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NORTHLAKE INVESTMENTS LIMITED

NORTHBROOK WANAKA APPLICATION

INFRASTRUCTURE REPORT

PROJECT:	Northbrook Wanaka – Retirement Village
PRINCIPAL:	Northlake Investments Limited
OUR REF:	W6211
DATE:	July 2020

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1. Scope

This report has been prepared to support a resource consent application for subdivision and land use activities associated with the proposed Northbrook Wanaka retirement village located in Activity Areas C2, D1 and E1 within the Northlake Special Zone.

The proposed development is for a retirement village that will accommodate all stages of aged care and mobility. Ancillary facilities are also included. The proposal includes:

- 100 apartments - consisting of a mix of 2 and 3 bed apartments located within 32 buildings
- 36 bed care pod facility
- Main entry and back-of-house (BOH) building (780m²)
- Clubhouse building (740m²) that includes the following facilities
    - Café
    - Library
    - Exercise facilities (yoga studio / gym / 10m swimming pool)

This report covers the availability of the following infrastructure elements.

- Northlake development summary
- Earthworks and geotechnical
- Stormwater
- Wastewater
- Water supply
- Network utility services (electricity and telecommunications)

A transport assessment has been prepared by Carriageway Consultants and is included as a separate appendix within the resource consent application.

2. Northlake Special Zone – Development Summary

The following information and tables provide a snapshot summary of development progress within the Northlake Special Zone since the ratification of Plan Change 45. This information is relevant when determining the capacity of and effects on Council's infrastructure.

2.1 Northlake – Completed and Under Construction Residential Stages

The proposed retirement village development sits within the wider context of the Northlake Special Zone and more specifically within the Northlake Development which has been progressively developed since early 2016. The following table identifies the number of lots completed to date and those anticipated to be completed soon.

Stage Reference	RM Number	Number of Lots	Status
Stages 1-3	RM160509	107	Complete and titles issued
Stages 4-6	RM161292	71	Complete and titles issued
Stages 8-9	RM170361	75	Complete and titles issued
Stage 8 Duplex Lots	-	20	Parent titles created and lots sold *1
Stage 10	RM180795	25	Complete and titles issued
Stage 6	RM180492	20	Complete and titles issued
Stage 1A	RM180702	10	Complete and titles issued
Stage 15	RM190505 RM190849	129 *2	RM190505 – 155 lots under construction RM190849 - Application for 20 lot subdivision lodged with QLDC but currently on hold
Stage 12 (incl. duplex lots)	RM200086	66	Under staged construction – all lots to be titled by Q2 2021
TOTAL LOTS		523	

Table 1: Summary of Northlake lots completed and titled to date and/or under construction

**1 The Stage 8 duplex parent lots have been titled and sold as part of the Stage 8 development. Ownership is currently with multiple owners so for the purposes of this report we will assume that these lots have been further subdivided.*

**2 RM190515 granted subdivision consent for 155 residential lots however the land area for 26 of these lots is now part of the current proposal therefore the actual number of residential lots that will be created on completion of Stage 15 is 129.*

2.2 Northlake – Village Centre

The following table summarises the village centre lots at Northlake that were created as part of Stage 2 (RM160509). These lots are now completed i.e. the underlying subdivision work is complete and the lots are titled. The subsequent commercial development on these lots is at varying stages of concept / consenting / construction.

Lot Reference	Land Area (ha)	Status
Lot 1 DP 523922 (Offices)	0.0404	Complete
Lot 2 DP 523922 (Childcare)	0.1178	Complete
Lot 3 DP 523922 (Café / Bar)	0.0849	Complete
Lot 1006 DP 515015	0.4580	-
Lot 1005 DP 515015 (Hotel)	0.6004	Consented
TOTAL LAND AREA	**1.3015**	

Table 2: Summary of Northlake Village Centre Development

2.3 Northlake – Future Development Stages (Residential)

The following table summarises the future residential development at Northlake. Note that this is conceptual only at this time and no consents have been applied for.

Stage Reference (concept only)	Number of Lots	Status
Stage 14 (incl. duplex lots)	49	ODP consent granted. Subdivision consent to be lodged Q3 2020.
Stage 15f	7	ODP consent granted. Subdivision consent to be lodged Q3 2020.
Stage 16	56	Concept
Stage 17	46	Concept
Stage 18	95	Concept
TOTAL LOTS	**253**	

Table 3: Summary of residential lots within Northlake that have ODP concept or are at the concept stage

2.4 Other Developments within the Northlake Special Zone

The following table summarises the other development anticipated within the Northlake Special Zone. Note that these developments are at varying stages of completion and the information presented below is based on publicly available information (QLDC eDocs on-line database)

Stage Reference	RM Number	Number of Lots	Status
Urquhart & Others	-	23	No consenting progress – Lot number based on max yield for this Activity Area (plus 15%)
Allenby Farms Limited	RM161292	354	ODP Issued – RM180502
Hikuwai: Stage 1-3	RM170797	78	Complete and titles issued
Hikuwai: Future	RM170797	14	Future stage – timing unknown
Hikuwai: Future	RM200355	108	Future stage – timing unknown
TOTAL LOTS		577	

Table 4: Summary of residential lots by other developers within the Northlake Special Zone

2.5 Northlake Special Zone – Current Snapshot

The following table identifies the total number of residential lots that have either been completed and titled or are currently under construction.

Development Reference	Number of Lots	Comments
Northlake – completed and titled	328	Includes allowance for duplex lots
Northlake – under construction	195	Staged completion with expected completion date for all lots Q2 2021
Hikuwai – completed / titled	78	
TOTAL LOTS	601	

Table 5: Summary of all NLSZ lots either completed or under construction

3. Proposed Infrastructure

3.1 General

It is proposed that all infrastructure for the Northbrook Wanaka development will be designed in accordance with the QLDC Land Development and Subdivision Code of Practice 2018 (LDSCoP), the current version of which is v1.1.

3.2 Ownership of Infrastructure Assets

The proposal is that most infrastructure assets within the development site i.e. west of the Lindis Road legal road corridor and south of the Outlet Road legal road corridor, will be retained in private ownership. This applies to the following asset categories.

- Roading
  - Road A
  - Road B
  - Accessways A – F inclusive
- Wastewater
- Stormwater – reticulated network only.
- Water supply

It is expected that the ownership of electrical and telecommunications assets will be retained by the respective utility providers i.e. Electricity Southland Limited and Chorus NZ Limited.

Outlet Road is an existing QLDC asset and whilst it is proposed to upgrade a section of this road as part of the development it is expected that these upgrades will be vested with QLDC on completion of the works.

4. Earthworks and Geotechnical Investigations

4.1 Relevant Existing Consents

Stage 1 Works – Activity Area C2

Refer to the Sheet RC.2.3 of the architectural detail included with this application which shows the extents of Stage 1 in Activity Area C2.

The Stage 1 area has to date been used as a construction laydown area and for the purposes of managing environmental effects created by the construction works e.g. there are several large sediment detention ponds currently located within this area.

The Stage 1 area has not been extensively modified by earthworks like much of the rest of the developable area within Northlake. Works have been limited to stripping and mounding topsoil, maintaining laydown areas and construction roads, the construction and maintenance of sediment detention ponds and for the stockpiling of materials (topsoil and surplus fill material).

Recently, RM200167 granted land use consent for earthworks covering several areas of the Northlake balance land including the Stage 1 area of the current proposal. These works have not yet been implemented however the design surface / contours approved under this consent have been adopted as the starting point for the earthworks currently proposed in the Stage 1 area of this resource consent application.

Stage 2 Works – Activity Area D1

Refer to the Sheet RC.2.3 of the architectural detail included with this application which shows the extents of Stage 2 in Activity Area D1.

The Stage 2 works area has been the subject of several previous consents.

RM171190 granted land use consent for extensive bulk earthworks across much of the Northlake site including the Stage 2 area. The purpose of these earthworks was to re-contour the land in preparation for medium density type of development required in Activity Area D1.

RM190515 granted subdivision consent for Northlake Stage 15. The earthworks component of this consent has now been implemented and the necessary Geotechnical Completion Reports and fill certifications have been completed. The finished and current surface / contours approved under this consent have been adopted as the starting point for the earthworks currently proposed in the Stage 2 area of this resource consent application

Lot 66 DP371470 and Lot 68 DP371470

RM200387 granted consent for earthworks within both Lot 66 DP371470 and Lot 68 DP371470. The land subject this consent is not part of the subject site and this resource consent application does not propose to vary the scope of this consent. This consent is only relevant in terms enabling the stormwater basin required for the disposal of stormwater from the proposed development. Further details relating to stormwater are outlined in the stormwater section later in this report.

4.2 Proposed Earthworks

The earthworks proposed by this application are detailed on the plans included with this report as **Appendix 1**. The following information is supplied:

- Existing contours – These contours reflect the contour of the land today excluding material stockpiles and some existing environmental management features.
- Contours as consented under RM200167 and RM190505 – these consented earthworks have been adopted as the starting point for the earthworks being applied for as part of this consent.
- Proposed contours
- Cut / fill contours
- Cross sections

The earthworks quantities are summarised on **Appendix 1** Sheet 104 and in Table 6 below.

Proposed Earthworks Quantities	
Area of earthworks	4.9ha (49,000m²)
Maximum depth of cut	4.0m
Maximum depth of fill	2.0m
Strip topsoil to stockpile	7,600m³
Cut to fill	24,600m³
Respread topsoil from stockpile	2,500m³
Stockpile topsoil on site for future use	5,100m³
TOTAL EARTHWORKS QUANTITY	39,800m³

Table 6: Proposed earthworks quantities

4.3 Preliminary Geotechnical Report

A preliminary geotechnical report has been prepared by Geosolve Limited and is included with this infrastructure report as **Appendix 2**. Page 14 of the preliminary geotechnical report outlines a series of recommendations. These are listed as follows.

- *The site is underlain by surficial topsoil, uncontrolled fill, loess, colluvium and pond sediment, which overlies outwash sand and gravel and glacial till, which extends to at least 10.64 m beneath the surface of the proposed development area.*
- *Minor groundwater seepage was observed in TPs 1, 8 and 9 during site investigations; however, the regional groundwater table is expected to lie more than 10 m below the proposed foundation areas therefore it is unlikely to be encountered during earthworks.*
- *No evidence of existing slope instability has been identified on site. Earthworks plans have been developed by Paterson Pitts Group that include cuts of up to 4.0 m and engineered fills of up to 2.0 m. Assuming cut and fill slopes are implemented as per Section 5 of this report slope stability is not considered to be an issue.*
- *Bearing on the site will predominantly be governed by the outwash gravel, glacial till and engineered fill. The outwash gravel, glacial till and engineered fill will provide good bearing (100 kPa allowable), for 400 mm wide by 400 mm deep shallow footings.*
- *Foundation bearing capacity on outwash sand and colluvium or thin engineered fill overlying the same is expected to provide between half and three quarters of 'good ground' as per the recommendations of NZS3604:2011. It is recommended that additional investigations are undertaken at detailed design to confirm bearing recommendations across the site.*
- *The eastern areas of the site have had previous earthworks undertaken, which have been supervised by B F Whitham. The GCR which provides bearing capacity recommendations for these areas is attached in Appendix C.*
- *Recommendations for temporary and permanent batter slope angles are described in Table 2. Slopes that are required to be steeper than those described should be structurally retained or subject to specific geotechnical design.*
- *All retaining walls should be designed by a Chartered Professional Engineer using the geotechnical parameters recommended in Table 1 of this report.*
- *The colluvium, glacial till, outwash soils and Stage 15 certified fill are considered suitable for use as engineered fill (in accordance with an earth fill specification).*
- *Loess and pond sediment soil will need to be mixed with granular soils prior to use as an engineered fill source. Alternatively, this can be stockpiled and reused for landscaping purposes within lawn areas and bunding.*
- *Any uncontrolled/uncertified fill identified during construction should be removed and reviewed by the civil or geotechnical engineer to confirm its suitability for reuse. Any uncertified fill that is not considered suitable for reuse should be cut to waste or stockpiled for reuse in landscaping areas only.*
- *In areas where significant amounts of cobbles over 100 mm are observed the material should be blended with fine grained soil materials to create a well graded fill.*
- *All unsuitable soils identified in foundation excavations, particularly those softened by exposure to water, should be undercut and replaced with engineered fill during construction.*
- *Any fill that is utilised as bearing for foundations should be placed and compacted in accordance with NZS 4431:1989 and certification provided to that effect.*
- *For detailed design purposes it is recommended that the site is classified "Class D – Deep subsoil" in accordance with NZS 1170.5:2004 seismic provisions.*
- *A Chartered Professional Engineer should inspect all excavations, foundation subsoil, batter slopes and spring flow or under-runners that may be encountered during construction.*

None of the conclusions presented by Geosolve suggest that the proposed earthworks cannot be supported subject to further detailed design, implementation of the works following best practice and nationally recognised standards as well as appropriate supervision of the works by a suitably qualified geo-professional.

4.4 Construction Management Plan

A Construction Management Plan (CMP), that includes an Environmental Management Plan (EMP), has been prepared in accordance with the QLDC Guidelines for Environmental Management Plans (June 2019) and is supplied in draft with this infrastructure report as **Appendix 3**. This CMP/EMP will be thoroughly reviewed against any resource consent conditions and will have added inputs from a contractor once one is appointed. The revised CMP/EMP will then be submitted to Council for certification prior to the commencement of works associated with this consent.

We consider that optimal environmental management outcomes are achieved when the appointed contractor is instrumental in preparing the EMP because the contractor then has a far better understanding of the project's environmental management goals and how they will be accomplished.

The proposed works will be categorised as 'high risk' under the QLDC EMP guidelines. This is because the proposal involves

1. Area of land exposed will likely be greater than 1ha
2. Disturbed surface area open at any one time will be greater than 2500m^2
3. The glacial till soils that will be encountered are highly erodible

Accordingly, the EMP will need to be prepared by a suitably qualified and experienced person.

5. Stormwater

A stormwater assessment report has been prepared by Fluent Solutions Limited and is included with this infrastructure report as **Appendix 4**. Page 13 of the stormwater assessment report provides some conclusions from Fluent's assessment. These are summarised as follows.

- The proposed development is situated entirely within stormwater catchment B.
- The stormwater management concept for the proposed development builds on the stormwater management plan previously developed for Catchment B as part of Stages 2 and 15 of the Northlake development
- Stormwater runoff from the retirement village is to be collected and discharged to the infiltration pond within Lot 66 DP 371470 by a pipe network system
- A small area of the retirement village is not able to drain towards the infiltration pond and would be collected and discharged to the north along the Outlet Road table drain
- The infiltration pond has been sized to cater to existing development, the retirement village, and future development areas in Catchment B.

6. Wastewater

6.1 Background

All wastewater from the Northlake Special Zone land west of Outlet Road flows to a Ø300mm pipe in Outlet Road. This pipe then connects into the wider reticulated network at the intersection of Outlet Road and Aubrey Road. Wastewater from the adjacent Hikuwai development connects to the QLDC network in Aubrey Road 300m to the east of Outlet Road / Aubrey Road intersection.

Refer to **Appendix 5** for an overview plan of the Northlake wastewater reticulation. This plan identifies all development areas west of Outlet Road that contribute wastewater flows to Outlet Road. Catchments and key nodes shown on this plan are referred to later in this infrastructure report.

In 2016, Rationale undertook a desktop modelling exercise of the Northlake wastewater flows. Copies of these reports (x2) are included in this infrastructure report as **Appendix 6**. These reports concluded that there will be capacity issues in the critical pipe on Aubrey Road once the Northlake Special Zone is fully developed. This conclusion was based on several assumptions that are summarised below

- Load assumptions have been adopted from the LDSCoP rather than NZS4404:2010. We consider this approach to be appropriate.
- The total wastewater load from Outlet Road has been assumed to arrive at the Outlet Road / Aubrey Road corner instantaneously because the internal reticulation has not yet been modelled. It is likely that there would be some smoothing of the peak flow resulting in a lower peak load at the Outlet Road corner if this modelling were to be completed.

The approach taken to date by Northlake in modelling wastewater flows for the individual stages as each consent has been progressively applied for has been to adopt these same assumptions but to use the cumulative residential yields based on the number of residential and commercial lots completed and/or consented. Refer to Table 5 for a current residential yield summary.

6.2 Wastewater Demand – Northbrook Retirement Village

Table 7 below shows the wastewater design flow rates for the retirement village area based on the District Plan (Northlake Special Zone) residential density provisions for Activity Areas C2 and D1.

Activity Area	Number of Units	Max No. of People / Unit / Day	Average Per Capita Daily Wastewater Production (L/p/d)	Daily Wastewater Production (m^3/d)	Dry Weather Diurnal Peaking Factor	Peak Dry Weather Flow (L/s)	Wet Weather Peaking Factor	Peak Wet Weather Flow (L/s)
AA-C2	15	3	250	11	2.5	0.3	2	0.7
AA-D1	26	3	250	20	2.5	0.6	2	1.1
TOTAL				**30.8**		**0.9**		**1.8**

Table 7: Wastewater Design Flow Rate – Northlake Special Zone Densities

Table 8 below shows the wastewater design flow rates for the proposed retirement village

Northbrook Wanaka - Unit Types	Number of Units	Max No. of People / Unit / Day	Average Per Capita Daily Wastewater Production (L/p/d)	Daily Wastewater Production (m^3/d)	Dry Weather Diurnal Peaking Factor	Peak Dry Weather Flow (L/s)	Wet Weather Peaking Factor	Peak Wet Weather Flow (L/s)
Residential apartments: 2 bedroom	68	2	250	34	2.5	1.0	2	2.0
Residential apartments: 3 bedroom	32	2.5	250	20	2.5	0.6	2	1.2
Care pod rooms	36	1	250	9	2.5	0.3	2	0.5
Care pod staff	1	10	50	0.5	2.5	0.0	2	0.0
Clubhouse & amenity building	1	300	30	9	4	0.4	2	0.8
Main entry & back-of-house	1	50	50	2.5	4	0.1	2	0.2
TOTAL				**75.0**		**2.4**		**4.7**

Table 8: Wastewater Design Flow Rate – Retirement Village

The building occupancies shown in Tables 7 & 8 have been selected to reflect the maximum estimated daily wastewater production. These design occupancies may vary from the final building occupancies which will be dictated by other factors such as fire safety, carparking provisions and operational matters.

The proposed Northbrook development is not a conventional residential subdivision and as such it does not fully fit the design parameters described by the LDSCoP. Accordingly, the parameters that have been used in Table 8 have been derived from multiple sources including AS/NZS 1547:2012.

For all residential aspects of the proposed development i.e. the residential apartments and care pod rooms, the average dry weather flows are based on 250 L/p/d with a peaking factor of 2.5 for dry weather diurnal and a peaking factor of 2 for wet weather dilution / infiltration. The number of unit occupants is based on the likelihood that the 2-bedroom units will only have 2 occupants and the 3-bedroom apartments will have 2.5 occupants. This allows for some apartments to have visitors at any point in time whereas it is unrealistic that all apartments will have visitors staying at the same time.

The non-residential aspects of the proposed development the various wastewater production volumes have been selected using AS/NZS 1547:2012 as a guide as well as estimated water demands. To account for the operating hours of these facilities a dry weather diurnal peaking factor of 4 has been used.

Table 8 identifies a daily wastewater production volume of 75m³ and a peak wet weather flow rate of 4.7L/s.

In comparison to what is already anticipated by the District Plan in the proposed development area, this represents an increase in daily wastewater production volume of 44.2m³ and an increase in peak wet weather flow rate of 2.9 L/s

In isolation this may seem like a large increase in peak flow rate however when considered in the context of the wider Northlake Special Zone that flows to Outlet Road it is approximately a 5% increase in peak flow rate.

6.3 Council Reticulation – Outlet Road

As part of the construction of Northlake Stages 1-3, a Ø300mm main was extended up Outlet Road to the entrance to the Northlake development at Northlake Drive. This main was installed with the capacity to reticulate the entire Northlake development west of Outlet Road including other areas of the Northlake Special Zone located upstream of this main (Allenby Farms Limited and Urquhart).

The Ø300mm Outlet Road main has a design capacity of approximately 58L/s when calculated using the following parameters.

- Pipe diameter: 300mm
- Manning's roughness: 0.011 (LDSCoP Table 5.2)
- Pipe slope: minimum grade @ 0.25% (most of the Outlet Road pipe is at this grade)
- Percent of full depth: 100%

Tables 9 & 10 below outline the PWWF in Outlet Road i.e. coming into Node 01 (see Appendix 5), for two scenarios. The first scenario (Table 9) includes all development that is either complete or under construction as of July 2020 as well as the proposed Northbrook retirement village. The second scenario (Table 10) includes all completed, under construction, consented and future development that will contribute loads to the Outlet Road main.

There is sufficient capacity in the Outlet Road Ø300mm for both scenarios

- Scenario 1 (Table 9): 27.8 L/s design < 58 L/sec actual capacity
- Scenario 2 (Table 10): 56.5 L/s design < 58 L/sec actual capacity

Note: The flow from the Outlet Road Motor Camp rising main is not included in either of these scenarios because it can be set to contribute at off peak times.

PWWF Contributing to Outlet Road Ø300 Wastewater Main			
Development Area	Number of Lots	Total Lot Area (ha)	PWWF (L/s)
Northlake residential - complete	328	-	14.2
Northlake commercial - complete	-	0.243	0.3
Northlake - under construction	195	-	8.5
Northbrook Retirement Village	-	-	4.7
TOTAL	523	0.243	27.8

Table 9: PWWF in Outlet Road – includes all consented development plus Northbrook Retirement Village

PWWF Contributing to Outlet Road Ø300 Wastewater Main – Fully Developed Scenario			
Development Area	Number of Lots	Total Lot Area (ha)	PWWF (L/s)
Northlake residential - complete	328	-	14.2
Northlake commercial - complete	-	0.243	0.3
Northlake - under construction	195	-	8.5
Northbrook Retirement Village	-	-	4.7
Northlake residential - future	*253*	-	*11.0*
Northlake commercial - future	-	*1.058*	*1.4*
Allenby Farms - future	*354*	-	*15.4*
Urquhart & others - future	*23*	-	*1.0*
TOTAL	1153	1.302	56.5

Table 10: PWWF in Outlet Road – Fully Developed Scenario

6.4 Council Reticulation – Aubrey Road

The report prepared by Rationale in 2016 concludes that the critical pipe in Aubrey Road (# 200969) has a maximum capacity of 55.9 L/s and that once the Northlake Special Zone is fully developed, the total load on this critical pipe will exceed its capacity. Rationale calculated that the load on this critical pipe will be approximately 79.5 L/s i.e. the pipes capacity is exceeded by 23.6 L/s.

Table 11 below outlines the PWWF into the critical pipe in Aubrey Road using Scenario 1 from Section 6.3 of this report (Outlet Road flows) plus the other incoming flows identified in the Rationale 2016 report.

PWWF Contributing to Aubrey Road Critical Main #200969	
Development Area	**PWWF (L/s)**
Outlet Road – Scenario 1 from Table 9 (complete / under construction)	27.8
Outlet Motor Camp Pump Station	0.0
Existing dwellings upstream of Outlet Road	7.2
Existing dwellings upstream of pipe 200969	1.0
Hikuwai - complete	3.4
TOTAL PWWF in critical main # 200969 on completion of Northbrook Wanaka	**39.3**
Capacity of critical main # 200969	55.9
Spare capacity in critical main # 200969 on completion of Northbrook Wanaka	16.6

Table 11: PWWF in Aubrey Road Critical Main # 200969

Table 11 indicates that there will be spare capacity in the critical Aubrey Road main of 16.6 L/s on completion of Northbrook Wanaka.

Note that the Outlet Road motor camp rising main has not been included in this calculation because it can be set to pump at off peak times.

6.5 Northbrook Wanaka and its Overall Effect on Wastewater Infrastructure

The overall effect of the proposed Northbrook Retirement Village on the wider network is minor. The increase in PWWF from what is already anticipated in the District Plan equates to approximately an extra 5% in the Outlet Road Ø300mm main and an extra 3.7% in the Aubrey Road Ø300mm main.

Northbrook Wanaka does not trigger the need for upgrade works to the wastewater mains in either Outlet Road or Aubrey Road. Nor is it likely to affect the scale of upgrades already programmed by Council in Aubrey Road i.e. if Council intend to upgrade the Aubrey Road critical pipe from a Ø300mm main to a Ø375mm main, the increased PWWF from Northbrook is highly unlikely to force this upgrade into the next pipe size.

It is expected that the minor effect that the Northbrook retirement village will have on the wider wastewater network will be more than offset by the development contributions triggered by this development.

7. Water Supply

7.1 Water Supply System Design

The design of the water supply network to service the proposed Northbrook Wanaka development depends on the population served, the facilities to be provided and the landscaping water demand. The following aspects relating to water supply have been investigated to assess water supply requirements.

- Population
- Water demands – both peak and firefighting requirements
- Water supply availability
- Water pressure requirements
- Landscaping irrigation requirements

7.2 Water Demand Assessment

7.2.1 Domestic and Irrigation Water Demands

It was noted in the wastewater assessment included in Section 6 of this infrastructure report that the Northbrook retirement village development is not typical of standard residential subdivisions in relation to both domestic, commercial or irrigation water demands. For standard residential subdivisions, the property occupancies vary from house to house and can also vary seasonally, especially in resort / tourist towns like Wanaka. Water for irrigation purposes is also different for standard residential subdivisions because it is largely uncontrolled. All allow for these factors, the LDSCoP directs that the water demand of a standard residential subdivision is assessed on a per capita basis at 700 L/p/d.

For the Northbrook Wanaka development however, there is far greater control over water consumption, particularly with regards to irrigation which will be controlled by the retirement village operator rather than individual residents. Accordingly, the water demand for the proposed development can be assessed from a first principals' approach and the domestic water demand for each of the residents is reduced to match the wastewater demands i.e. 250 L/p/d. Irrigation and commercial water demands are assessed.

Table 12 below shows the water supply design volumes and flows for the retirement village area based on the District Plan (Northlake Special Zone) residential density provisions for Activity Areas C2 and D1. Irrigation demand is included in the Daily Water Demand Per Capita to no additional allowance has been made though we note that this is likely to be a conservative approach given that the 15 lots that could be created in AA-C2 would be approx. 1500m² and likely have a much high irrigation demand than a more standard 500m² lot.

Activity Area	Number of Units	Max No. of People / Unit / Day	Daily Water Demand Per Capita (L/p/d)	Daily Water Demand (m^3/d)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)
AA-C2	15	3	700	31.5	6.6	2.41
AA-D1	26	3	700	54.6	6.6	4.17
TOTAL				86.1		6.58

Table 12: Water supply assessment – design volumes and flows - Northlake Special Zone Densities

Table 13 below sets out the assessed domestic and commercial demands for the proposed development. The peaking factors provided in the LDSCoP have been used for the peak hour demand for most facilities however some non-residential facilities have been assessed using a peak hour demand of 10. This is considered a conservative approach and has been adopted to account for the operating hours of these facilities (estimated to be between 12-16 hours per day). Specific irrigation demands are assessed in Table 14 below.

					Scenario 1: Domestic Peak Hour (day time only / no irrigation)		Scenario 2: 50% Domesitc Peak Hour (irrigation on overnight)	
Northbrook Wanaka - Unit Types	Number of Units	Max No. of People / Unit / Day	Daily Water Demand Per Capita (L/p/d)	Daily Water Demand (m^3/d)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)	50% Peak Hour Peaking Factor	Peak Hour Demand (L/s)
Residential apartments: 2 bedroom	68	2	250	34.0	6.6	2.60	3.3	1.30
Residential apartments: 3 bedroom	32	2.5	250	20.0	6.6	1.53	3.3	0.76
Care pod rooms	36	1	250	9.0	6.6	0.69	3.3	0.34
Care pod staff	1	10	50	0.5	6.6	0.04	3.3	0.02
Clubhouse & amenity building	1	300	30	9.0	10	1.04	5	0.52
Main entry & back-of-house	1	50	50	2.5	10	0.29	5	0.14
Irrigation Volume (Table 13)				82.5		0.00		2.86
TOTAL				157.5		6.18		5.95

Table 13: Water supply assessment – design volumes and flows - Retirement Village

The building occupancies shown in Tables 12 & 13 have been selected to reflect the maximum estimated daily wastewater production. These design occupancies may vary from the final building occupancies which will be dictated by other factors such as fire safety, carparking provisions and operational matters.

With regards to the proposed development, two peaking factor scenarios have been considered.

- Scenario 1: Daytime peak hour with no irrigation
- Scenario 2: Night-time peak hour = 50% domestic peak + irrigation over 8 hours

Scenario 2 has discounted the domestic peak by 50% as it is considered that water demand will be significantly lower overnight particularly in the proposed retirement village scenario.

The irrigation demands in Table 14 below are based on an irrigation rate of 5mm/m^2/day over all the landscaped areas.

Irrigation Demand	Area of Landscaping (m^2)	Daily Irrigation Rate (mm/m^2/d)	Irrigation Demand (m^3/day)	Irrigation Peak Hour Demand (8 hour total irrigating duration) (L/s)
All landscaped areas	16500	5	82.5	2.86

Table 14: Proposed irrigation demand

Note: no additional allowance has been made for establishment irrigation because this will occur prior to the buildings being occupied.

Table 15 below identifies the difference between the water supply demand anticipated by the District Plan and what is required for the proposed development. Whilst there is a 82% increase in daily water demand there actually a slight decrease in the peak hour demand flow rate. This is because irrigation can be controlled and operated only overnight.

	District Plan Densities (Table 12)	Proposed Development (Table 13)	Difference
Peak Day Demand (m^3/day)	86.1	157.5	71.4
Scenario 1: daytime peak hour	6.58	6.18	-0.4
Scenario 2: nighttime peak hour	-	5.95	-

Table 15: Differences between Tables 12 & 13

7.2.2 *Firefighting Supply*

The design of the water supply system is required to meet the fire fighting flow and pressure requirements of *SNZ PAS 4509:2008 – NZ Fire Service Firefighting Water Supplies Code of Practice*.

All facilities will be serviced by a sprinkler system and therefore they fall under the FW2 water supply classification which requires a minimum firefighting supply of 12.5 L/s within 135m of the fire source and a second supply of 12.5 L/s within a distance of 270m of the fire source at a minimum pressure of 100kPa.

Recent hydrant flow testing within Northlake Stages 10 and 15A indicate that FW2 supply will be available to the proposed development as these recently tested stages are in the immediate vicinity of the proposed development. These hydrant flow testing results are included with this infrastructure report as **Appendix 7**.

7.3 Existing Water Supply System

7.3.1 *Hydraulic Modelling*

Watershed have undertaken hydraulic modelling of the Northlake water supply catchment in 2017 with respect to achieving the levels of service required the QLDC. This modelling report is included as **Appendix 8** of this infrastructure report.

The Watershed modelling assessed Stages 1-14 of the Northlake / Allenby / Urquhart developments (refer to the plan included with the Watershed report). The report concludes that *"the modelling results indicate that Stages 1-14 can be supplied through the proposed reticulation on drawing W4481-7 076 Sheet No. 600 and meet the desired level of service indicated by Queenstown Lakes District Council."* The caveats to this conclusion regarding Glenaray Road and the small area of Stage 14 above the 350m RL contour are not applicable to this proposal.

To compare the conclusions in the Watershed report against the current proposal some context is required.

- The Watershed report conclusions related only to Stages 1-14 as shown on the plan in that report.
- The current proposal relates to the following stages shown on that plan
    - Stage 13 (in part)
    - Stage 19 (in full)
- The Watershed analysis allowed for 237 lots within the Stage 13 area. This was a preliminary estimate of lot yields based on early concept drawings available at the time (2017).
- The Stage 13 area is now occupied in part by Northlake Stage 15 (which is a different area to the Stage 15 shown on the plan in the Watershed report). The actual Stage 15 (RM190515) development only yields 136 lots (including Stage 15f).
- The remainder of the Watershed plan Stage 13 area is now included in this proposal for a retirement village (Northbrook Stage 2)
- Northbrook Stage 1 occupies the area shown as Stage 19 on the Watershed plan.
- In order to compare the current proposal to the Watershed conclusions we need to assess the difference in water supply demand and peak hour demand between these two scenarios. Refer to Table 16 below for these differences.
- We also need to adjust the peak hour peaking factor used in Tables 12 & 13 from 6.6 to 2 as this is what has been used in the Watershed modelling. We have left the peak hour peaking factor at 10 for the non-residential facilities.
- Table 16 shows that the current proposal's water demand is
    - 16% lower than modelled for the daily water demand (m^3/day)
    - 23% lower than modelled for the peak hour demand (L/s)

- We can therefore conclude that the Northbrook proposal has a lower water supply demand that what has been modelled and confirmed as acceptable.

Activity Area	Number of Units	Max No. of People / Unit / Day	Daily Water Demand Per Capita (L/p/d)	Daily Water Demand (m^3/d)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)
Watershed Plan - Stage 13	237	3	700	497.7	2	11.52
Watershed Plan - Stage 15	15	3	700	31.5	2	0.73
TOTAL				**529.2**		**12.25**
Northbrook - Scenario 1	See Table 13			157.5	2	2.80
Northlake Stage 15	136	3	700	285.6	2	6.61
TOTAL				**443.1**		**9.41**
Difference (total)				-86.1		-2.84
Difference (as a % of Watershed allowance)				-16.3%		-23.2%

Table 16: Comparison between Watershed modelling and current proposal

7.3.2 Existing Water Supply Infrastructure

Refer to **Appendix 9**. Existing (or under construction) water supply pipes are located immediately adjacent to the proposed development and will be extended to service the proposal.

8. Network Utility Services (Electricity and Telecommunications)

The existing networks for electricity and telecommunications have sufficient capacity to service the proposed development.

Confirmation has been provided by PowerNet (on behalf of Electricity Southland Limited), please refer to **Appendix 10**.

Confirmation has also been provided by Chorus, please refer to **Appendix 11**.

9. Conclusion

The capacity of the existing and proposed three waters infrastructure has been assessed in terms of its ability to adequately service the proposed development and we consider that the proposal is appropriate.

Stormwater runoff can be satisfactorily reticulated and disposed of using a continuation of the range of low impact design solutions i.e. swales, detention ponds and soakage along with traditional piped reticulation where required to ensure there is no increase from pre to post development flows leaving the site and that discharged stormwater quality is maintained prior to ultimate discharge.

Capacity within the network utility services has been confirmed by the relevant utility providers.

Alex Todd
Principal, MS+SNZ
Paterson Pitts Limited Partnership

APPENDIX 1: Paterson Pitts Group – Proposed Earthworks Plans

Northbrook Village - Earthworks Plans

Plan Index

Sheet	Contents	Rev	Date
101	Existing Contours	2	13/08/2020
102	Contours as per RM200167 & RM190505	2	13/08/2020
103	Proposed Design Contours	2	13/08/2020
104	Cut-Fill Depths	2	13/08/2020
105	Cross Sections 1	1	07/08/2020
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108	Cross Sections 4	1	07/08/2020

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Index Sheet

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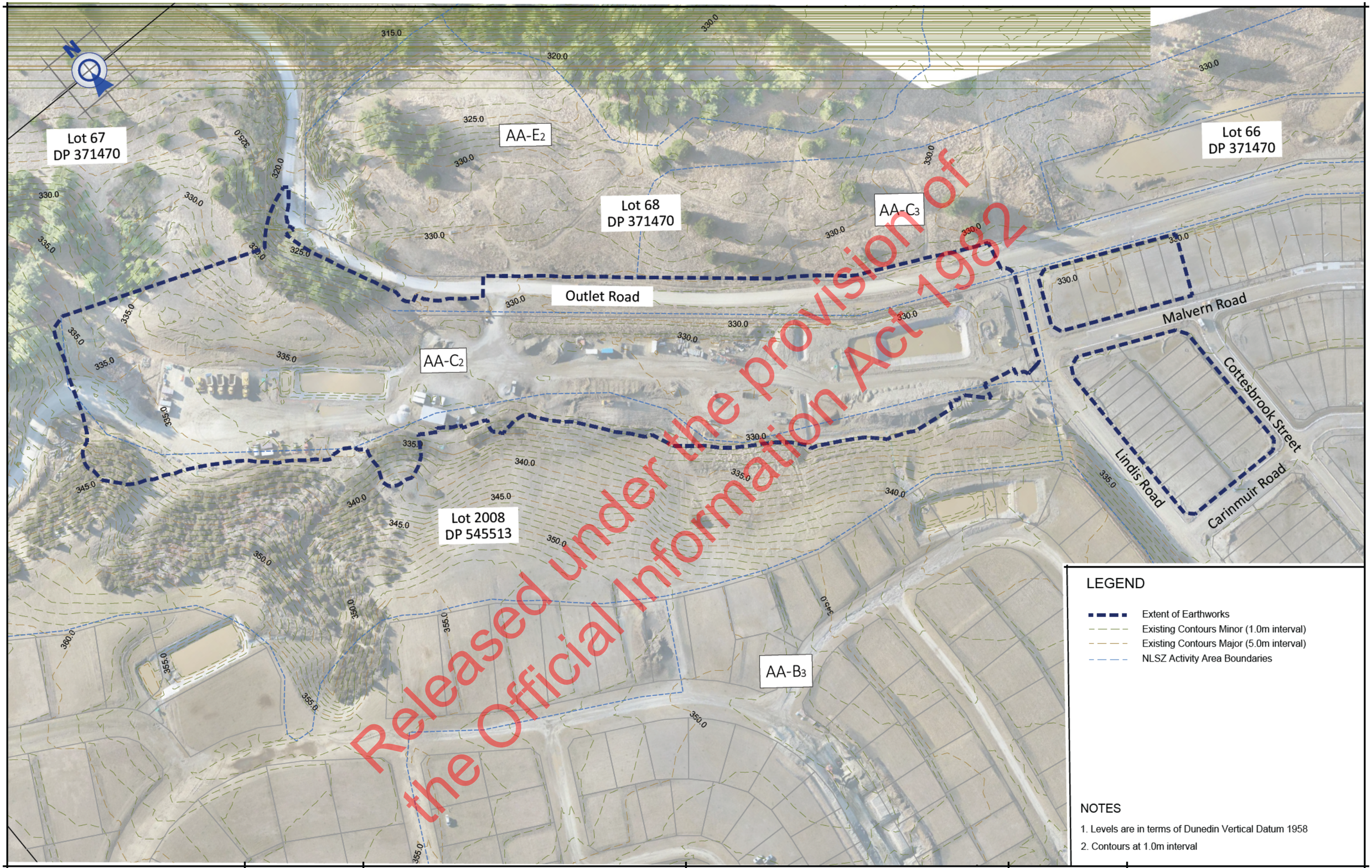

LEGEND

- Extent of Earthworks
- Existing Contours Minor (1.0m interval)
- Existing Contours Major (5.0m interval)
- NLSZ Activity Area Boundaries

NOTES

1. Levels are in terms of Dunedin Vertical Datum 1958
2. Contours at 1.0m interval

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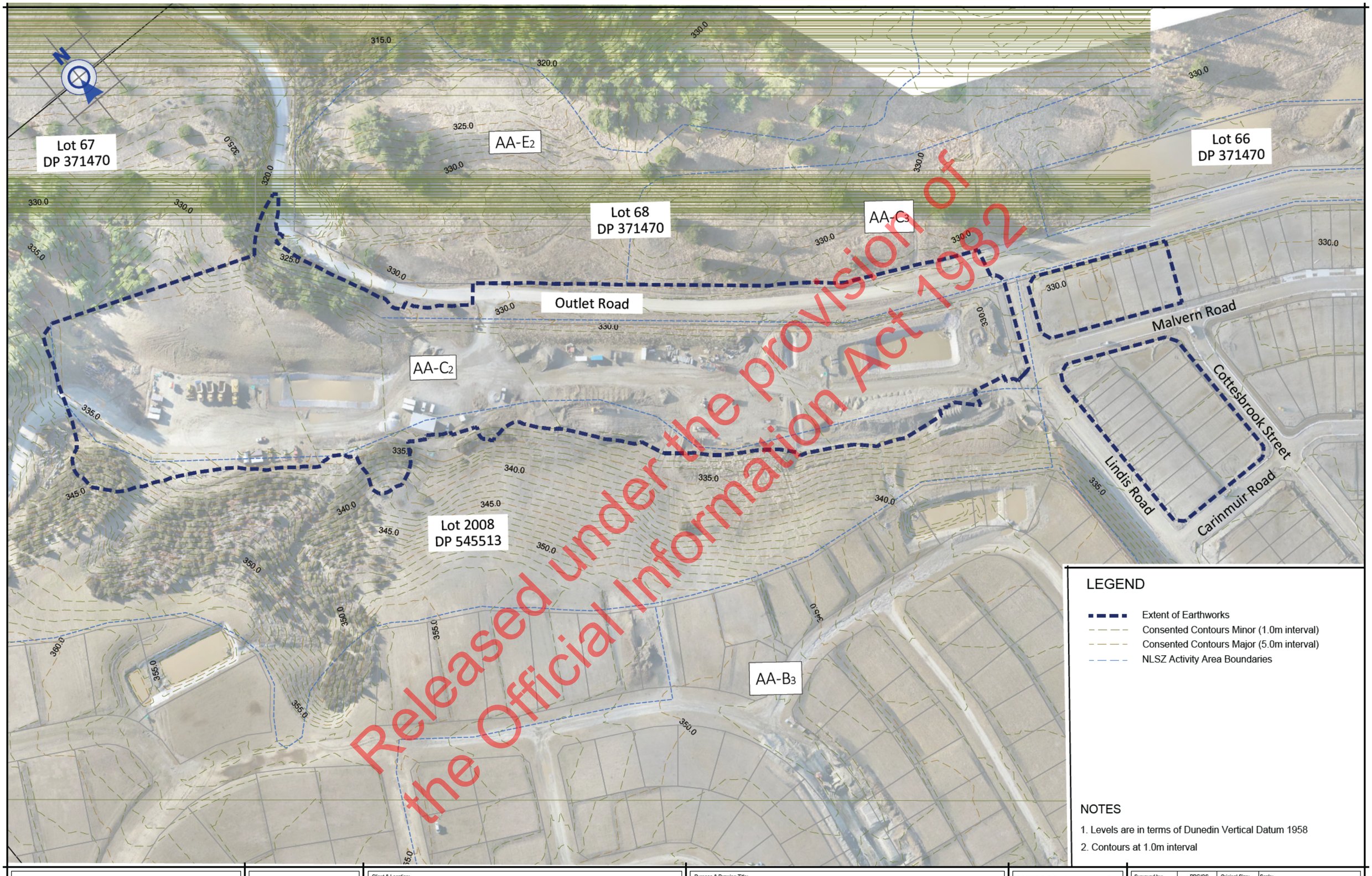

LEGEND

- Extent of Earthworks
- Consented Contours Minor (1.0m interval)
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- NLSZ Activity Area Boundaries

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1. Levels are in terms of Dunedin Vertical Datum 1958
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Contours as per RM200167 & RM190505

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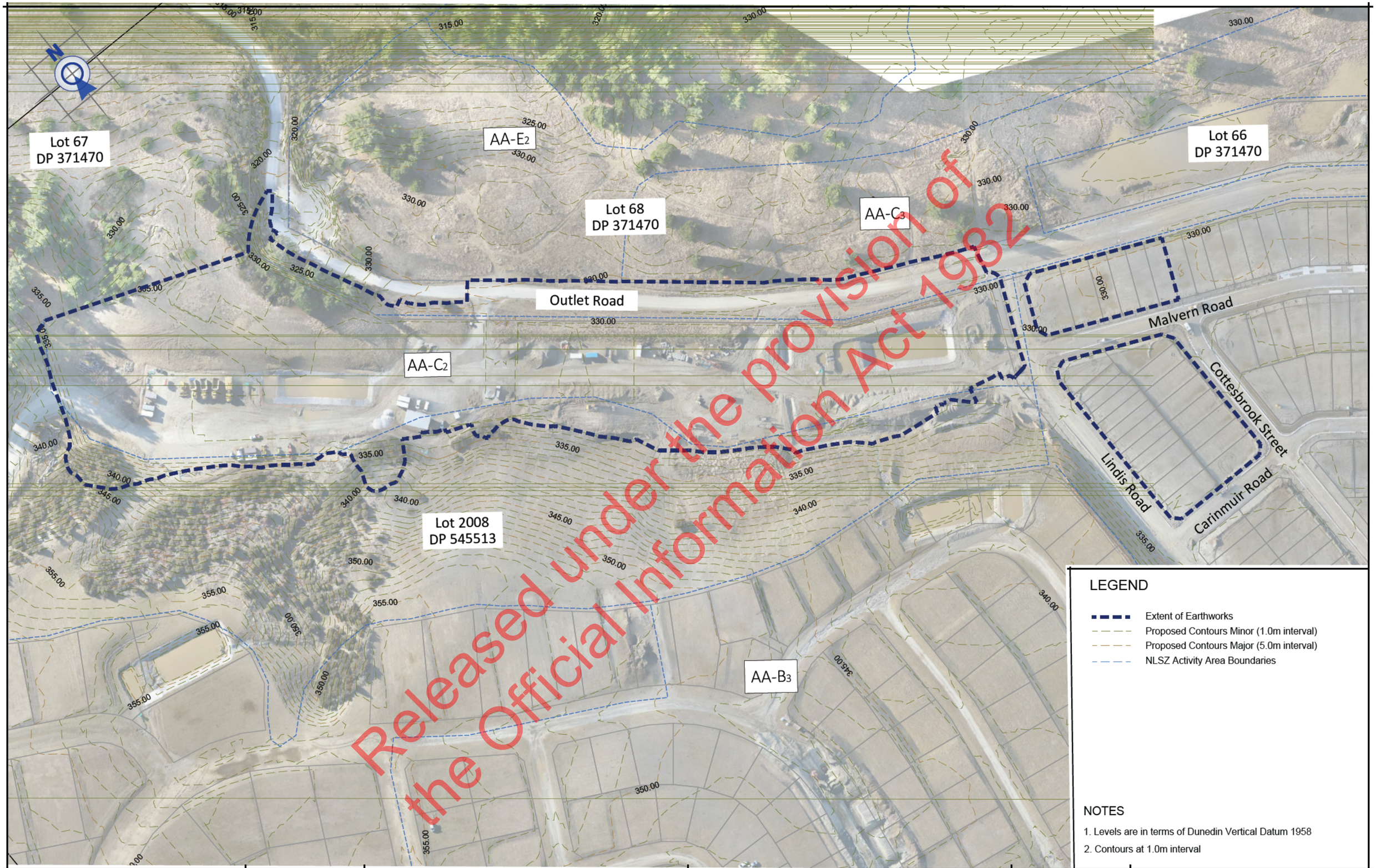

LEGEND

- Extent of Earthworks
- Proposed Contours Minor (1.0m interval)
- Proposed Contours Major (5.0m interval)
- NLSZ Activity Area Boundaries

NOTES

1. Levels are in terms of Dunedin Vertical Datum 1958
2. Contours at 1.0m interval

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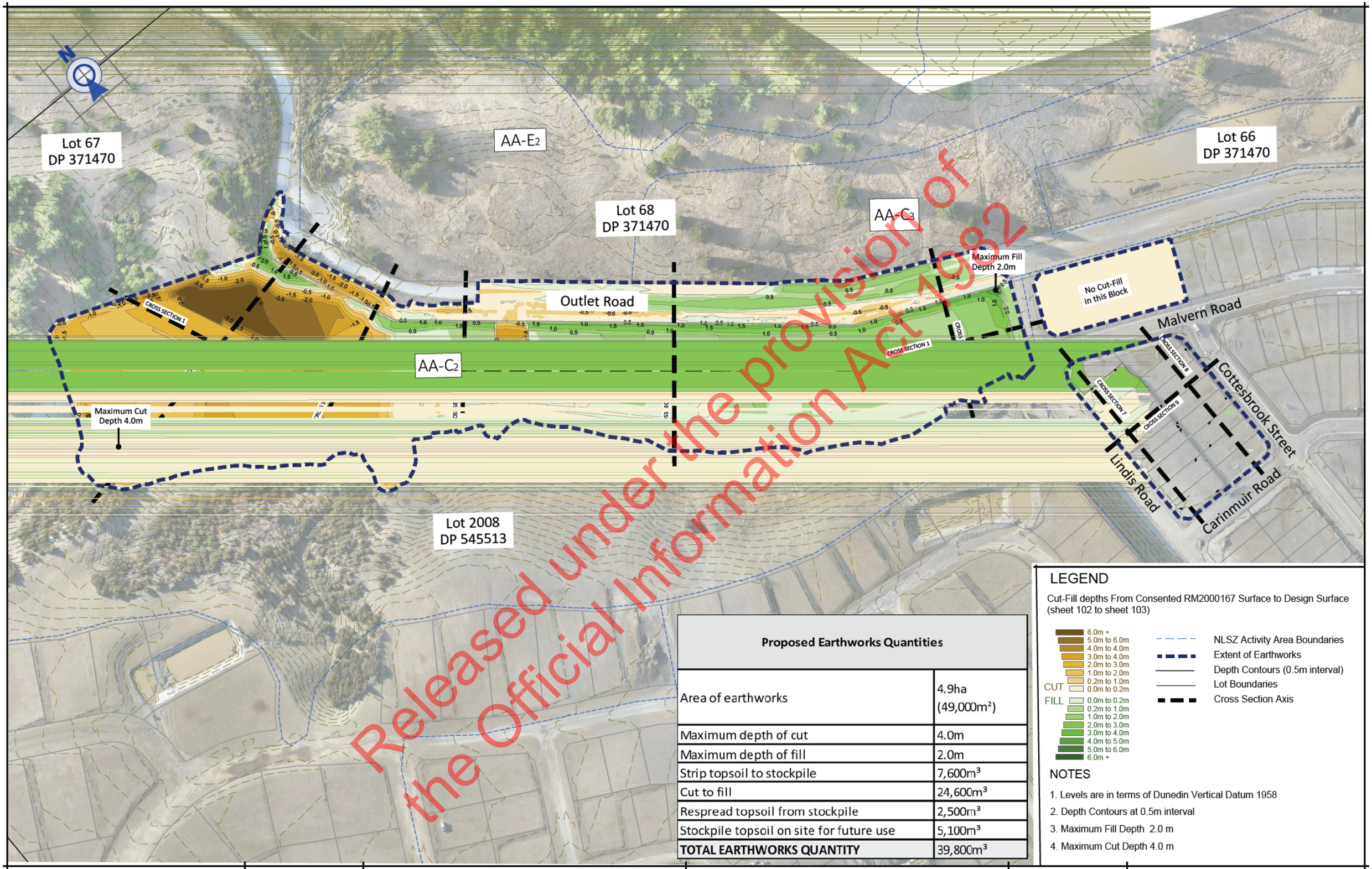

Proposed Earthworks Quantities	
Area of earthworks	4.9ha (49,000m²)
Maximum depth of cut	4.0m
Maximum depth of fill	2.0m
Strip topsoil to stockpile	7,600m³
Cut to fill	24,600m³
Respread topsoil from stockpile	2,500m³
Stockpile topsoil on site for future use	5,100m³
TOTAL EARTHWORKS QUANTITY	39,800m³

LEGEND

Cut-Fill depths From Consented RM2000167 Surface to Design Surface (sheet 102 to sheet 103)

CUT: 6.0m +; 5.0m to 6.0m; 4.0m to 4.0m; 3.0m to 4.0m; 2.0m to 3.0m; 1.0m to 2.0m; 0.2m to 1.0m; 0.0m to 0.2m

FILL: 0.0m to 0.2m; 0.2m to 1.0m; 1.0m to 2.0m; 2.0m to 3.0m; 3.0m to 4.0m; 4.0m to 5.0m; 5.0m to 6.0m; 6.0m +

- NLSZ Activity Area Boundaries
- Extent of Earthworks
- Depth Contours (0.5m interval)
- Lot Boundaries
- Cross Section Axis

NOTES

1. Levels are in terms of Dunedin Vertical Datum 1958
2. Depth Contours at 0.5m interval
3. Maximum Fill Depth 2.0 m
4. Maximum Cut Depth 4.0 m

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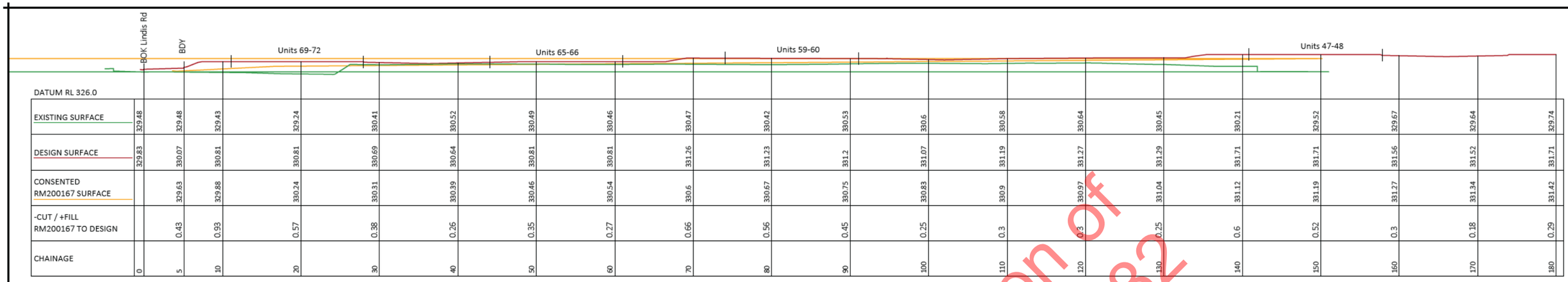

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DESIGN SURFACE	329.83	330.07	330.81	330.81	330.69	330.64	330.81	330.81	331.26	331.23	331.2	331.07	331.19	331.27	331.29	331.71	331.71	331.56	331.52	331.71				
CONSENTED RM200167 SURFACE		329.63	329.88	330.24	330.31	330.39	330.46	330.54	330.6	330.67	330.75	330.83	330.9	330.97	331.04	331.12	331.19	331.27	331.34	331.42				
-CUT / +FILL RM200167 TO DESIGN		0.43	0.93	0.57	0.38	0.26	0.35	0.27	0.66	0.56	0.45	0.25	0.3	0.3	0.25	0.6	0.52	0.3	0.18	0.29				
CHAINAGE	0	5	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180				

Cross Section 1
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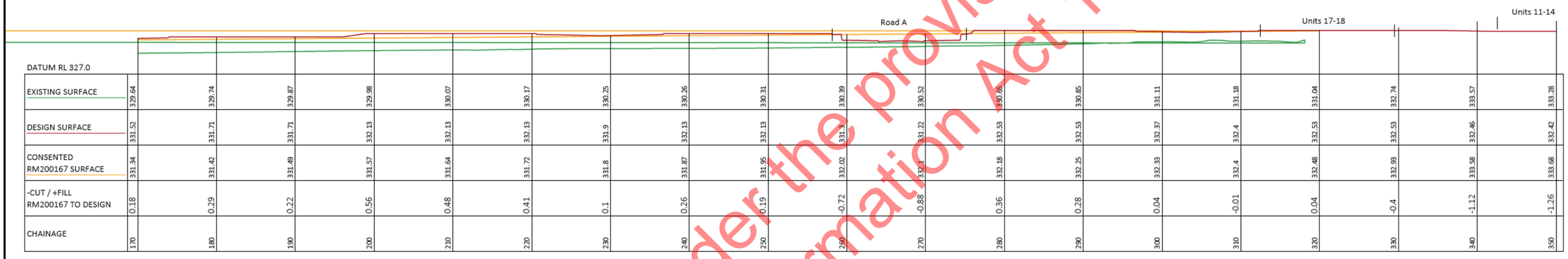
A3 VERT SCALE 1:250



DATUM RL 327.0

EXISTING SURFACE	329.64	329.74	329.87	329.98	330.07	330.17	330.25	330.26	330.31	330.39	330.52	330.65	330.85	331.11	331.18	331.04	332.74	333.57	333.28					
DESIGN SURFACE	331.52	331.71	331.71	332.13	332.13	332.13	331.9	332.13	332.13	331.3	331.22	332.53	332.53	332.37	332.4	332.53	332.53	332.46	332.42					
CONSENTED RM200167 SURFACE	331.34	331.42	331.49	331.57	331.64	331.72	331.8	331.87	331.95	332.02	332.1	332.18	332.25	332.33	332.4	332.48	332.93	333.58	333.68					
-CUT / +FILL RM200167 TO DESIGN	0.18	0.29	0.22	0.56	0.48	0.41	0.1	0.26	0.19	-0.72	-0.88	0.36	0.28	0.04	-0.01	0.04	-0.4	-1.12	-1.26					
CHAINAGE	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350					

Cross Section 1
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A3 VERT SCALE 1:250

DATUM RL 328.0

EXISTING SURFACE	333.57	333.28	333.19	333.86	334.5	334.5	334.34	334.76	335.67	336.4	336.81	337.3	336.79	335.79	334.62	333.11	332.28							
DESIGN SURFACE	332.46	332.42	332.42	331.48	332.3	332.8	332.97	333.01	333.06	333.1	333.15	333.19	333.23	334.1	334.65									
CONSENTED RM200167 SURFACE	333.58	333.68	333.79	333.88	333.98	334.06	334.12	334.17	334.22	334.27	334.32	334.38	334.43	334.88										
-CUT / +FILL RM200167 TO DESIGN	-1.12	-1.26	-1.37	-2.4	-1.68	-1.26	-1.15	-1.15	-1.16	-1.17	-1.18	-1.19	-1.2	-0.78										
CHAINAGE	340	350	360	370	380	390	400	410	420	430	440	450	460	470	474	480	484							

Cross Section 1
A3 HORZ SCALE 1:250
A3 VERT SCALE 1:250

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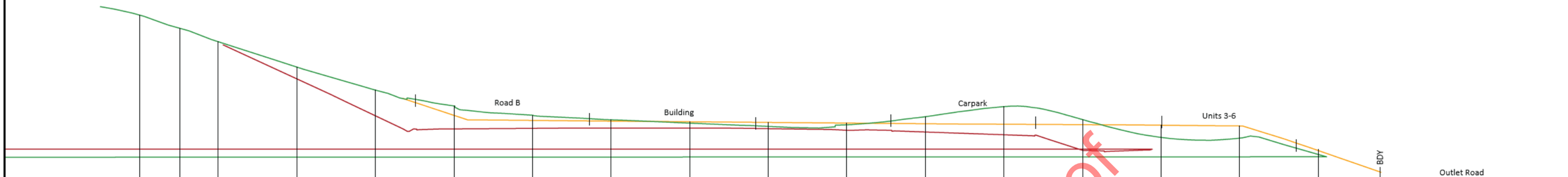

DATUM RL 320.0

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EXISTING SURFACE	348.11	346.43	344.71	341.48	338.54	336.52	335.34	334.75	334.33	333.91	334.12	335.15	336.43	334.78	332.51	332.41	330.33	326.39	323.92	322.53
DESIGN SURFACE				339.98	335.26	333.59	333.66	333.7	333.7	333.62	333.42	333.2	332.84	330.86	331	331	331	324.86		
CONSENTED RM200167 SURFACE						335.32	334.67	334.59	334.5	334.42	334.33	334.25	334.19	334.14	334.06	333.97	330.83			
-CUT / +FILL RM200167 TO DESIGN						-1.73	-1.02	-0.89	-0.8	-0.8	-0.92	-1.05	-1.34	-3.27	-3.06	-2.97	0.17			

Cross Section 2
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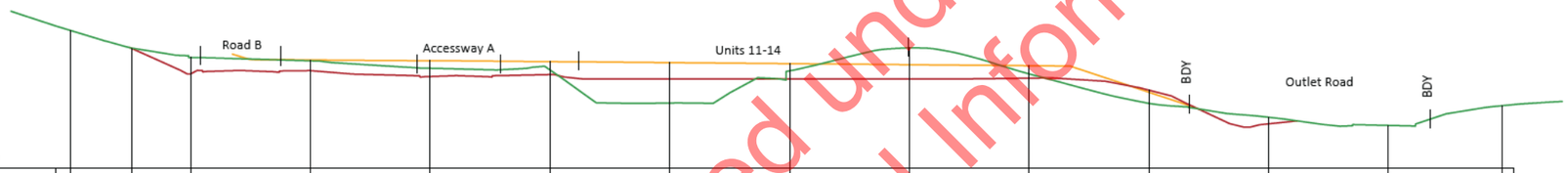
A3 VERT SCALE 1:250



DATUM RL 325.0

CHAINAGE	0	5	10	20	30	40	50	60	70	80	90	100	110	120
EXISTING SURFACE	336.45	334.99	334.21	333.93	333.31	333.17	330.41	333.09	335.01	332.84	330.38	329.22	328.55	330.19
DESIGN SURFACE		334.96	332.84	333.11	332.62	332.78	332.42	332.42	332.42	332.48	331.48	328.68		
CONSENTED RM200167 SURFACE				334	333.94	333.87	333.78	333.7	333.61	333.52	331.31			
-CUT / +FILL RM200167 TO DESIGN				-0.89	-1.32	-1.08	-1.36	-1.28	-1.19	-1.04	0.17			

Cross Section 3
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W6211	005	106	1 / 07/08/2020

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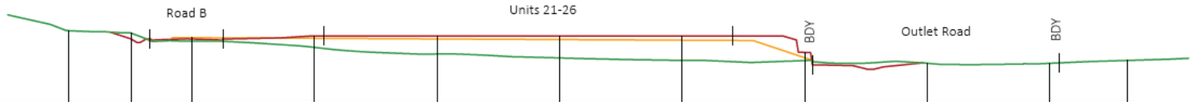


DATUM RL 327.0

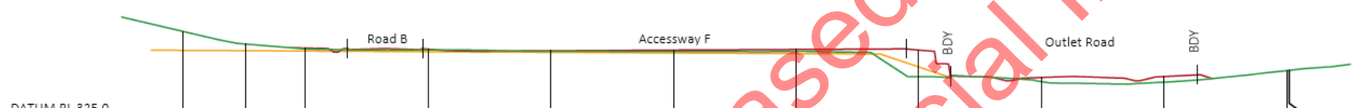
EXISTING SURFACE	332.96	332.75	332.1	331.6	331.07	330.74	330.55	330.53	330.31	330.31	330.54
DESIGN SURFACE		332.26	332.29	332.53	332.53	332.53	332.53	331.19			
CONSENTED RM200167 SURFACE			332.4	332.34	332.29	332.24	332.19	330.75			
-CUT / +FILL RM200167 TO DESIGN			-0.11	0.19	0.24	0.29	0.34	0.44			
CHAINAGE	0	5	10	20	30	40	50	60	70	80	86

Cross Section 4
A3 HORZ SCALE 1:250
A3 VERT SCALE 1:250

DATUM RL 326.0

EXISTING SURFACE	334.12	332.65	331.41	330.1	330.02	329.86	329.79	329.81	329.37	329.18	329.38	331.39	332.26
DESIGN SURFACE			331.78	331.56	331.73	331.71	331.71	331.71	331.71	329.74	329.11	329.31	
CONSENTED RM200167 SURFACE			331.63	331.58	331.53	331.48	331.43	331.38	330.74				
-CUT / +FILL RM200167 TO DESIGN			0.15	-0.01	0.2	0.23	0.28	0.33	0.97				
CHAINAGE	0	5	10	20	30	40	50	60	70	80	90	100	106

Cross Section 5
A3 HORZ SCALE 1:250
A3 VERT SCALE 1:250



DATUM RL 325.0

EXISTING SURFACE	332.11	331.08	330.67	330.6	330.49	330.47	330.47	328.41	328.02	327.97	328.91	328.94
DESIGN SURFACE			330.75	330.66	330.53	330.58	330.63	330.58	328.35	328.43		
CONSENTED RM200167 SURFACE	330.56	330.53	330.5	330.45	330.4	330.35	330.3	329.21				
-CUT / +FILL RM200167 TO DESIGN	1.54	0.54	0.25	0.21	0.13	0.23	0.33	1.37				
CHAINAGE	0	5	10	20	30	40	50	60	70	80	90	90

Cross Section 6
A3 HORZ SCALE 1:250
A3 VERT SCALE 1:250

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Client & Location:
Northbrook

Purpose & Drawing Title:
Earthworks Plan
Cross Sections 3

Surveyed by:	PPG/OS	Original Size:	Scale:
Designed by:	PPG/Client	A3	See Plan
Drawn by:	AGM		
Checked by:	DA		DO NOT SCALE
Approved by:	AGT		
Job No:	DWG No:	Sheet No:	Revision No: / Date Created:
W6211	005	107	1 / 07/08/2020

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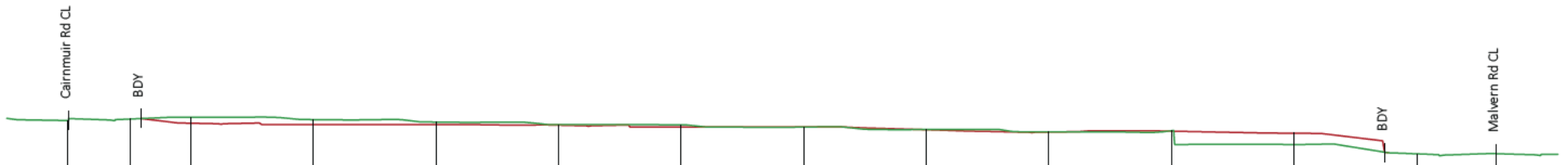
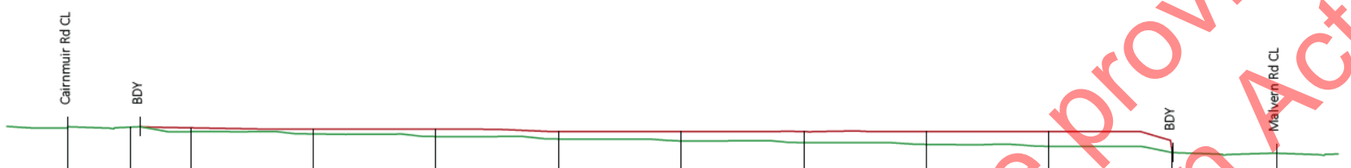


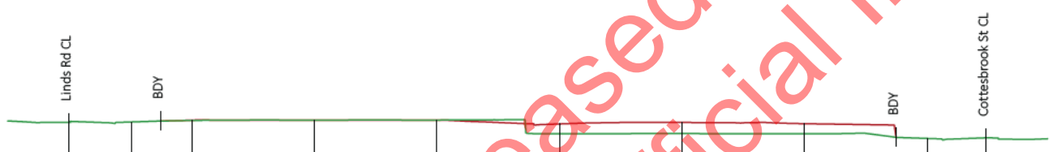
DATUM RL 327.0															
EXISTING SURFACE RM190505	333.24	333.36	333.5	333.31	333.11	332.9	332.88	332.7	332.5	332.31	332.41	331.28	330.52	330.53	
-CUT / +FILL TO DESIGN	0	0	-0.48	-0.41	-0.21	-0.05	-0.18	-0	-0.01	-0.01	-0.04	0.93	0	0	
DESIGN SURFACE			333.02	332.9	332.9	332.86	332.7	332.7	332.49	332.3	332.37	332.2			
CHAINAGE	0	5	10	20	30	40	50	60	70	80	90	100	110	117	

Cross Section 7
A3 HORZ SCALE 1:250
A3 VERT SCALE 1:250



DATUM RL 328.0													
EXISTING SURFACE RM190505	332.9	332.86	332.5	332.31	332.1	331.9	331.74	331.61	331.46	331.29	330.8	330.74	
-CUT / +FILL TO DESIGN	0	0	0.31	0.39	0.6	0.6	0.76	0.9	1.04	1.21	0.43	0	
DESIGN SURFACE			332.81	332.7	332.7	332.5	332.5	332.5	332.5	332.5	331.23		
CHAINAGE	0	5	10	20	30	40	50	60	70	80	90	99	

Cross Section 8
A3 HORZ SCALE 1:250
A3 VERT SCALE 1:250



DATUM RL 328.0											
EXISTING SURFACE RM190505	332.51	332.55	332.67	332.7	332.7	331.58	331.61	331.6	331.21	331.26	
-CUT / +FILL TO DESIGN	0	0	0.02	-0	-0	0.81	0.9	0.82	0	0	
DESIGN SURFACE			332.7	332.7	332.7	332.39	332.51	332.41			
CHAINAGE	0	5	10	20	30	40	50	60	70	75	

Cross Section 9
A3 HORZ SCALE 1:250
A3 VERT SCALE 1:250

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Client & Location:
Northbrook

Purpose & Drawing Title:
Earthworks Plan
Cross Sections 4

Surveyed by:	PPG/OS	Original Size:	Scale:
Designed by:	PPG/Client	A3	See Plan
Drawn by:	AGM		
Checked by:	DA		DO NOT SCALE
Approved by:	AGT		
Job No: W6211	DWG No: 005	Sheet No: 108	Revision No: 1
			Date Created: 07/08/2020

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APPENDIX 2: Geosolve – Preliminary Geotechnical Report