BEFORE THE QUEENSTOWN LAKES DISTRICT COUNCIL

IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	Plan Change 54 – a Request for a private plan change to the Queenstown Lakes District Council Operative District Plan by Northlake Investments Limited

---

STATEMENT OF EVIDENCE OF ALEX TODD

INFRASTRUCTURE

Dated: 9 July 2023

Counsel:
Warwick Goldsmith, Barrister
20 Cheltenham Road, Devonport, Auckland 0624
m + 64 021 220 8824
warwickgoldsmith@gmail.com

Introduction

1 My full name is Alexander Graham Todd.

2 I hold the following qualifications:

a. Bachelor of Science – University of Otago;

b. Bachelor of Surveying (Distinction) - University of Otago;

c. Post Graduate Certificate in Project Management - Curtin University.

3 I hold the following professional memberships:

a. Full member - Survey and Spatial New Zealand (formerly known as the New Zealand Institute of Surveyors);

b. Full member - Consulting Surveyors of New Zealand.

4 I am currently employed by Paterson Pitts Limited Partnership as a Principal in the Wanaka office. I am responsible for overseeing the planning, design, construction and completion of several large greenfield developments in Wanaka. I have been in this role since September 2014 (9 years) initially as a Senior Surveyor, then as a Principal, but essentially this is the same work.

5 I previously worked for another surveying company in Wanaka (Clark Fortune McDonald & Associates) from the time I graduated in 2004 up to March 2011 (6.5 years).

6 I have also spent time working in Western Australia (March 2011 – September 2014, 3½ years) for AAM Group and Survey Group. These roles involved major construction works for resource expansion projects.

7 Overall, I have worked in Wanaka on land development projects for approximately 15 years.

8 In this time, I have been involved with various projects, the most recent of which include Meadowstone Stage 9, Meadowstone Alpha

Series, Northlake (all stages to date post PC45), Alpine Estate and Pembroke Terrace.

Code of Conduct

9 Although this is a Council hearing, I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving evidence.

10 Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

Scope of Evidence

11 My evidence is presented on behalf of Northlake Investments Limited (`**Northlake**), the Requestor in these proceedings.

12 In preparing my evidence, I have reviewed:

a. The specialist reports appended to the Paterson Pitts Group Infrastructure Report which formed part of the PC54 Request.

b. The relevant parts of the Queenstown Lakes District Council Operative District Plan.

c. The relevant parts of the Council Section 42A Report, with particular reference to the accompanying assessments by:

i. Richard Powell – Infrastructure;

ii. Beca – Stormwater.

13 Subject to any points of difference, clarification or addition detailed below, my evidence for this hearing comprises:

a. the Paterson Pitts Group Infrastructure Report dated February 2022 which formed part of the PC54 Request;

b. the relevant parts of the Section 42A Report which I agree with and adopt, other than as stated below;

c. this evidence.

14 My evidence does not address stormwater.

Executive Summary

15 The proposed amendments to the Northlake Special Zone Structure Plan will approximately yield an additional 63 residential lots.

16 The technical aspects of stormwater and water supply have been assessed and report on by Fluent Solutions Limited. I defer to their expertise on these matters.

17 I stated in my original infrastructure report that the wastewater modelling requested from QLDC's modellers was not available at that time. I did however conclude that it was likely that there was sufficient capacity within the existing network to accommodate the additional residential lots being requested.

18 We have since received a wastewater modelling report from Hydraulic Analysis Limited (via QLDC). This report supports the conclusions stated in the infrastructure report and in itself concludes there is sufficient capacity within the existing infrastructure to accommodate the additional residential lots being requested. A copy of this report is attached.

19 I have read the statement of evidence prepared by Marc Bretherton. I am very familiar with the Northlake reservoir and water supply project having been involved with the design, construction, evolution and final implementation of the Developer Agreement relating to this project. I agree with Mr Bretherton's evidence in all respects.

Points Of Difference/Clarification/Addition

20 I have read the evidence of Richard Powell which includes the following statement:

> *"we would require the 'high level' reservoir to be raised to enable it to provide adequate pressures or a secondary higher reservoir will need to be included to supply the upper areas."*

21 With regard to the above paragraph, I note that when the position for the current reservoir was chosen, multiple options were assessed and considered. This assessment focussed on the following key aspects:

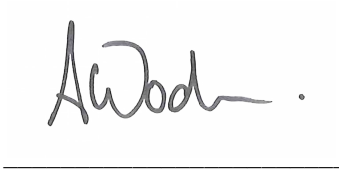
(a) Respecting the natural topography and in particular the ridgeline above the current reservoir location which is very visible from the north

(b) Forming a large enough pad for the reservoir to sit on. This had to be either all fill or all cut. It could not be a mixture of cut and fill.

(c) Keeping the pad level high enough to service as large an area as possible.

22 A lot of thought went into the chosen location for the reservoir, so to suggest that this can simply be 'raised' suggests a lack of understanding of what would be involved and, more importantly, other options to deal with the situation.

23 I agree with Mr Bretherton's evidence with regards to using a booster pump to supply potable water to the highest part of Activity Area B6. A connection booter pump for this has already been allowed for in the pipe work constructed at the existing Northlake reservoir.



Alexander Graham Todd

9 July 2023

QUEENSTOWN LAKES DISTRICT COUNCIL

NORTHLAKE
DEVELOPMENT IMPACT ASSESSMENT

FEBRUARY 2022

HAL HYDRAULIC ANALYSIS LIMITED

QUALITY SECTION

AUTHOR

Name	Title	Organisation	Signature
Sherine Sathiasothy	Experienced 3-Waters Engineer	Hydraulic Analysis Ltd	

REVIEWED

Name	Title	Organisation	Signature
Brian Robinson	Director	Hydraulic Analysis Ltd	

REVISION HISTORY

Revision	Publication Date
Draft	3 February 2022

CONTENTS

1. INTRODUCTION

1.1. OBJECTIVE

The objective of this study is to utilise the existing hydraulic model (Wanaka Wastewater Model with HAL updates, 2018) of the Wanaka wastewater network to assess the impact of the proposed Northlake development on the wastewater network. The current population (2015) scenario has been used for this assessment.

1.2. BACKGROUND

The Northlake development site is located at the northern end of Wanaka catchment, adjacent to Clutha River and is currently zoned as 'Northlake Special Zone'. The development infrastructure assessment request seeks approval for subdivision and development of the existing vacant site into 130 dwellings/lots.

The developer has proposed a discharge point just downstream of the development site, but the connecting wastewater pipeline is outside the Wanaka Wastewater network in the model. Therefore, a downstream point (Node ID SM101911) on the wastewater pipeline running parallel to Aubrey Road has been chosen for the purpose of this assessment.

2. SCOPE

The following tasks have been undertaken as part of this assessment:

- Calculation of design flows for Northlake development
- Assessment of the Northlake development impact on the existing network for the current (2015) development scenario

Each of these tasks is discussed in more detail in the following sections.

3. NORTHLAKE DEVELOPMENT – DESIGN FLOWS

3.1. OVERVIEW

The Northlake development proposal seeks approval for subdivision of an existing vacant site into 130 dwellings. The location of the development site with the proposed discharge point is shown in Figure 3-1 below.

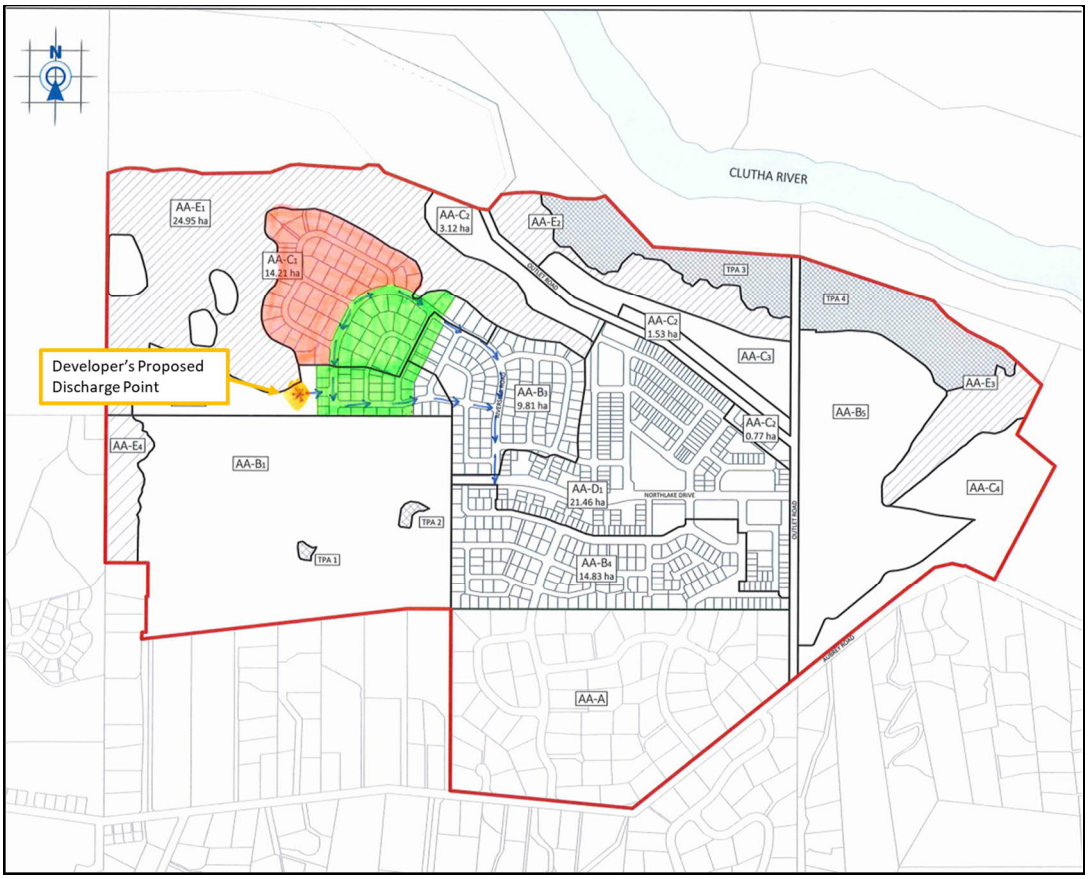


Figure 3-1 Northlake Development Site location

The developer's proposed discharge point and the connecting wastewater pipeline are outside the Wanaka Wastewater network model, hence a downstream point (Node ID SM101911) on the wastewater pipeline running parallel to Aubrey Road has been chosen for the purpose of this assessment. This is a gravity line that flows to the Albert Town #2 WWPS (076 Main WWPS) about 3km from the point of discharge and eventually to the Wanaka Wastewater Treatment Plant. The detailed location of the proposed development and the discharge point used for the purpose of this assessment are shown in the figure below.

This assessment is based on expected flows resulting from a traditional gravity system servicing the development.

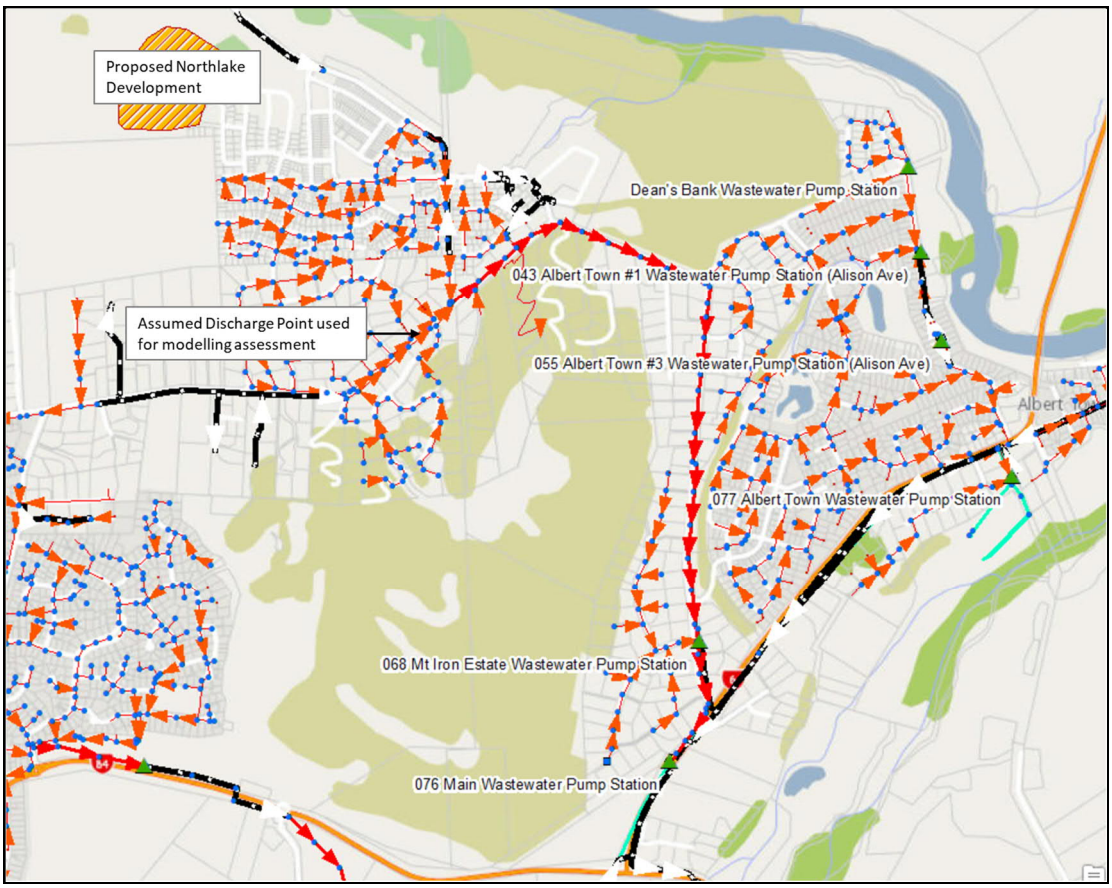


FIGURE 3-2 NORTHLAKE DEVELOPMENT PROPOSED WASTEWATER CONNECTION

3.2. DEVELOPMENT DESIGN FLOWS

The design wastewater flows have been calculated using the QLDC 'Land Development and Subdivision Code of Practice', which assumes an average dry weather flow of 250 litres/person/day, a dry weather diurnal peaking factor of 2.5, and a wet weather dilution/infiltration factor of 2 (i.e. a peak wet weather flow (PWWF) of 5x average dry weather flow (ADWF)).

The Northlake development proposal seeks to develop 130 residential dwellings and with an assumed occupancy of 3 people per dwelling. The design PWWF equates to 5.64 l/s and the details of the calculation are shown in

Table 3-1 below.

TABLE 3-1: NORTHLAKE DEVELOPMENT DESIGN FLOWS

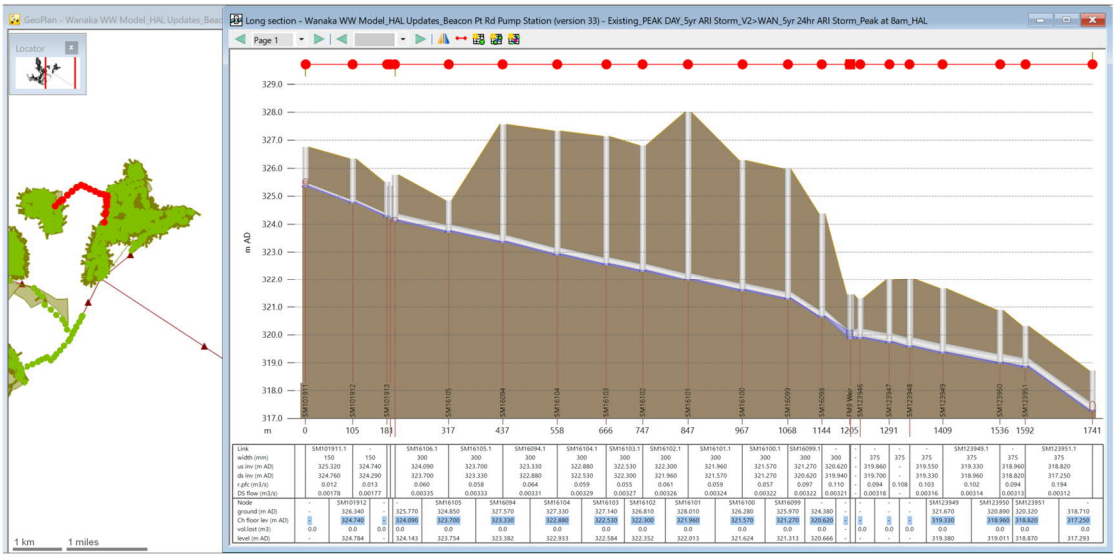
	Residential Lots
No. of Units	130
Occupancy	3
Population	390
ADWF (l/p/day)	*250*
ADWF (l/s)	1.13 l/s
DWF Peaking Factor	*x2.5*
PDWF (l/s)	2.82 l/s
WWF Peaking Factor	*x2*
PWWF (l/s)	5.64 l/s

4. NORTHLAKE DEVELOPMENT IMPACT ASSESSMENT

4.1. PRE-DEVELOPMENT SCENARIO

The existing Wanaka wastewater model (with 2018 HAL updates) was run under the current (2015) population scenario, without the proposed Northlake development. A monthly seasonal DWF profile was applied to the model to represent increased visitor numbers during peak periods, with a maximum peaking factor of 1.1x calibrated DWF over the Dec/Jan period. The network was assessed against a 5-year ARI design storm.

As shown in the Figure 4-1 long section below, the existing 150, 300 and 375mm local wastewater network from the discharge point to Albert Town #2 WWPS (076 Main WWPS) shows no evidence of pipe surcharge or uncontrolled manhole overflows.



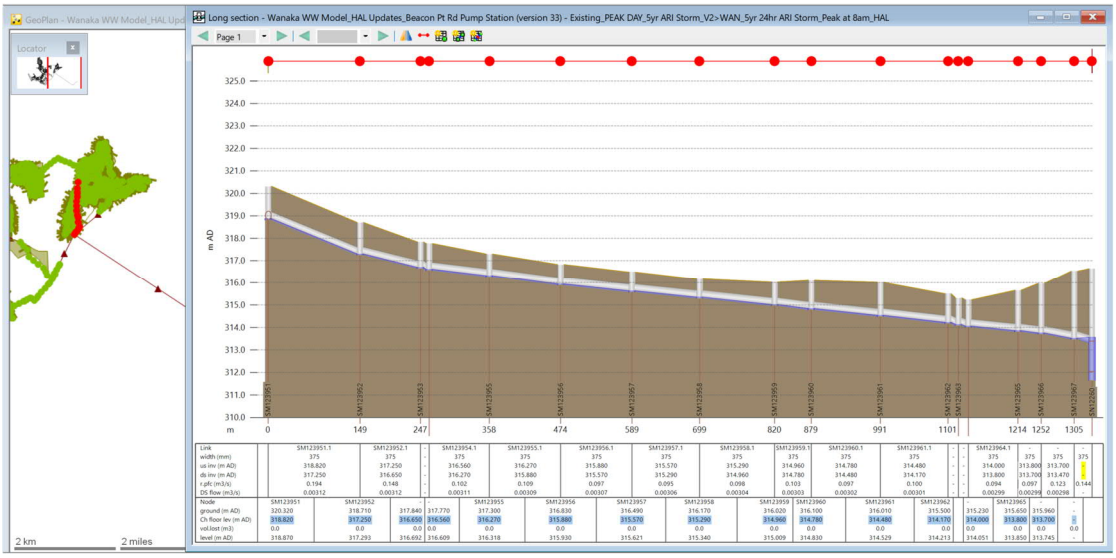


FIGURE 4-1 EXISTING (2015) LONG-SECTION – 5 YEAR ARI DESIGN STORM

It should be noted that this area is understood to be being currently/recently developed, so the currently modelled flows (based on the 2015 calibration) may not be an accurate representation of current flows. However, as part of the recently undertaken Queenstown Wastewater Master Plan undertaken by Morphum/HAL), future growth scenarios were assessed which considered significant growth in this area, and which didn't identify any constraints in the local network.

4.2. POST-DEVELOPMENT SCENARIO

The Wanaka wastewater model (with 2018 HAL updates) was run under the current (2015) population scenario, with the additional peak wet weather flow of 5.64 l/s from the proposed Northlake development. The flow was added in as a direct gravity connection to Manhole ID: SM101911. The development impact was assessed against a 5-year ARI design storm to understand the performance of the network.

As shown in the Figure 4-2 long section below, in the post-development scenario, the existing 150, 300 and 375mm local wastewater network from the discharge point to Albert Town #2 WWPS (076 Main WWPS) shows no evidence of pipe surcharge or uncontrolled manhole overflows, indicating sufficient capacity within the network to convey the additional PWWFs from the proposed development site.

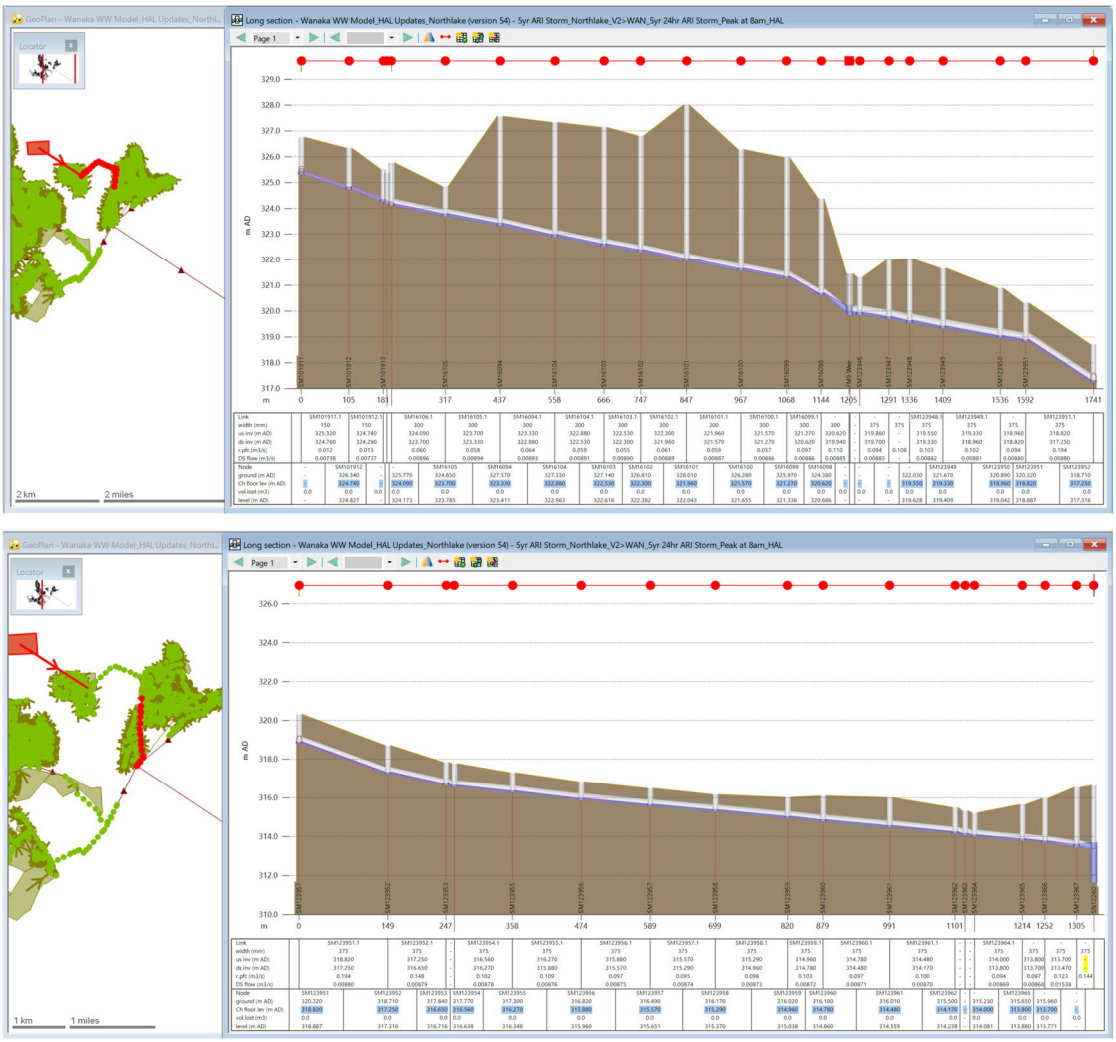


FIGURE 4-2 NORTHLAKE (5.64 L/S) LONG-SECTION – 5 YEAR ARI DESIGN STORM

4.3. REPORTED OVERFLOWS ALONG NORTHLAKE

QLDC's reported overflow database has been reviewed for evidence of existing capacity issues. The database shows one wet weather event which according to the GIS records is off Aubrey Road and is within the vicinity of the proposed development site but not along the downstream network of the site. The detailed location of the reported wet weather incident is shown in the figure below:

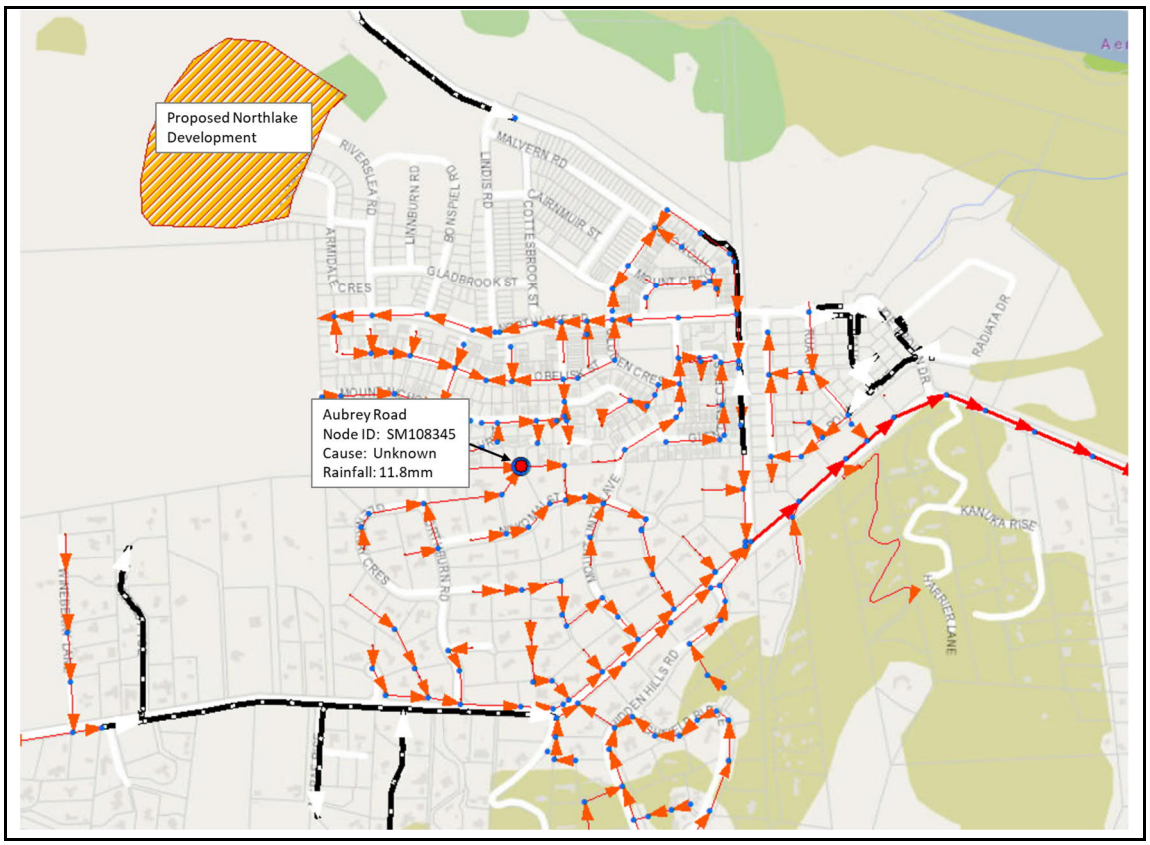


FIGURE 4-3 OVERVIEW OF REPORTED OVERFLOW INCIDENT LOCATIONS

4.4. ALBERT TOWN #2 WWPS (076 MAIN WWPS) ASSESSMENT

The local 375mm trunk wastewater line, running parallel to Aubrey Road, flows south-east, discharging via gravity to the Albert Town #2 WWPS (076 Main WWPS), which receives flows from all of Wanaka and Alberttown. The Albert Town #2 WWPS has a maximum capacity of 208 l/s (based on QLDC records).

The pre-development scenario simulates a peak inflow rate of approximately 316 l/s during the 5-year design storm. With the proposed Northlake development PWWF of 5.64 l/s added into the model, in the post development scenario a peak inflow rate of approximately 319 l/s is simulated in the 5-year design storm.

In both pre-development and post-development scenarios, the modelled flows exceed the pump station capacity, however, there is no evidence of overflows in the vicinity of the network due to the buffering provided to high wet weather flows by the storage in the network. Hence, it can be concluded that the Albert Town #2 WWPS (076 Main WWPS) has adequate capacity to receive the additional Northlake development flows without any upgrades required.

It should be noted that future upgrade options for Albert Town #2 WWPS (076 Main WWPS) have been identified in the 'QLDC Wastewater Master Plan 2020' report. It is classified as a

Priority 1 project in the 10 year LTP programme and the capacity of the pump station will be upgraded from 208 L/s to approximately 400 L/s.

Modelled inflows and outflows for the post-development scenario are shown in Figure 4-4 below.

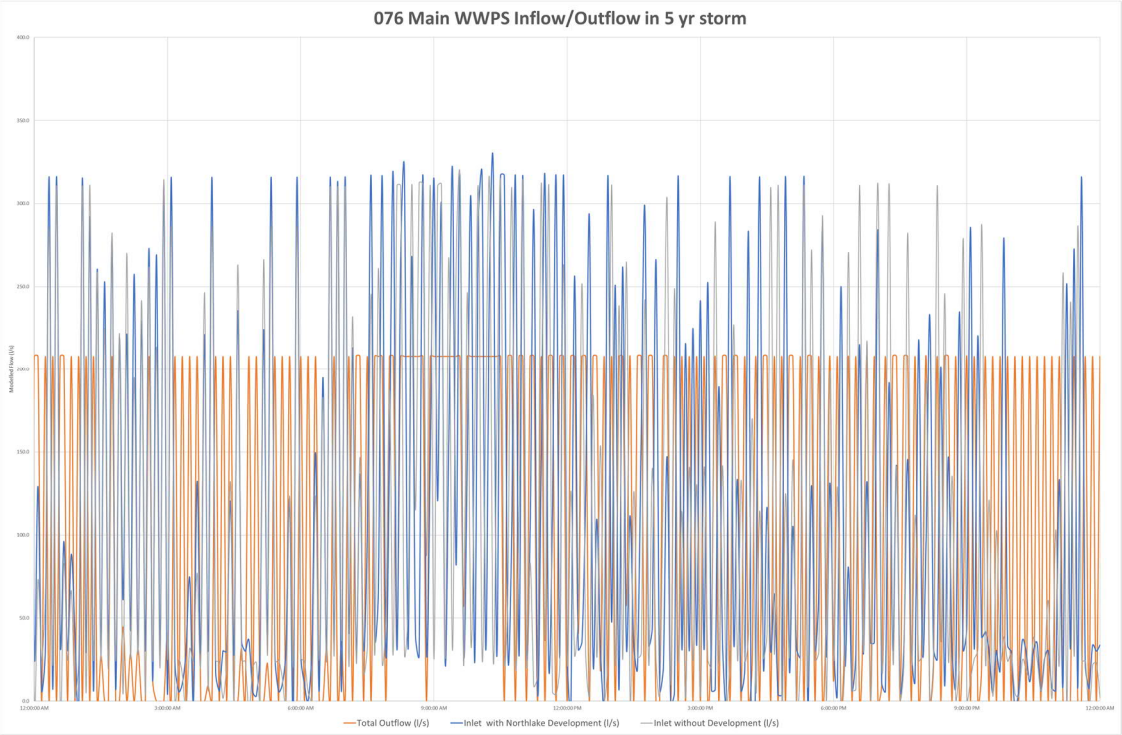


FIGURE 4-4 MODELLED 077 ALBERT TOWN WWPS FLOWS – 5 YEAR ARI DESIGN STORM

4.5. THEORITICAL VS. MODELLED WASTEWATER FLOWS FOR EXISTING SCENARIO

Theoretical assessment of the downstream wastewater pipeline was undertaken as per QLDC 'Land Development and Subdivision Code of Practice' to ensure the network downstream from the developer's proposed discharge point to the modelled discharge point has sufficient pass forward capacity.

The area under consideration for the theoretical assessment is highlighted in Figure 4-5 below.

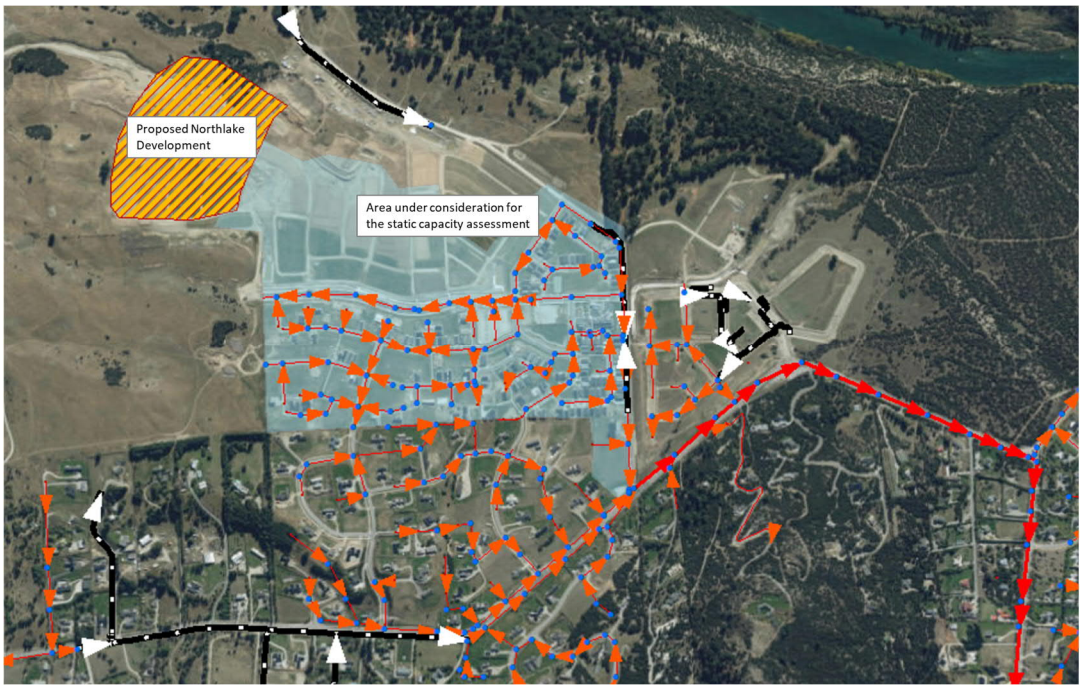


FIGURE 4-5 OVERVIEW OF AREA CONSIDERED FOR EXISTING DESIGN FLOW CALCULATION

The details of the calculation are shown in the table below.

TABLE 4-1: NORTHLAKE DEVELOPMENT CAPACITY ASSESSMENT

Enter US Manhole ID (Compkey)	Enter DS Manhole ID (Compkey)	U/S Manhole Invert	D/S Manhole Invert	Enter Pipe Length	Enter Diameter e.g. 0.150	Calculation				Enter Incoming Flow	Calculation	Check
From	From_Invert	To	To_Invert	Length	Dia (m)	Slope	Area (m2)	Hydraulic R. (m)	Pipe Capacity (l/s)	Incoming Flow (l/s)	Capacity - Income	Check
SM160944	336.03	SM160943	335.13	103	0.3	0.87%	0.071	0.075	90.43	5.84	84.59	OK
SM160943	335.13	SM160942	333.56	92	0.3	1.71%	0.071	0.075	126.37	5.84	120.53	OK
SM160942	333.56	SM160941	333.09	41.1	0.3	1.14%	0.071	0.075	103.45	6.95	96.50	OK
SM160941	333.09	SM160940	333.01	10.3	0.3	0.78%	0.071	0.075	85.26	7.25	78.01	OK
SM160940	333.01	SM160939	332.11	68.5	0.3	1.31%	0.071	0.075	110.89	7.48	103.41	OK
SM160939	332.11	SM160938	331.34	48.7	0.3	1.58%	0.071	0.075	121.64	7.48	114.16	OK
SM160938	331.34	SM160937	330.38	48.1	0.3	2.00%	0.071	0.075	136.67	8.50	128.17	OK
SM160937	330.38	SM159261	329.35	50.5	0.3	2.04%	0.071	0.075	138.16	12.65	125.51	OK
SM159261	329.35	SM159264	326.09	234.2	0.3	1.39%	0.071	0.075	114.14	12.65	101.49	OK
SM159264	326.09	SM144854	325.82	88.9	0.3	0.30%	0.071	0.075	53.31	13.00	40.31	OK
SM144854	325.82	SM81073	325.8	11.3	0.3	0.18%	0.071	0.075	40.70	14.90	25.80	OK
SM81073	325.8	SM144855	325.5	109	0.3	0.28%	0.071	0.075	50.75	15.20	35.55	OK
SM144855	325.5	SM139239	325.09	121.4	0.3	0.34%	0.071	0.075	56.22	15.20	41.02	OK
SM139239	325.09	SM101914	324.2	99.5	0.3	0.89%	0.071	0.075	91.49	15.20	76.29	OK

From the above results, it can be concluded that the wastewater network downstream of the developer's proposed discharge point to the modelled discharge point has sufficient pass forward capacity to convey the post-development peak flows.

5. MODEL ASSUMPTIONS AND LIMITATIONS

The model assumptions should be read in conjunction with the following reports.

- 'Wanaka Wastewater Model Build & Calibration Report' (Beca, August 2016)
- 'Wanaka Wastewater Network Future System Performance Report' (Beca, August 2017)
- 'Wanaka Wastewater Model Review & Update – High & Medium Priority Fixes Memo' (HAL, 2018)
- Wastewater Master Plan report (Morphum, 2020)

The following limitations apply to the modelling undertaken as part of these studies:

- The model was originally calibrated against flows developed from field data collected in 2015 supplemented by QLDC pump station SCADA data. The 2018 model review undertaken by HAL has determined only a medium degree of confidence in the accuracy of the model. Additional flow gauging is currently underway and model re-calibration is proposed to follow..
- The distribution of the modelled population is an approximation based on the 2013 census residential population, factored up for a high population scenario. No allowance has been made for additional growth since 2013, other than known development areas.
- Modelled network asset data for manholes and pipes is generally as provided in the BECA calibration model, and its origin is not clear. Manhole and pipe level data has not been validated against QLDC's GIS, as-builts or survey data as part of this assessment, or as part of the HAL model review/update. Where potential network constraints are identified, it is recommended asset data in these areas is confirmed through manhole survey.
- Pump station model parameters have been determined based on information provided by the QLDC planning team, SCADA data (where available) and pump station manuals, and the accuracy has not been validated as part of these studies.
- This assessment focuses on the wastewater network downstream of the site and does not consider sizing of infrastructure within the proposed site to service future development upstream of the site.
- It has been assumed that no existing overarching structure plan has been developed by QLDC for servicing this area.
- The impact of expected flows on the WWTP has not been considered as part of this assessment.

6. CONCLUSION

The objective of this study was to utilise the existing hydraulic model of the Wanaka wastewater network to assess the impact of the proposed Northlake development. The development proposes to create 130 lots within a greenfield site.

The model was run under the current (2015) scenario, with the additional peak wet weather flows of 5.64 l/s from the Northlake development added into the model at MH ID: SM101911 on Aubrey Road. The development impact on the wastewater network was assessed against a 5-year ARI design storm to understand the performance of the local network with the development flows.

During the post-development scenario, the existing local wastewater pipeline immediately downstream of the modelled discharge point shows no evidence of pipe surcharge or uncontrolled manhole overflows, indicating sufficient pass forward capacity within the network.

The Albert Town #2 WWPS (076 Main WWPS) has a maximum capacity of 208 l/s (based on QLDC records). The pre-development scenario simulates a peak inflow rate of approximately 316 l/s during the 5-year design storm. With the proposed Northlake development PWWF of 5.64 l/s added into the model, in the post development scenario a peak inflow rate of approximately 319 l/s is simulated in the 5-year design storm.

In both pre-development and post-development scenarios, the modelled flows exceed the pump station capacity, however, there is no evidence of overflows in the vicinity of the network due to the buffering provided to high wet weather flows by the storage in the network. Hence, it can be concluded that the Albert Town #2 WWPS (076 Main WWPS) has adequate capacity to receive the additional Northlake development flows without any upgrades required.

It should be noted that future upgrade options for Albert Town #2 WWPS (076 Main WWPS) has been identified in the 'QLDC Wastewater Master Plan 2020' report. It is classified as a Priority 1 project in the 10 year LTP programme and the capacity of the pump will be upgraded from 208 L/s to approximately 400 L/s.

A Theoretical Assessment of the downstream wastewater pipeline was undertaken as per QLDC 'Land Development and Subdivision Code of Practice' to ensure the network downstream from the developer's proposed discharge point to the modelled discharge point has sufficient pass forward capacity and it was concluded that the wastewater network between the developer's proposed discharge point and the modelled discharge point has sufficient pass forward capacity to convey the post-development peak flows.

Hence, it is recommended that the development is approved without the requirement for any upgrade works within the local network.