SOUTHERN PARALLEL CAMPUS

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Reference: LUC23/0109

In reference to the RFI and paragraph "*Please confirm the Applicants position regarding the potential water main upgrade/extension. In order for the Council to assess whether this connection is possible, more up to date information will be required in relation to the volume of water required for this proposal. Previous assessments undertaken to date and provided to Council refer to the water demands of the previous development proposal for the site.*"

Southern Parallel Campus Ltd (SPC) intent is to utilise water currently supplied to irrigate and provide water to farmhouse at 279 Stranges Road (SPEC site) by Graeme Small at the rate of 800,000 litres per day for irrigation of pastures during establishment and a limited quantity during the construction phase of the project, both of which will be far less will be utilised than supplied.

During the SPEC construction phase, it is the SPC intent to continue (September 2022) discussion towards entering into on a joint venture agreement with Ashburton District Council to implement a larger replacement Lake Hood water pipe along Grahams Road and Stranges Road with a branch running along Stranges Road to service Southern Parallel Equine Centre (SPEC) and subsequent SPC developments.

I attach a document prepared by Reeftide Environment & Projects prepared September 2022 detailing water requirements for the entirety of SPC Project developments. SPC understanding following meetings with ADC in September 2022 that such a joint venture for water supply upgrade to Lake Hood and linked supply to SPC Project would be viable and of interest.

It is important to note that the SPEC project will require a lessor supply of water than forecast and I understand Reeftide has provided the water supply chart. SPC however wish to plan for the entirety of SPC Projects and enter into an agreement with ADC. Please do not hesitate to contact SPC for further information.

Respectfully

Catherine J Stuart
CEO & Project Director

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☒ **TechnicalReport**

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TO **Southern Parallel Sports Campus**
279 Stranges Road,
RD 4 Ashburton,
Ashburton

Attention – Catherine Stuart

FROM Victor Mthamo

DATE 29 September 2022

FILE 233-2022 – 279 Stranges Road, Huntingdon

SUBJECT **Water Supply Servicing**

1. Introduction

Southern Parallel Sports Campus (SPSC) are proposing to construct a state of the art sports campus at 279 Stranges Road, Huntingdon, Lake Hood, Ashburton. SPSC wants to pursue resource consent for this development. SPSC has engaged Reeftide Environmental & Projects Limited (Reeftide) to carry out an assessment of the water supply options to service the proposed development. This report provides details of the assessment and the best option to service the development.

2. Site Description and Location

279 Stranges Road, Huntingdon is an approximately 65 ha block located approximately 6.7 km from Tinwald and also adjacent to Lake Hood. The property lies directly adjacent to the Huntingdon Park subdivision and adjoins the Lake Hood. The main lake is located approximately 100m from the site's eastern extent.

3. Project Description

The proposed state of the art sports campus will accommodate (among other things):

- A training and resilience program for high performance athletes, wounded warriors, returned service men and women (predominantly from the US), and youth sports athletes.
- A range of sports facilities including outdoor G3 pitch and running track, indoor G3 pitch, courts, high performance gym, and swim resistance facilities.
- Supporting facilities such as medical suites, mental health and wellness clinic, lecture halls, and a café.
- A residential component of townhouses for guests and their support persons (at this stage I understand 25 townhouses with a combination on 3-4 bedroom).
- A full indoor equestrian/polo facility that would be capable of holding national and international events.
- And most recently an equestrian hospital/clinic which would include an MRI machine.

4. Existing Water Supplies

The property has a single dwelling that is supplied with water from offsite the bore across Stranges Road pumped into a water storage tank. The existing bore sited under the house is not used and closed off. This supply would be too small to service the proposed SPSC development and would need to be consented. If consented, the point of take would require deeper bores and upgraded to include treatment. However, given the nature of the SPSC proposal getting consents to take water is not guaranteed as the property is within an overallocated groundwater zone.

Within the wider area is a pipeline that runs from Archibald Street in Tinwald along Graham Road, then along Stranges Road and Lake Hood Drive to the Lake Hood and Huntingdon developments. This supplies potable water to the developments via a locally reticulated water supply network.

5. Estimation of the SPSC Water Supply Demands

5.1. Introduction

Water is within the proposed SPSC development required for:

- Potable uses.
- Firefighting.
- Irrigation and other uses around the facility.

This section discusses the potable water demands for the project. Water supply for firefighting and other uses are discussed in Section 8.

5.2. Population Estimates

The normal daily population or number of people to be served is based on the projections by SPSC and depends on who they are (e.g. staff vs guests) or where they are (hotel stayer vs day visitor) within the facility. These are summarised as follows:

- Sports Campus Residents = 250 people.
- Staff = 50 people.
- Equestrian Centre – Day Visitors = 100 people.
- Motel (24 units x 2 people per unit) = 48 people.

It is expected that there will be up to 8 equestrian events per year. On each event day the projections are that there will be up to 1,000 people within the equestrian centre. This is up from the normal 100 people per day visiting the equestrian facility during most of the year.

5.3. Assumptions Adopted in Estimating the Water Demands

Table 1 below summarises the assumptions adopted for the potable water use estimates.

Table 1 – Water Use Estimates Assumptions

Facility/	Water Use	Source of Assumption
Hotel	250 L/p/day	NZS4404 Design Guide - as per the ADC requirements
Sports Campus Residents	160 L/p/day	Auckland - Water and Wastewater Code of Practice for Land Development and Subdivision – for Student accommodation
Equestrian Centre – Day Visitors	100 L/p/day	Assumed demand based on time on facility and activities
Staff - Day	50 L/p/day	Auckland - Water and Wastewater Code of Practice for Land Development and Subdivision – for staff

L/p/day – Litres per person per day

In addition to the water use rates in Table 1 the following peak factors have also been adopted in the water demand estimates.

- Peak Demand Factor = 2
- Peak Hourly Demand Factor = 5

5.4. Potable Water Demands

Using the population projections in Section 5.2, the assumptions in Section 5.3 and Table 1 the potable water requirements have been estimated for (i) normal days i.e. when there are no events and (ii) each of the 8 days when events are held. These are provided in Table 2 below.

Table 2 – Potable Water Demands

User/Use	No. of persons	Water Use Rate	DEMAND					
			ADD		PDD		PHD	
		L/p/day	m^3/day	L/s	m^3/day	L/s	m^3/hr	L/s
	Normal Water Supply Demands							
Sports Campus Residents	250	160	40	0.46	80.0	0.93	16.67	4.63
Staff	50	50	2.5	0.03	5.0	0.06	1.04	0.29
Equestrian Centre - Day Visitors	100	100	10	0.12	20.0	0.23	4.17	1.16
Motel (24 units x 2pp/unit)	48	250	12	0.14	24.0	0.28	5.00	1.39
Normal Demand	**448**		**64.5**	**0.75**	**129.0**	**1.49**	**26.88**	**7.47**
	Water Supply Demand on Event Days - 8 Events/Year							
Sports Campus Residents	250	160	40	0.46	80.0	0.93	16.67	4.63
Staff	50	50	2.5	0.03	5.0	0.06	1.04	0.29
Equestrian Centre - Event Days	1000	100	100	1.16	200.0	2.31	41.67	11.57
Motel (24 units x 2pp/unit)	48	250	12	0.14	24.0	0.28	5.00	1.39
Events Demand	**1,348**		**154.5**	**1.79**	**309.0**	**3.58**	**64.38**	**17.88**

ADD – Average Daily Demand
PDD – Peak Daily Demand (=ADD x 2)
PHD – Peak Hourly Demand (=PDD x 5)

The annual volume demands associated with the various scenarios are presented in Table 3 below.

Table 3 – Water Supply Volumes

User/Use	Days of Use/Year	Annual Volume (m^3)
Normal Water Supply Volumes		
Sports Campus Residents	350	14,000
Staff	350	875
Equestrian Centre - Day Visitors	365	3,500
Motel (24 units x 2pp/unit)	265	3,180
Volume with No Events	**1,330**	**21,555**
Water Volumes with Events On - 8 Events/Year		
Sports Campus Residents	350	14,000
Staff	350	875
Equestrian Centre - Event Days	8 + 342	4,220
Motel (24 units x 2pp/unit)	265	3,180
Volumes with Events		**22,275**

6. Discussions with Ashburton District Council (ADC)

6.1. Meeting with ADC

SPSC's Ms Catherine Stuart organised a meeting with ADC to discuss the project and the water requirements. This meeting was held on the 12th of September 2022. In attendance were:

- Ms Catherine Stuart (SPSC).
- Mr Andrew Guthrie (ADC Water Asset Manager).
- Mr Chris Stanley (ADC – Water Engineer).
- Ms Zani van der Westhuizen (ADC – Development Engineer).

- Victor Mthamo (Reeftide).

ADC confirmed that:

- The project could be supplied with potable water from the ADC network based in the demand estimated in Table 2.
- The project would need to have its own dedicated pipeline from Tinwald. This would be installed parallel to the existing DN225 supplying the Lake Hood and Huntingdon Subdivisions.
- They wanted SPSC's new pipeline for the project to consider or include redundancy for the existing DN225 pipe i.e. the new pipe to also include the capacity of the existing Lake Hood and Huntingdon developments.
- If the costs of upsizing the pipe are within its budget, the Council will enter into an Infrastructure Provision Agreement (IPA) with SPSC.
- The IPA will detail the cost share arrangements for the new pipe. ADC's contribution to the extra pipe capacity or redundancy will be the difference between (i) the cost of materials and installation of the upsized pipe and (ii) the cost of materials and installation associated with the SPSC requirements.
- ADC will also require the procurement process for the upsized pipe to be in line with the Council processes to ensure transparency and will reserve the right to review the procurement process to confirm this.

6.2. ADC Requirements and Expectations

Following on from the meeting Reeftide liaised with Chris Stanley to confirm the details of connecting to the ADC network in town and the Council's general expectations for the development. A copy of the correspondence is presented in **Attachment 2**. In summary Mr Stanley was able to confirm that:

- The point of connection of the new pipe would be at Archibald Street.
- The peak factors, the water demand assumptions adopted and the flow estimates by Reeftide and are in line with ADC's expectations.
- Lake Hood subdivision has a high summer peak around 18L/s, with a maximum recorded up to 23 L/s.
- If the Council was looking to add full redundancy for the existing pipe, they would expect approximately 23L/s capacity to be included in the new pipe.
- Depending on how the pipe sizes worked, the Council might opt for partial redundancy in the SPSC pipeline (e.g. only accommodating the summer peak flow of 18 L/s instead of the maximum recorded flow of 23 L/s).
- The existing pipe has a pressure reducing valve at Lake Hood Drive. This reduces the pressure to 390 kPa. This will be the expected minimum pressure at in the new pipeline.
- The new pipeline will not necessarily need to supply other properties enroute to the SPSC development.
- Flow tests had been done at the recommended connection point.

These flow tests results from Mr Stanley are summarised in Table 4 below.

Table 4 – Flow Tests Results

Pressure (kPa) at 0 L/min	Pressure (kPa) at 810 L/min	Pressure (kPa) at 1500 L/min	Pressure (kPa) at Maximum flow	Maximum flow (L/min) achieved
443	420	400	350	2,300

7. Proposal for the New Pipeline

7.1. Level of Service

The Level of Service (LoS) describes what the user can expect from the service. This includes the quantity, limits or pressures that will be placed on the service. The following are the minimum LoS for the new pipe.

- The minimum water demands for potable use estimated in Table 2.
- The minimum pressure at the Lake Hood Drive/Stanges Road junction is 390 kPa. This would need to be maintained for any redundancy included in the new pipe.
- The minimum pressure at the 279 Stranges Road frontage is also assumed to be 390 kPa.

7.2. Potential Pipe Sizes Estimates

As discussed with ADC the pipe would connect to the existing main at the Archibald Street/Graham Road junction. This would be run to the 279 Stranges Road frontage. This is a distance of approximately 6,700 m. To get a sense of the pipe sizes required for the new pipe the following scenarios where considered:

- Scenario 1 - SPSC potable water supply flows only during the normal (non-event) days.
- Scenario 2 - SPSC potable water supply flows only during one of the event days.
- Scenario 3 - SPSC potable water supply flows during the normal days + 23 L/s to provide 100% redundancy for the existing pipe.
- Scenario 4 - SPSC potable water supply flows during one of the event days + 20.4 L/s to provide approximately 89% redundancy for the existing pipe. The full 23 L/s for 100% redundancy is not possible for this scenario given that the flow testing maximum gave a maximum flow rate of 2,300 L/min (38.3 L/s) and a pressure of 350 kPa.
- Scenario 5 - SPSC potable water supply flows during one of the event days + 23 L/s to provide approximately 100% redundancy for the existing pipe. However, based on the flow test results provided this is a theoretical option since the maximum flow recorded was 38.3 L/s and has been included for completeness. This option would also be equivalent to supplying the SPSC flows during an event (17.8 L/s) + 100% of the summer peak flow (18 L/s).

A high level assessment of the pressures at the point of connection, head losses in the pipes, elevation differences and residual pressures at 279 Stranges Road has been carried out. The inputs into this assessment and the results are provided in **Attachment 3**. Table 5 below gives the range of possible pipe sizes for Scenarios 1-4.

Table 5 – Possible Pipe Sizes

Scenario	Flow (L/s)	Possible Pipe Sizes (mm)	Estimated Maximum Residual Pressure at 279 Stranges Road (kPa)
1	7.5	125 uPVC	526
2	17.9	175 uPVC	549
3	30.5	200 uPVC	439
4	38.3	225 uPVC	454
5	40.9	225 uPVC	430

Table 5 shows that the ADC redundancy requirements can be included in the new pipe. It should be noted that:

- The extent of redundancy during the event days will depend on flow available in the existing Archibald Street mainlines.
- The number of event days that will coincide with the maximum recorded flow of 23 L/s will be less than 8. There is likely to be more high peak summer flows days of 18 L/s (ADC correspondence) coinciding with an event day than the maximum recorded flow coinciding with an event day.
- Furthermore, the number of events during those peak time summer times will be significantly be less than 8.

- The event day peak demands will peak during the day whereas the peak flows within the township will occur either early in the morning or early evening during weekdays and possibly weekends.

The high peak summer flow of 18 L/s and the SPSC flow of 17.8 L/s during the event days add up to 35.9 L/s. Therefore, Scenario 4 best approximates the most likely flow conditions during the event days leading to the conclusion that the new pipe will be at least DN225 to carry the flows for the proposed and existing developments.

A pipe to carry the SPSC flows only will be:

- DN125 outside of event days.
- DN175 on event days.

Therefore, the Council would be looking at funding the cost difference between installing a DN225 and a DN125 or 175 pipe.

The above pipe sizing calculations are high level and very conservative and have been prepared to demonstrate feasibility. Reeftide recommends that more detailed modelling be carried out at the detailed design stage to refine the pipe sizes. The modelling would be based on a dynamic model with inputs into the model be based on more precise data on elevation differences, pipe routing and other pipe types (e.g. polyethylene pipe) etc.

7.3. SPSC Potable Water Reticulation

7.3.1. Reticulation

The pipe from Tinwald will terminate in a flow meter at the 279 Stranges Road frontage. The SPSC site reticulation system will run from the meter into the site and to the individual buildings and points of use. The reticulation system will only be for potable water supply ad discussed above.

7.3.2. Flow Control

One of SPSC's objectives for the project is sustainability. To assist in ensuring sustainability of the potable water supply for the proposed development flow control systems will be considered to monitor and control flows throughout the site.

Use of sanitary fixtures with flow control systems on both the hot and cold water reticulation systems will be considered. This will ensure maximum rate to each outlet is maintained as follows:

- Basins – 6 L/minutes.
- Showers – 12 L/minute.
- Baths – 9 L/minutes.
- Sinks – 9 L/minute.

8. Non-Potable Water Requirements and Supplies

8.1. Introduction

The previous sections have discussed the potable water supply in detail. This section looks at the non-potable water requirements and supply sources.

8.2. Firefighting Requirements

Fire flows will be designed according to SNZ PAS 4509:2008 New Zealand Fire Service Fire Fighting Water Supplies Code of Practice. The code of practice notes a water supply classification (FW1-FW7) which can be assessed based on the fire hazard category for the building, floor area of the building or size of the largest firecell and whether it has sprinklers or not. The fire hazard category ranges from FHC1 for motels, hotels and hostels of less than 100 people to FHC4 for working/business/storage activities with high fire load.

For this development the FHC2 would be most appropriate. Fire Water Classification Number (FW) will range from FW2 to FW7 depending on the general building sizes and/or fire cells and whether or not the buildings are sprinklered i.e:

- FW2 for sprinklered structures.
- FW3-FW7 for non-sprinklered structures.

The required flows where the system is reticulated or storage volumes where a reticulated system is not feasible are provided in Figure 1 below which has been extracted from the fire code (Table 2 of the firefighting code of practice).

	Reticulated water supply			Non-reticulated water supply	
Fire water classification	Required water flow within a distance of 135 m	Additional water flow within a distance of 270 m	Maximum number of fire hydrants to provide flow	Minimum water storage within a distance of 90 m (see Note 8)	
				Time (firefighting) (min)	Volume (m^3)
FW1	450 L/min (7.5 L/s) (See Note 3)	–	1	15	7
FW2	750 L/min (12.5 L/s)	750 L/min (12.5 L/s)	2	30	45
FW3	1500 L/min (25 L/s)	1500 L/min (25 L/s)	3	60	180
FW4	3000 L/min (50 L/s)	3000 L/min (50 L/s)	4	90	540
FW5	4500 L/min (75 L/s)	4500 L/min (75 L/s)	6	120	1080
FW6	6000 L/min (100 L/s)	6000 L/min (100 L/s)	8	180	2160
FW7	As calculated (see Note 7)				

Figure 1 – Firefighting Water Supply (Extracted from the Firefighting Code)

8.3. Other Water Requirements

In addition to normal individual water demands and fire-fighting requirements, water will also be required for watering gardens, cleaning public areas such as public areas etc. Water use assumptions used for estimating these other requirements are summarised in Table 6 below.

Table 6 – Water Use Assumptions for Services

Use	Allowance	Source of Assumption
Hotels/Apartments	2 $L/m^2/day^a$	From various literature e.g. Christchurch City Council.
Equestrian Areas	5 $L/m^2/day$	Proposed design baseline based on Reeftide's experience.
Irrigated Areas	3-5 mm/day	Typical demands for lawns/gardens

a - Figures based on Gross Floor Area (GFA)

8.4. Supply of Non-Portable Water Requirements

8.4.1. Introduction

As part of its sustainability objectives SPSC also intends to reuse water generated or collected on site. The main sources of the water to be reused will be stormwater runoff and treated wastewater. These sources are discussed below.

8.4.2. Stormwater

Roof stormwater is considered to be "clean". Stormwater from roofs will be collected and conveyed to onsite storage.

Stormwater from hardstanding areas will be collected and conveyed to storage. Trafficable hardstanding (e.g. carparks) stormwater will be treated to remove the first flush contaminants prior to discharge into storage. Flows and volume above the capacity of the storage will be discharged into the waterway and away from the site.

The pervious, impervious, roof, trafficable and non-trafficable areas will be determined in more detail at the detailed design. Table 7 below gives an indication of the areas that would be required to generate the firefighting volumes in Figure 1. The table conservatively assumes that the storage was filled from a rainfall depth of 25 mm (which is equivalent to the minimum first flush contaminant removal depth required by Canterbury Regional Council).

Table 7 – Catchment Areas Required to Generate the Firefigthing Flows

Rainfall Depth (mm)	Minimum Catchment Area (m^2)	Site Coverage (%)	Volume (m^3)
25	1,800	0.28%	45
25	7,200	1.11%	180
25	21,600	3.32%	540
25	43,200	6.65%	1,080
25	86,400	13.30%	2,160

While the details of the stormwater catchment areas will be determined at the detailed design stage it is expected that the overall developed site will be >13.3%. In summary, there will be sufficient catchment areas to generate the volumes of water required for up to FW6 firefighting storage volume.

8.4.3. Wastewater Volumes

Wastewater generated from within the development will be treated using a BioGill system. The treated wastewater will be discharge to land either directly or via a storage system. Discharge to land will require consents from Canterbury Regional Council. These will be sought as part of the project. SPSC will be able to demonstrate that the effects on the environment are less than minor.

The stored water will be used for irrigation and other non-potable uses around the site. Table 8 below provides conservative estimates of the possible effluent flows and volumes generated within the proposed development that will potentially be available for non-potable uses.

Table 8 – Wastewater Flow and Volume Generation

Source	No. of persons	Generation (L/p/day)	Daily Flow Generated (m^3/day)	Days of Use/Year	Annual Volume (m^3)
Wastewater Estimates with No Events During the Year					
Sports Campus Residents	250	130	32.5	350	11,375
Staff	50	30	1.5	350	525
Equestrian Centre - Day Visitors	100	65	6.5	350	2,275
Motel (24 units x 2pp/unit)	48	220	10.56	265	2,798
Totals	**448**		**51.06**		**16,973**
Wastewater Estimates with - 8 Events/Year					
Sports Campus Residents	250	130	40	350	11,375
Staff	50	30	2.5	350	525
Equestrian Centre - Event Days	1,000	65	100	8 + 342	2,743
Motel (24 units x 2pp/unit)	48	220	12	265	2,798
Totals	**1,348**		**154.5**		**17,441**

As noted above the treated wastewater will be collected and stored. This will be used for irrigation and other non-potable sources. It should also be noted that irrigation can be provided from the attenuated stormwater. As with the discharge of wastewater to land, consents to discharge treated stormwater to land will also be sought as part of the project consenting programme.

While there will be sufficient water for onsite use, if it becomes necessary the non-potable water uses can be scaled back e.g. the frequency of irrigation can be reduced or the volume of water used for cleaning can be cut back.

9. Summary and Conclusions

9.1. Summary

The proposed development's water supply requirements will be taken from the existing network in Archibald Street in Tinwald. There is sufficient capacity in the Council network to supply the development and also provide some redundancy to the Lake Hood and Huntingdon developments.

ADC has confirmed that depending on costs it may want the new pipe to be sized to include the redundancy flows. The Council would pay for the costs associated with increasing the pipe size above what the development requires.

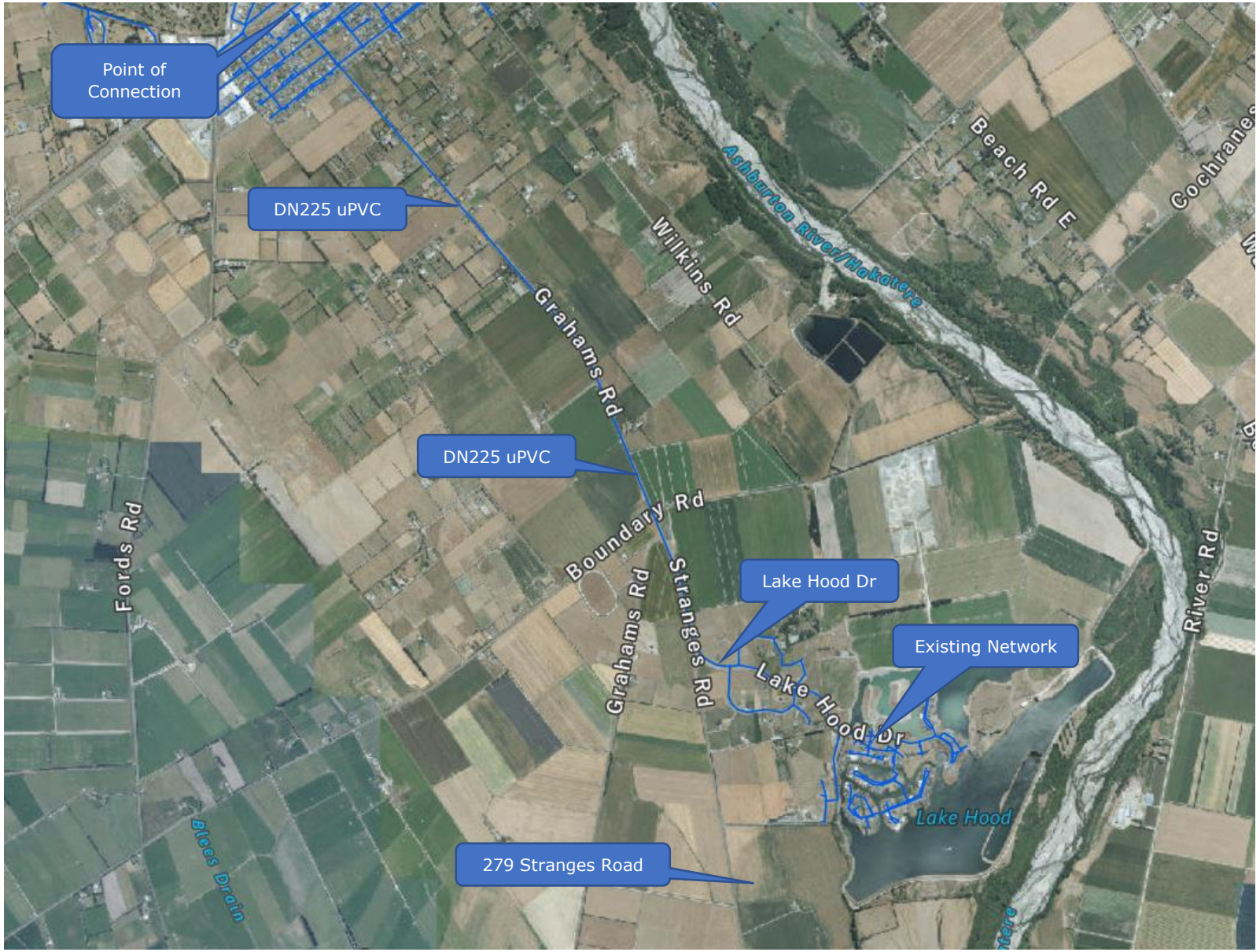
The new pipe will run along Grahams Road and then onto Stranges Road terminating at a flow meter at the 279 Stranges Road frontage. A pipe from the meter into the development will supply the internal reticulation.

Water for non-potable uses (firefighting, irrigation, cleaning etc) will be sourced from storage of treated wastewater and stormwater. There will be sufficient volumes generated to provide for the non-potable uses.

9.2. Conclusions

This report has demonstrated that the proposed development will be able to be supplied with potable water and non-potable water. There is sufficient capacity in the Council network to provide the required drinking water demands. Sufficient storage will be provided to capture and store stormwater and treated wastewater.

ATTACHMENT 1 – EXISTING WATER SUPPLY NETWORK


Point of Connection
DN225 uPVC
DN225 uPVC
Lake Hood Dr
Existing Network
279 Stranges Road
Grahams Rd
Wilkins Rd
Boundary Rd
Stranges Rd
Grahams Rd
Fords Rd
Beach Rd E
River Rd
Lake Hood Dr
Lake Hood
Blees Drain
Ashburton River/Hakatere

ATTACHMENT 2 – CORRESPONDENCE WITH ADC

ATTACHMENT 3 – PIPE SIZING AND RESIDUAL PRESSURE ESTIMATES

SPSC Development Flows Only During Non-Event Days

PHD (L/s)	Pipe Dia (mm)	Pipe Length (m)	Head Loss (m)	Head Loss (m/1 km)	Total Losses (Head Loss x 20%) (m)	Pressure at Connection Point (kPa)	Approx Elevation Drop (m)	Pressure at 279 Stranges (kPa)
7.47	125 uPVC	6,700	16.13	2.4	19.4	420	-30	526
7.47	150 uPVC	6,700	8.49	1.3	10.2	420	-30	618
7.47	175 uPVC	6,700	2.85	0.4	3.4	420	-30	686
7.47	200 uPVC	6,700	1.63	0.2	1.8	420	-30	702
7.47	225 uPVC	6,700	0.98	0.1	1.1	420	-30	709

SPSC Development Flows Only During Event Days

PHD (L/s)	Pipe Dia (mm)	Pipe Length (m)	Head Loss (m)	Head Loss (m/1 km)	Total Losses (Head Loss x 20%) (m)	Pressure at Connection Point (kPa)	Approximate Elevation Drop (m)	Pressure at 279 Stranges (kPa)
17.88	175 uPVC	6,700	13.4	2.0	16.1	410	-30	549
17.88	200 uPVC	6,700	7.64	1.1	9.2	410	-30	618
17.88	225 uPVC	6,700	4.61	0.7	5.1	410	-30	659
17.88	250 uPVC	6,700	2.68	0.4	2.9	410	-30	681

SPSC Development Flows + 100% ADC Redundancy Flows - During Non-Event Days

PHD (L/s)	Pipe Dia (mm)	Pipe Length (m)	Head Loss (m)	Head Loss (m/1 km)	Total Losses (Head Loss x 20%) (m)	Pressure at Connection Point (kPa)	Approximate Elevation Drop (m)	Pressure at 279 Stranges (kPa)
30.47	200 uPVC	6,700	19.65	2.9	23.6	375	-30	439
30.47	225 uPVC	6,700	11.86	1.8	14.2	375	-30	533
30.47	250 uPVC	6,700	6.9	1.0	7.6	375	-30	599
30.47	300 uPVC	6,700	4.24	0.6	4.7	375	-30	628

SPSC Development Flows + 89% ADC Redundancy Flows - During Non-Event Days

PHD (L/s)	Pipe Dia (mm)	Pipe Length (m)	Head Loss (m)	Head Loss (m/1 km)	Total Losses (Head Loss x 20%) (m)	Pressure at Connection Point (kPa)	Approximate Elevation Drop (m)	Pressure at 279 Stranges (kPa)
38.33	200 uPVC	6,700	29.51	4.4	35.4	350	-30	296
38.33	225 uPVC	6,700	17.82	2.7	19.6	350	-30	454
38.33	250 uPVC	6,700	10.37	1.5	11.4	350	-30	536

SPSC Development Flows + 100% ADC Redundancy Flows - During Non-Event Days

PHD (L/s)	Pipe Dia (mm)	Pipe Length (m)	Head Loss (m)	Head Loss (m/1 km)	Total Losses (Head Loss x 20%) (m)	Pressure at Connection Point (kPa)	Approximate Elevation Drop (m)	Pressure at 279 Stranges (kPa)
40.88	200 uPVC	6,700	33.08	4.9	39.7	350	-30	253
40.88	225 uPVC	6,700	19.97	3.0	22.0	350	-30	430
40.88	250 uPVC	6,700	11.62	1.7	12.8	350	-30	522