in the final engineering design.

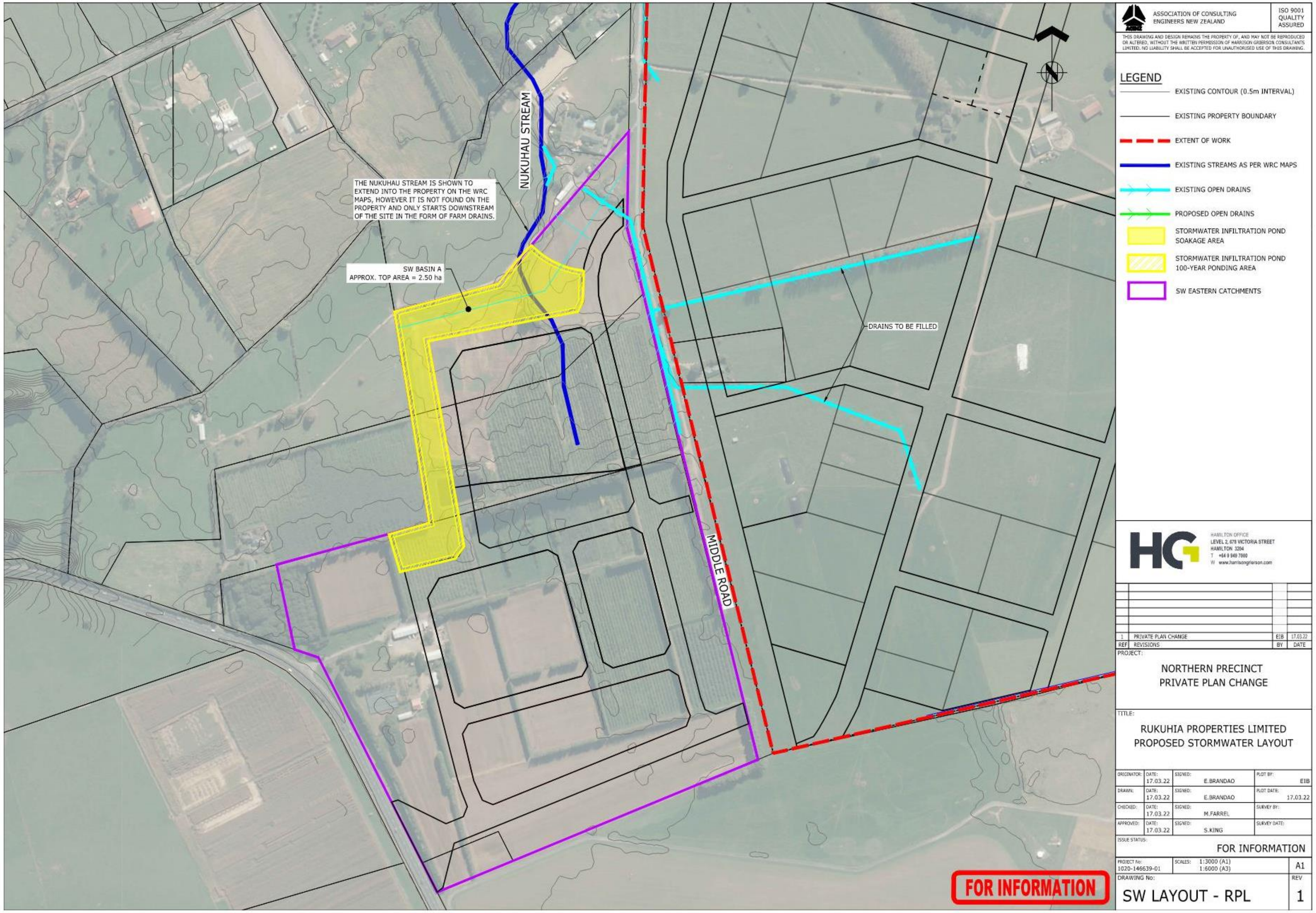

FIGURE 9: RPL BLOCK STORMWATER LAYOUT

The hydrology parameters used in the soakage and attenuation basin design are listed in the following tables. The 100-year storage volume was the controlling factor for the basin size.

TABLE 6: PRE-DEVELOPMENT HYDROLOGY PARAMETERS

BASIN	CATCHMENT AREA (HA)	RUNOFF COEFFICIENT	100-YEAR 24H VOLUME (M^3)
A	29.30	0.30	13,080

TABLE 7: POST-DEVELOPMENT 100-YEAR HYDROLOGY PARAMETERS

BASIN	CATCHMENT AREA (HA)	RUNOFF COEFFICIENT	SOAKAGE RATE (MM/H)	100-YEAR VOLUME REQUIRED AFTER SOAKAGE (M^3)
A	29.30	0.65	122	11,177

Table 8 is a summary of the designed basin dimensions.

TABLE 8: BASINS' DIMENSIONS

BASIN	DEPTH (M)	TOP AREA (HA)
A	0.8	2.50

3.4 CONSTRAINTS AND FURTHER INVESTIGATIONS

3.4.1 STORMWATER CONSTRAINTS

Additional stormwater constraints will require further investigation as part of the resource consent / building consent process for the Northern Precinct.

The design intention outlined in this report provides for at-source water quality treatment, soakage to ground and attenuation of flows prior to discharge from site. It is currently based upon conservative design assumptions and as such, based on our experience, the constraints identified below will be capable of being overcome with further investigation and design development:

- The lots and roads will need to be designed to ensure overland flows are off the lots, along the roads to the dry basins
- There is a high possibility that portions of the development area will require subsoil drainage to control groundwater levels – the spacing and location of drains will need to take into account the possibility of large buildings being constructed across more than one lot.
- The Preliminary Geotechnical Report (Coffey, 2011) proposes drilling down to more permeable soils approximately 9m below the site to improve soakage efficiencies. This will need to be investigated in more detail to determine the associated costs and effectiveness this will have.
- Based on final surface and subsoil designs the outlet points and culverts under public roads may need to be lowered.
- The stormwater pipes under Narrows Road have very little cover. These will need to be addressed to ensure they meet the requirements of industrial vehicle loading and if they are lowered, the downstream drains in the adjacent properties will also need to be lowered. This may require landowner liaison at that stage.

3.4.2 FURTHER GEOTECHNICAL INVESTIGATION

As the development of the Northern Precinct progresses beyond the plan change stage and into the resource consent and detailed design stage, more detailed geotechnical investigation will be required, with specific focus on groundwater dispersal and hydraulic conductivity before the final design is carried out.

Stormwater design and modelling will also be required to accurately detail and size the stormwater devices.

3.5 SUMMARY

We have developed a solution for managing stormwater for the two predominant blocks within the Northern Precinct, being the TPL and RPL blocks.

In summary, our assessment found that:

- On-lot stormwater can be managed on site for the water quality and 10-year storms, via soakage where possible (and with the addition of proprietary pre-treatment systems on lots, if necessary, prior to soakage).
- Road catchments can be managed via roadside soakage swales for treatment and conveyance of the 10-year storm.
- 10-year road catchments can be directed to the proposed infiltration and attenuation basins and soaked to ground.
- 100-year storm flows can be directed overland to the proposed infiltration and attenuation basins.
- The proposed basins can be designed for the 10-year conveyance and discharge to ground of the road catchments and attenuation of the 100-year volume.

Any design will need to be confirmed at further stage supported by stormwater modelling, which might change the required basin areas that have been indicatively shown as part of this assessment.

4.0 WATER SUPPLY

4.1 EXISTING WATER SUPPLY

Bulk water to the other Airport Business zone precincts is currently supplied under agreement to Titanium Park Limited from Waipa District Council (WDC) that sources water from its Pukerimu Scheme. The Pukerimu scheme also supplies rural households between Te Awamutu and Cambridge, Hamilton Airport, Ohaupo and Mystery Creek and is supplied by WDC's Parallel Water Treatment Plant (WTP).

The Parallel Road WTP has recently completed upgrades, increasing the capacity to 12,000 m3/day. The design of the new WTP allows for a further additional 4,000m3/day upgrade in the future.

The WDC water supply agreement with Titanium Park is staged with upgrade costs linked to the demand. The total amount under the agreement is 600 m3/day. The first stage of supply is up to 200m3/day, the second stage will supply up to 600m3/day. The upgrade from Stage 1 to Stage 2 will involve WDC splitting its current network and upgrading the pumps on the network supplying Titanium Park.

The Pukerimu Scheme is part of Waipa's rural network and is a low-pressure or "trickle feed" system. As a result, the existing development uses reservoirs and pumps to supply the reticulation.

There are currently two reservoirs serving separate networks within the development. There is a 1000kl reservoir in Raynes Precinct and a 679kl reservoir in Western Precinct. The intention is that as demand increases the networks and reservoirs will be linked with a ring main.

4.1.1 DEMAND AND AVAILABILITY

The RITS standards for industrial development recommend a population equivalent rate of 45 persons/Ha and a daily demand of 260 l/person/day or 11.7 m3/Ha/day.

The full Titanium Park / Airport Business zone development area that has been used for this initial assessment of the bulk water demands is approximately 248 Ha. This excludes the runway and hangar areas but includes the full extent of Northern Precinct (as proposed as part of this Plan Change request).

Based on the RITS water consumption values, the current water supply agreement will supply about 51 Ha (i.e. 11.7 m3/Ha/day x 51 Ha = 600m3/day).

There are allowances within the RITS to base water demand for commercial and industrial zones on expected actual flows that may be significantly lower than the values listed in the RITS.

The actual water usage from developed sites was assessed in 2019 based on 6 occupied properties, with usage ranging between 0.3 to 1.8 m3/Ha/day, an average of 1.1m3/Ha/day (an 80th percentile of 1.43 m3/Ha/day).

This analysis has also been repeated with metered records up to June 2021, with 31 properties occupied (total lot area of 37.9 Ha) within the development. The average daily usage is currently 1.0 m3/Ha/day (and an 80th percentile of 1.18 m3/Ha/day). This is slightly lower than the 2019 assessment of 1.1m3/Ha/day. Our assessment excluded the meter readings from March 2021 to June 2021 as these were significantly lower than the other months most likely caused by the national Covid-19 lockdown.

The daily usage range is between 0.70 m3/Ha/day and 1.39 m3/Ha/day (excluding the Covid-19 lockdown period). The peaks and troughs shown in **Figure 10** tend to correlate with dry and wet seasons, an indication that rainwater reuse is in use on a large portion of the occupied properties.

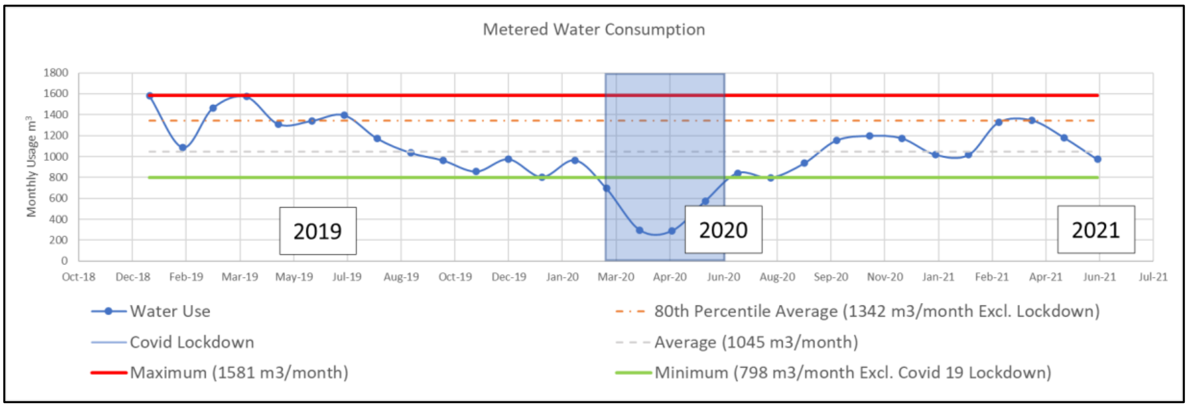

FIGURE 10 METERED WATER CONSUMPTION

Table 9 below shows that, using the current water usage rates, the 600 m3/day water allocation will be able to service the full development of the Airport Business zone (including the full extent of Northern Precinct as proposed as part of the plan change application) provided the types of industry and associated water use remain similar to the current tenants (i.e. land use is 'dry industry' and the average daily demand per hectare remains under 2.4m3/Ha/Day, as 2.4m3/Ha/Day x 248 Ha = 595m3/day).

TABLE 9: WATER DEMAND

	APPROXIMATE DEVELOPMENT AREA (HA)	MAXIMUM DOMESTIC DEMAND (1.39 M3/HA/D) (M3/D)	MINIMUM DOMESTIC DEMAND (0.7O M3/HA/D) (M3/DAY)	DESIGN DEMAND (3M3/HA/DAY) (M3/D)
Western & Aviation Precinct	41	57	29	123
Southern Precinct	14	19	10	42
Central Precinct	25	35	18	75
Raynes Precinct	15	21	11	45
Hotel	2	3	1	6
Terminal	18	25	13	54
Northern Precinct – TPL Block	104	145	73	312
Northern Precinct – RPL Block	29	40	20	87
TOTAL	**248 Ha**	**345 m3/D**	**174 m3/D**	**744 m3/D**

While this assessment of current usage shows consistency over the past 2.5 years it will still need to be agreed with WDC (as asset owner) as it is lower than the water demand requirements set out in the RITS and is lower than the demand rate basis of the water supply agreement with WDC.

The original water supply[1] was based on 3 m3/Ha/day, which equates to a total daily demand for the entire airport zone (including the Northern Precinct) of 744 m3/day (i.e. exceeding the current agreed supply limit of 600 m3/day).

[1] Provided in correspondence from WRAL

Covenants for currently occupied sites at the airport state that water usage shall not exceed 3m3/Ha/day. Similar covenants for the Northern Precinct, limiting water usage to around 2m3/Ha/day, would ensure that the actual demand for the wider area would not exceed supply (i.e 600m3/day) when the development was fully occupied. Actual water usage would be monitored via water meter readings to ensure covenant limits were adhered to.

In addition, discussions with WDC to date have indicated that, with the upgrades to the Parallel Road Water Treatment Plant, there is potentially an option to increase the supply to WRAL from the Pukerimu Scheme to about 800m^3/day if needed. Progressing this scenario would enable the estimated maximum demand of 744 m3/day to be provided, with covenants for all sites limiting water usage to 3m3/Ha/day.

4.1.2 SUPPLY TO THE NORTHERN PRECINCT

The current water supply from the Pukerimu scheme connects to the Titanium Park water network. The Norther Precinct would be supplied from the existing Titanium Park water network. The intention for the Airport Business zone is to ultimately ring-main all the precincts together. **Figure 11** depicts how this reticulation could be achieved.

The Northern Precinct (including both the TPL and RPL blocks) would initially be supplied by a single supply line to its own reservoir and pump station. The preferred location for the pump station would be on the elevated area within the Hub that is central within the Northern Precinct. This reservoir could be supplied either from the east by extending the Raynes water network or from the west by extending the western water network.

Supplying the Northern Precinct from the Western Precinct may be preferable as there may be capacity with the existing pumped network to supply the preliminary stages of the development before the reservoir and pumps are installed. This will be investigated further during the resource consent / detailed design process.

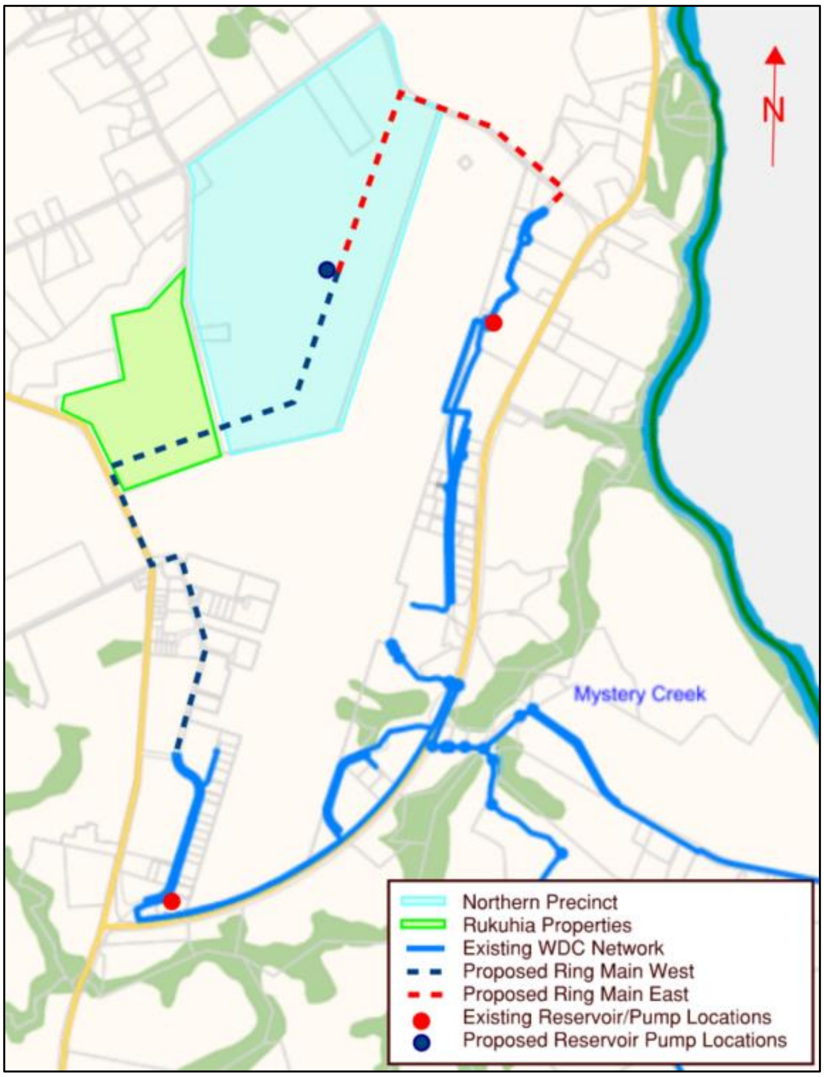

FIGURE 11 EXISTING AND PROPOSED WATER RETICULATION

4.1.3 STORAGE

The water supply agreement with WDC specifies a requirement to store 48 hours of average daily demand within the development.

There are currently two reservoirs, one in Western Precinct, the other in Raynes Precinct of the Airport Business zone. The combined storage of these two tanks (including firefighting storage) is 1,679m3. Raynes Precinct is classed as FW-5 firefighting supply. This requires 1,080m3 to be always available for firefighting, leaving 599m3 available for potable use.

Using a demand of 3 m3/Ha/day as the average daily demand would mean that the Northern Precinct would need to have a 798 m3 reservoir for potable water supply. The demand for the full build out of the Airport Business zone (including all precincts) would be 1,650 m3 (excluding firefighting requirements) and once the development is ring-mained this could be held within multiple reservoirs.

4.1.4 FIRE FIGHTING SUPPLY

At this stage we have assumed the development will be reticulated to meet an FW3 level of service for firefighting. Under this class there is a need to supply a flow rate of 50l/s through three fire hydrants for 60 minutes. This means the Northern Precinct will need to include dedicated fire water storage of 180 m3.

This can be stored within the potable water supply reservoir. That would result in a combined storage of 978 m3 for the Northern Precinct development. The fire storage may be included within the existing water reticulation provided that fire flow requirements are achieved within the Northern Precinct.

Hydraulic modelling of the full water reticulation should be carried out as part of the detailed design process. This will identify the locations of reservoirs and booster pumpstations and the possibility of combined storage within the full development.

5.0 WASTEWATER

This section provides a summary of how wastewater is currently serviced for the precincts within the Airport Business zone that have been developed as well as the Airport terminal. It then provides an assessment of how wastewater servicing can be provided to enable the development of the Northern Precinct.

It acknowledges that the detailed arrangements and timings for wastewater servicing will be developed as part of the resource consent / detailed design process in collaboration with the relevant stakeholders (including Waipa District Council).

5.1 EXISTING WASTEWATER SYSTEMS

The Western Precinct, Hotel and Terminal buildings have on-lot wastewater treatment through septic tanks and disposal beds. The Southern, Central and Raynes Precincts have reticulated systems that currently terminate at storage chambers at the end of each reticulated portion (**Figure 12**). These chambers are periodically pumped out and transported by truck to the wastewater treatment plant in Cambridge.

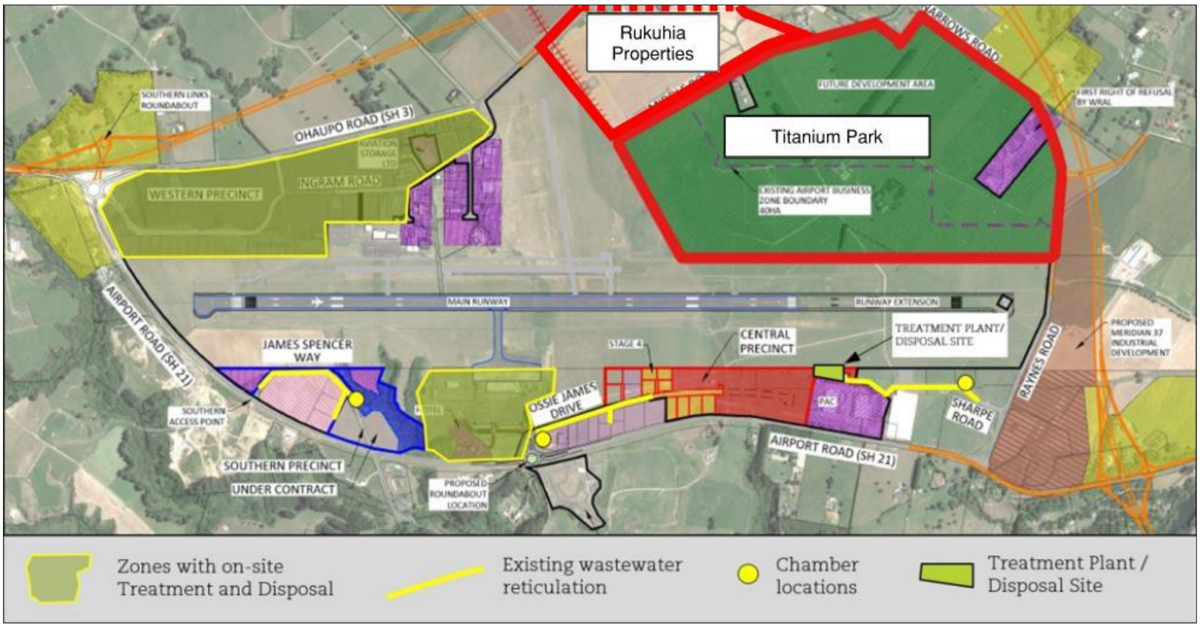

FIGURE 12 EXISTING WASTEWATER INFRASTRUCTURE

The long term intention/preference would be to connect these precincts to the Hamilton/Waipa future Metro WwTP that is proposed to be constructed within the vicinity of the airport.

In the situation of significant delay (or abandonment) of the provision of the metro wastewater scheme, the alternative long-term solution for wastewater would be to pump the effluent from the existing collection chambers directly to a new privately owned on-site package type wastewater treatment plant in the Central Precinct (refer to **Figure 13**). This treatment plant would have on-site disposal beds for the treated effluent.

5.2 NORTHERN PRECINCT SHORT TO MEDIUM-TERM WASTEWATER SOLUTION

We have assessed the options available for conveyance, collection, treatment and disposal of wastewater to enable progression of development on the Northern Precinct in the short to medium term (i.e. in advance of development of the proposed Hamilton/Waipa Metro WwTP).

5.2.1 CONVEYANCE

Conveyance is largely dependent on the topography. The traditional method of wastewater collection for development sites is by gravity flow through small diameter pipes, which are connected to bulk collector pipes and ultimately drain via gravity to a main collection manhole, which is then linked to a wastewater treatment plant.

Where the terrain is relatively flat these gravity lines tend to become very deep. In these situations, the costs and logistics of constructing deep gravity lines makes them unfeasible and wastewater pump stations are used to collect and lift effluent to a point where it can join a gravity main and flow to the main collection manhole.

For the purposes of this assessment, we have taken a conservative approach and assumed the terrain to be completely flat. We have used a conservative pipe gradient of 1:100 and set a maximum pipe depth as 6m. This has enabled a simplified wastewater pump station catchment layout to be produced for the Northern Precinct. Based on these catchments there could be three pump stations within the Northern Precinct (two pumpstations in the TPL block and one in the RPL block) operating in series; pumping from one catchment to the next and then on to a main collection manhole, linked to a wastewater treatment plant. The reasons for not pumping across to the Central Precinct WWTP are discussed in further detail later in this report.

Due to the depth that traditional gravity wastewater pipes would need to be on both the Central and Northern Precincts, an alternative, low-pressure sewer system is the preferred solution over the traditional gravity conveyance method. In a low-pressure sewer system, each lot has a small septic tank and pump conveying effluent under pressure to a central location, in this case that would be the main collection manhole, then linked to a treatment plant. Low-pressure sewer systems are beneficial for flat terrain and high ground water areas as they reduce pipe depths, have fewer large pump stations and ultimately lower development costs.

5.2.2 COLLECTION, TREATMENT AND DISPOSAL – NORTHERN PRECINCT TPL AND RPL BLOCKS

As per the current short-medium term solution for the Southern, Central and Raynes Precincts, the proposed conveyance system for the Northern Precinct (described above) would terminate in a number of collection/storage chambers at the end of each reticulated portion. In the short-medium term these chambers would then need to be periodically pumped out and transported by truck to the wastewater treatment plant in Cambridge, where the effluent would be treated to the required standards prior to discharge.

When required, the collection chambers would then be retrofitted with the addition of pump stations and emergency storage chambers and be connected to the planned metro wastewater scheme that is intended to cater for the long-term wastewater servicing of the area.

5.3 LONG TERM OPTION PREFERENCE – METRO WASTEWATER SCHEME

As noted above, the long term intention/preference for wastewater treatment for the overall development site would be to connect the precincts to the Hamilton/Waipa future Metro WwTP that is proposed to be constructed within the vicinity of the airport.

Transition from the short-medium term system would require the collection chambers across the precincts to be retrofitted with the addition of pump stations and emergency storage chambers and be connected to the planned metro wastewater scheme via pumped rising mains.

5.4 LONG TERM OPTION ALTERNATIVE – ON-SITE TREATMENT AND DISPOSAL

In the situation of significant delay (or abandonment) of the provision of the metro wastewater scheme, the alternative long-term solution for wastewater would be to pump the effluent from any proposed wastewater collection chambers directly to new privately owned and operated on-site package type wastewater treatment plants located in the various precincts. These treatment plants would have on-site disposal beds for the treated effluent.

5.4.1 ON-SITE TREATMENT AND DISPOSAL – SOUTHERN & CENTRAL PRECINCTS

TPL already has plans in place for a package-type wastewater treatment plant for the effluent from the Southern and Central Precincts. This proposed treatment plant is modular and consented to treat approximately 43 m3/day [2i5]. The consent was granted on effluent design flows of 1.5 m3/Ha/day, servicing an area of 28.6 Ha. The modular system has been consented in two stages with the first stage having a capacity of 21 m3/day (13.6 Ha) and the second stage 22 m3/day (14.9 Ha).

The phasing of the stages would be dependent on occupancy of the developed lots and subsequent effluent production. The treatment plant would require soakage trenches to dispose of the treated effluent. Due to the high groundwater levels the ground would need to be raised locally to ensure the minimum 600mm unsaturated soil clearance under the base of the soakage trench was met.

The consent application identifies a portion of land within the Central Precinct for the treatment plant and disposal trenches (refer to **Figure 13**), however we understand the intention is to have these disposal trenches within the runway area. The estimated areas required for the disposal trenches are 698 m2 for stage 1 and 730m2 for stage 2[2].

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[2] Titanium Park AEE Report – June 2015, prepared by Holmes Consulting

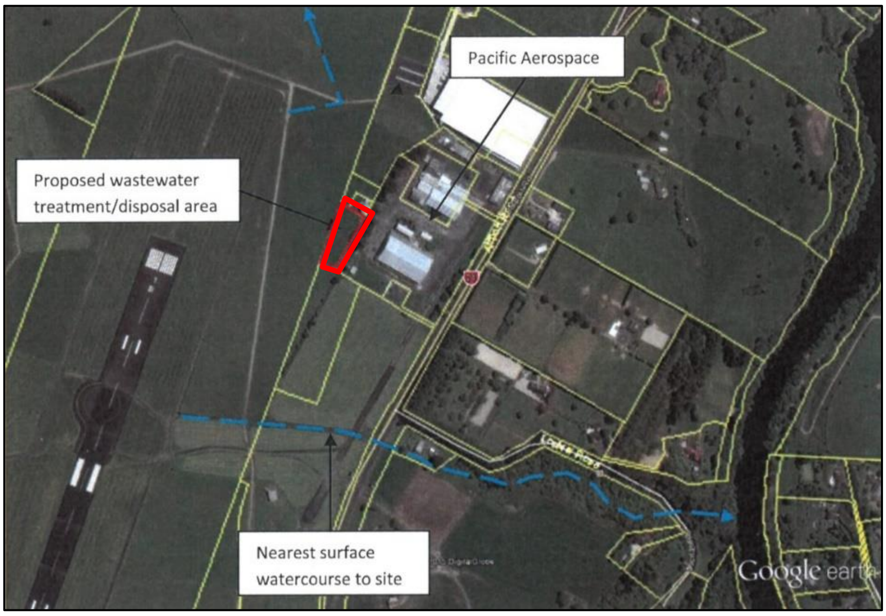

FIGURE 13 SOUTHERN AND CENTRAL WASTEWATER TREATMENT PLANT LOCATION6

5.4.2 ON-SITE TREATMENT AND DISPOSAL – NORTHERN PRECINCT TPL AND RPL BLOCKS

Based on a Population Equivalent (PE) of 30PE per Ha and 50 litres per PE per day, this equates to a wastewater flow rate of 156m3/day from the TPL block within Northern Precinct and 44m3/day from the RPL block, combining in a 200m3/day total for the precinct overall. These flows are based on the population density specified in Table 5-3 of the RITS for all commercial zones and wastewater design flows set out in Table H4 AS/NZS 1547:2012 – On-site Domestic Wastewater Management.

Based on the same trenched system and assuming the same soakage rates and ground conditions that the Central Precinct (consented[3]) on-site treatment and disposal option has been designed to, that being 30 litres/m2/day, any land disposal area required for TPL block would be 5,190m2 and 1,456m2 for the RPL block, with a total land disposal area of 6,645m2 for the Northern Precinct overall.

Assuming the same effluent quality of 20BOD/20SS/75TN that the Central Precinct WwTP was consented[3] upon, and based on the same wastewater treatment technology, the Northern Precinct WwTP footprint (excluding disposal area) would be 55m long by 25m wide (1,375m2). Add on the 6,645m2 disposal area then an allowance for the required buffer zone around the disposal area, the disposal area including redundancy would be approximately 8,700m2. Hence for the on-site treatment and land disposal option, a total footprint area for the WwTP and the disposal area including redundancy, would be approximately 10,100m2 for the Northern Precinct.

A preferred location for any on-site treatment and land disposal area for the Northern Precinct is, at this stage, yet to be confirmed. However, it would likely require a parcel of land within the TPL block. The disposal area could potentially be located along the flanks of the airport runway rather than taking up valuable industrial lot space.

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[3]Extracted from Resource Consent Application to: Discharge Waste to Land in Association with a Proposed Industrial/Commercial Development – June 2015, by Bloxam Burnett & Oliver Ltd

Note: If the wastewater from the Northern Precinct were to be transferred over to any Central Precinct On-site Wastewater Treatment Plant, this would equate to a 79% increase in wastewater volume and on-site disposal area. It is assumed that a new resource consent would also be required for this significant increase in volume rather than amending the current consent. Considering this option further, we found that the expansion of any Central on-site WwTP to accommodate the Northern Precinct became economically unattractive, as well as the WwTP and on-site disposal area footprints exceeding the land that is currently allocated for the Central Precinct WwTP. For this reason, the option for a standalone on-site WwTP and disposal area the Northern Precinct would be considered the preferred option in the situation where on-site treatment and land disposal were necessary.

5.5 SUMMARY

In the short to medium term, wastewater can be serviced via a low pressure wastewater system discharging to collection manholes, with untreated wastewater then being trucked to the Cambridge Wastewater Treatment Plant.

In the long term, the collection chambers can then be retrofitted with the addition of pump stations and emergency storage chambers and be connected via pumped rising mains to the planned metro wastewater scheme that is intended to cater for the long-term wastewater servicing of the area.

In the situation of significant delay (or abandonment) of the provision of the metro wastewater scheme, the alternative long-term solution for wastewater would be to provide the wastewater collection chambers with privately owned on-site package treatment plants discharging to on-site land disposal beds.

6.0
ELECTRICAL SUPPLY

WEL Networks manage the power distribution around the airport zone. WEL Networks are aware of potential developments around the airport and develop their 10-Year Asset Management Plan in parallel with these proposed developments.

The existing cable network to the area has adequate capacity to supply electricity to the area for general industrial works and they have a site available for a substation should then need to increase supply. A significant increase in power demand will prompt the need for a new substation.

Should an energy intensive industry (in excess of 2MW) start operating within the Northern Precinct it may be preferable to install a substation within the development, close to the demand location. In which case WEL would require a site of approximately 1000m^2 with public road access to build the substation.

Depending on the demand for energy intensive industries there may be benefit in creating a high energy user zone within the development with a dedicated substation site.

WEL Networks are also interested in encouraging distributing power generated from alternative sources including solar power. With industrial buildings generally having large roof areas there would be benefit in developing lot layouts that encourage building orientated with north facing roofs.

Information provided by WEL Networks shows that they are generally well placed to supply the greater Titanium Park area with power and there should be no power constraints in developing the area.

7.0 CONCLUSION

Our assessment has demonstrated that there are adequate and appropriate options to service the expansion of the Northern Precinct from an infrastructure perspective. These options will then be selected and refined as part of the resource consent/detailed design process.

Our assessment concludes that:

1. Stormwater can be managed with a combination of road swales and on-lot soakage for smaller storm events. Larger events up to the 100-year storm will be attenuated within communal soakage basins with controlled discharge to the Nukuhau Stream network prior to discharge north into the Waikato River.

2. Potable water supply and firefighting can be provided from the Pukerimu Water Supply scheme with onsite reservoirs and booster pumps.

3. In the short to medium term, wastewater can be serviced via a low pressure wastewater system discharging to collection manholes, with untreated wastewater then being trucked to the Cambridge Wastewater Treatment Plant. In the long term, the collection chambers can be retrofitted with the addition of pump stations and emergency storage chambers and be connected via pumped rising mains to the planned metro wastewater scheme that is intended to cater for the long-term wastewater servicing of the area. In the situation of significant delay (or abandonment) of the provision of the metro wastewater scheme, the alternative long-term solution for wastewater would be to provide the wastewater collection chambers with privately owned on-site package treatment plants discharging to on-site land disposal beds.

8.0 LIMITATIONS

This report is for the use by Titanium Park Limited & Rukuhia Properties Limited only and should not be used or relied upon by any other person or entity or for any other project.

This report has been prepared for the particular project described to us and its extent is limited to the scope of work agreed between the client and Harrison Grierson Consultants Limited. No responsibility is accepted by Harrison Grierson Consultants Limited or its directors, servants, agents, staff or employees for the accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes.