REPORT

Tekapo Landco Ltd

Lake Tekapo Holiday Park
Geotechnical, Ground Contamination, and Services Capacity Assessment

Report prepared for:

Tekapo Landco Ltd

Report prepared by:

Tonkin & Taylor Ltd

Distribution:

Tekapo Landco Ltd	**1 copy**
Tonkin & Taylor Ltd (FILE)	**1 copy**

June 2014

T&T Ref: 53436

Table of contents

1 Introduction

Tonkin & Taylor Ltd (T&T) is pleased to present the results of preliminary geotechnical, ground contamination, and infrastructure capacity assessments, relating to the property located at Lakeside Drive, Lake Tekapo (the site, see Figure 1, Appendix A).

1.1 Proposed activity

The site is being proposed to be rezoned to enable the development of multiple sites on land adjoining Lake Tekapo. The rezoning will allow for a variety of permanent and temporary visitor accommodation with a small associated commercial facility.

1.2 Scope of works

The works carried out comprised the following:

- An assessment of the potential for historical onsite activities to have resulted in **ground contamination** on the site, which included:
  - Review of property files information held by the Mackenzie District Council (MDC);
  - Review of the Listed Land Use Register (LLUR) held by Environment Canterbury (ECan);
  - Review historical aerial photographs purchased from New Zealand Aerial Mapping;
  - Review historical certificates of title for the site; and
  - Site walkover inspection.
- A **geotechnical assessment** of the site, which included:
  - Review of readily available geotechnical information from published maps;
  - Review of a previous geotechnical investigation of the camp ground area for plan change purposes, which was carried out in December 2009 (T&T report ref: 51581_rpt1, January 2010);
  - Site walkover of the northern half of the site to assess site exposure and evidence of historic or active geo-hazards.
- An assessment of existing **services capacity**, which included:
  - Review of requirements of Mackenzie District Council District Plan requirements;
  - Review of existing services plans;
  - Assessment of existing capacity for water supply and wastewater discharge;
  - Assessment of the design demands from the proposed development for stormwater, water supply, and wastewater discharge;
  - Discussion with Mackenzie District Council to ascertain if the water, sewer, and stormwater can be accepted into the Council network;
  - Discussion with electricity and telephone suppliers to ascertain the location of the nearest connection points and ability to connect to these locations.
- Preparation of this report, documenting the results of our investigations and implications for the proposed development of the site.

2 Site description

2.1 Location

The site comprises four lots totalling approximately 24 ha, located southwest of Lake Tekapo and bound by Lakeside Drive and Tekapo-Twizel Road/State Highway 8 (Figure 1, Appendix A). The site is owned by Tekapo Landco Ltd. Legal descriptions and current zoning in the Mackenzie District Plan are provided in Table 1.

Table 1: Property description

Legal Description	Certificate of Title	Area	Zone
Lot 1 DP 455053	584956	4.25 ha	Camp Ground Sub-Zone
Lot 2 DP 455053	584957	19.3 ha	Special Travellers Accommodation Zone (STAZ)
Lot 3 DP 455053	584958	0.58 ha	Residential 2
Lot 4 DP 455053	584959	0.024 ha	Camp Ground Sub-Zone

2.2 Surrounding properties

The site surrounds are:

- East: bounded by Lakeside Drive, beyond which is a reserve and Lake Tekapo;
- South: bounded by Tekapo-Twizel Road / State Highway 8, beyond which is rural / grazing land;
- West: forestry;
- North: forestry and Tekapo Springs development.

2.3 Topography

The site is characterised by a series of gently sloping terraces and ridge spurs separated by slopes ranging from about 8 to 15°, and locally up to 25° down towards the lake (northeast).

From the lake upwards there are 3 terraces at approximate levels 700mRL, 720mRL and 740mRL. These approximate terrace levels represent periods when the level of Lake Tekapo was relatively static, between periods of gradual downcutting of the lake outlet and lowering of the lake level to pre-control structure levels. Two broad gullies are incised on the slope at the northern end of the site. Moraine ridges and local ice-melt alluvial channels are evident on the high ridge in the northwest corner of the site.

2.4 Geology

The site is located on last glaciation (approximately 12,000 to 24,000 year BP) terminal moraine of the Tekapo glacier. The moraine is composed of gravelly Silt Till ($Q2t^1$) and a variety of ice-contact and glacier-deformed lacustrine and alluvial silt, sand and gravel deposits. The moraine materials are generally dense, dry to moist and very low permeability.

[1] 1:250,000 Geological Map 15, Aoraki, GNS Science, 2007

2.5 Hydrogeology

The moraine deposits underlying the site and neighbouring land do not contain any significant aquifers due to the very low permeability of the dominantly Till materials.

The water table is expected to have a gentle gradient to the south away from the lake at a level approximating median lake level.

ECan's online GIS indicates that there are no groundwater wells located on the site. The closest well is approximately 1 km to the north east and is reported to be used for domestic supply. Water levels range from 0.6m below ground level (bgl) up to 1.0m above ground level (artesian).

Stormwater runoff from the site discharges to Lake Tekapo, less than 50m to the east of the site.

3 Ground contamination assessment

3.1 Site condition

A walkover inspection was carried out on 25 February 2014 by a T&T Senior Engineering Geologist. Key site features relating to the potential for ground contamination are summarised below and shown on Figure 2 in Appendix A.

The property is currently mainly forested with a small area used for a camping ground and contains the following features:

- The site slopes towards Lake Tekapo, with some minor cut to fill of onsite material for building platforms in the camping ground area;
- The north and west of the site is largely forested. The forested area appears to have been present for around 60 years over natural slopes;
- There is some car and boat storage and 5 old 200L half-filled drums (contents unknown) in the southern area of the forested parts, near the camping ground areas;
- Numerous cabins are present across the camping ground portion of the site, most of which were built between 2005 and 2012 with a small number built in approximately the 1950s;
- The older cabins (identified in Figure 2) have corrugated iron roofing that was recently repainted and asbestos tiles used in gable ends;
- A 2,000L diesel above ground storage tank (AST) is located in the camp ground for heating water (shown in Figure 2). The tank is surrounded by a concrete block bund and appears to be in good condition;
- A pole-mounted transformer is located in the south of the site;
- LPG is used for heating water for the old ablution block;
- There is some paint and herbicide storage onsite, at small domestic-level volumes;
- Onsite drainage is via open drains and a culvert that discharges to the lake;
- The site appeared to be well maintained and generally free of waste.

3.2 Site history information

Historical information relating to the site has been collected from a variety of sources. The information presented documents on-site activities, except for the aerial photograph review where comments are also provided on readily observable surrounding land use. The site features are shown on Figure 2, Appendix A.

3.2.1 Historical aerial photos

Historical aerial photographs from the T&T library and other sources have been reviewed as stated in Table 2. Relevant features of the site and surrounding land are summarised from each aerial photograph in Table 2. Copies of the aerial photographs are included in Appendix B.

Table 2: Summary of aerial photograph review

Date and source	Key site features	Surrounding land features
1954 NZAM	The site appears to be largely covered in forest and scrub. The south eastern portion	Lake Tekapo is present to the east and some forested areas with a couple of dwellings

Date and source	Key site features	Surrounding land features
	of the site has approximately 14 cabins present.	present to the south east of the site. The remaining areas are rural.
1977 NZAM	Four cabins visible in the 1954 aerial are still present and a dwelling has been constructed near the cabins. An area of forest/scrub, centrally located, has been cleared and cabins have been developed.	The forested area has extended further west of the site. There are no other significant changes in the surrounding land use.
1986 NZAM	Due to scale of the photograph, it is difficult to distinguish small features. There appear to be no significant changes to the site.	There appear to be no significant changes to the site.
2006 Google Earth	More cabins have been developed across the site.	The area to the north east of the site has been cleared (for Tekapo Springs development). There are no other significant changes to the site.

3.2.2 Historical certificates of title

Current and historical certificates of titles for the site have been reviewed. A summary of the information reviewed is presented below.

- 1962: Gazette notice appointing the Mackenzie County Council to have control of the property, designated as a public domain by the Minister of Lands;
- 1971-1986: Owned by the Crown for a recreation reserve – Tekapo Domain, controlled by The Mackenzie County Council;
- 1974: 15 year lease dating from 1969 with right of renewal to I A Miles;
- 1986-2001: Transfer of ownership to The Mackenzie County Council;
- 1987: 33 year lease to M H Brass, P & E A Brass;
- 2001-2012: Change of name to The Mackenzie District Council;
- 2012-present: Tekapo Landco Limited

3.2.3 Mackenzie District Council property files

Property files held by MDC were viewed on 25 February 2014. The file review revealed the following information:

- 2009 – moving of Mayers house;
- 2010 – construction of the Backpackers Lodge;
- 2010 – construction of ten cabins;
- 2010 – installation of a log burner; and
- 2011 – subdivision and council land swap.

There were no recorded complaints regarding the use of the property and no potentially contaminating activities noted in the file.

3.2.4 ECan Listed Land Use Register

A copy of ECan's LLUR listing for the site was sourced on 14 February 2014. The site is listed on the LLUR for the use of storage tanks or drums for fuel, chemicals or liquid waste.

A note dated 26 March 1999 states that the site has two above ground storage tanks which were installed in December 1997. They both contain class 3(c) substances with a volume of 1,000L and 2,000L, for the purposes of heating water.

The information obtained during the site walkover inspection notes that the 1,000L tank has since been removed.

The LLUR listing is attached in Appendix C.

3.3 Potential for ground contamination

This investigation has identified that HAIL activities were (or are likely to have been) undertaken at the site. The activities, potential contaminants and an assessment of the likelihood, potential magnitude and possible extent of contamination are presented in Table 3. The inferred locations of these activities are presented on Figure 2 (Appendix A).

Table 3: Potential for contamination

Land use/activity	Potential contaminants	Likelihood, magnitude and possible extent of contamination	HAIL reference
Lead paint likely used on older cabins	Lead	This is likely limited to the surface soils immediately surrounding the older buildings that are likely to have previously been painted with lead-based paints.	Not a HAIL activity
Asbestos tiling in old cabins	Asbestos	The tiling appears to be in good condition in the cabins that remain onsite. Approximately 10 cabins were demolished between 1954 and 1977. It is likely that these cabins also had the asbestos tiling and the demolition of these buildings would not have been controlled.	Yes, only for the previously demolished areas E1 –Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition
Diesel AST	Total petroleum hydrocarbons (TPH) and polyaromatic hydrocarbons (PAHs)	The concrete bund surrounding the diesel AST is in good condition and there are no reports of significant spills. There is no significant staining, but there may be some localised surface contamination around the filling area.	Yes A17 – Storage tanks or drums for fuel, chemicals or liquid waste
200L drums in forest area	Dependent on contents of drums but may include PAHs, TPH, metals	There is no evidence of leaks or spills from the drums, but there may be localised contamination of surface soil near the drums.	Yes A17 – Storage tanks or drums for fuel, chemicals or liquid waste
Storage of paints and herbicides	Metals, solvents and herbicides	Small volumes were present at the time of the site inspection. There may localised contamination of surface soil near the storage area.	Yes A17 – Storage tanks or drums for fuel, chemicals or liquid waste

Land use/activity	Potential contaminants	Likelihood, magnitude and possible extent of contamination	HAIL reference
Dumping of wastes in trees	Metals and PAHs	None was identified onsite.	Activity not confirmed
Transformer	PCBs and hydrocarbons	The pole-mounted transformer appears to be in good condition with no staining in the surrounding areas.	Yes B2 – Electrical transformers

3.4 Ground contamination summary and implications

This assessment has identified a number of activities that have potential to have caused ground contamination (e.g., demolition of historical buildings, small-scale fuel and chemical storage). There is no evidence to suggest any contamination which would preclude the proposed plan change and subsequent development of the site. However, there may be cost implications for earthworks, particularly for the disposal of any geotechnically unsuitable material that cannot be managed onsite.

The plan change will not result in an immediate change that is reasonably likely to harm human health, and therefore resource consent is not expected to be required under the NES Soil[2] for the proposed plan change. However, at the development stage, when there is a change of use and/or earthworks, there may be an increased risk to human health, if elevated concentrations of contaminants are present, and the following may apply:

- Intrusive investigations will be required to assess if the historical activities have caused ground contamination. This will assist in fully assessing resource consent requirements and soil disposal or management options for any surplus material (if any);
- If contamination is present, resource consent would be required under the NES Soil for the change of use of the site, and potentially to disturb soil depending on earthworks volumes. A Site Management Plan may be required to ensure appropriate health and safety controls for excavation workers and outlining additional measures for earthworks of contaminated material. This will likely be part of resource consent conditions under the NES Soil, if required;
- Resource consent may be required from ECan for stormwater discharges from the site during and after development.
- Materials that are not geotechnically suitable or surplus to foundation requirements may be:
  - Managed onsite (e.g., landscaped bunds). The degree of management required will depend on the outcome of testing;
  - Disposed offsite. The disposal location will depend on the contaminant levels present. Clean fill is only available if soil is clean (i.e., consistent with background). If surplus soil is contaminated, it would have to be disposed to an appropriately consented landfill (e.g. Redruth Landfill in Timaru up to $190/tonne excluding application fees and transportation costs).

[2] National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (MfE, 2011)

4 Geotechnical assessment

4.1 Site geology

4.1.1 2009/10 investigation

Tonkin & Taylor carried out a geotechnical investigation of the camp ground area for plan change purposes in December 2009 (T&T report ref: 51581_rpt1, January 2010). A site walkover was conducted of the camp area and 4 test pits were excavated with a 20-tonne excavator into the dense till deposits. Dense, moist gravelly silt till materials were observed, along with minor lenses of varved and contorted lake silts. Beach gravel and sand was found in a test pit excavated on the 700m terrace next to Lakeside Drive. A 0.5m boulder lag deposit was noted on top of till deposits on the 720m terrace at the south end of the camp ground. Till and contorted lake silts were observed in a man-made cut next to the car and boat storage area.

4.1.2 2014 site observations

The area west and north of the camp ground, which is the subject of this report, was observed in a site walkover on 25 February 2014. Exposure of till deposits was observed in several man made cuts around the perimeter of the camp ground. There was no indication of slope stability or active erosion across the area. A subdued expression of ground subsidence (possible kettle hole[3]) was observed on the lower slopes to the north of the camp ground (see Figure 2). Development over or adjacent to (i.e., within 10 m of) the kettle hole should not occur without investigation of the feature to ascertain if there is ongoing or future risk of subsidence.

4.2 Natural hazards

Our assessment of the natural hazards with potential to affect the site are summarised in Table 4.

Table 4: Summary of Natural Hazards

Hazard	Characteristics	Likelihood	Risk to future development *
Landslides	Rotational/complex, slow moving, small to large scale	Unlikely	Low to very low
Landslides & debris Flows	Slide/flow, fast moving, small to medium scale	Unlikely	Low to very low
Erosion	Gully, rill and tunnel gully formation	Possible	Low to very low
Flooding (stormwater)	Overland flow in storms	Unlikely	Low to very low
Earthquake liquefaction	Broadly graded tills, discontinuous and contorted lenses of material, relatively deep water table.	Unlikely**	Low**
Earthquake ground shaking	Shaking will be typical of a deep soil profile in this region		Use appropriate recurrence intervals for proposed type of structure

[3] A kettle hole is a circular area of ground subsidence caused by a block of ice melting that was trapped within the moraine. There are many, usually with a small tarn in the base, out on the moraine south of the town.

Active Fault Rupture	No active faults known across or adjacent to the site		Nil risk

* Maintaining the above risk ratings after future development will be subject to suitable engineering design and proper construction of earthworks and structures.

**The likelihood and risk may be higher at specific locations within the site if they are underlain by materials susceptible to liquefaction. Liquefaction risk should be considered for all site specific investigation and design.

4.3 Section 106 of the Resource Management Act

The risk assessment described in Section 4.2 indicates very low to low qualitative risk to future development. Assessed very low to low risks would generally be accepted and no further mitigation measures adopted. In terms of Section 106 of the Resource Management Act (RMA) the hazards would be considered unlikely and development will not worsen or accelerate the occurrence of the hazards.

Development that follows the preliminary recommendations of this report and is subject to detailed engineering design is not likely to accelerate, worsen or result in material damage to the land by erosion, falling debris, subsidence, slippage, or inundation from any source as defined in Section 106 of the RMA.

4.4 Liquefaction

The risk of liquefaction is assessed as low. Therefore, no sub-surface investigations were carried out for this assessment.

Locally there may be areas of liquefiable soil within the complex sequence of the glacial moraine. This might be a lens (for example, areas 10m by 10m, or 40m by 20m) of alluvial sand with a perched water table. At subdivision stage, or for design of structures larger than residential dwellings, the risk of liquefaction should be considered by a geotechnical engineer based on site-specific investigation, assessment, and (if necessary), design of measures to mitigate the hazard.

4.5 Geotechnical summary and implications

Geotechnical considerations in design of the future land development include:

- No development constraints were identified from natural hazards;
- Silty tills and lake sediments will influence the design of cut and fill slopes;
- Long term slope stability and landform stability will require slopes similar to the natural slope angle range of 15^{o} to 25^{o}. Steeper slopes will require engineered retention;
- Development adjacent to the subdued kettle hole feature shown on Figure 2 will require specific investigation of the feature;
- Cuts deeper than about 3m should consider the possibility of the water table rising above the cut surface during wet periods/seasons;
- Foundation bearing capacity will generally be suitable for residential and commercial structures on slab and/or pad footings (subject to liquefaction risk assessment). Poorly graded, no fines beach gravels and sands may not be suitable for shallow foundations;
- Liquefaction risk must be considered as part of all site-specific investigation and design (i.e., at subdivision and building design stage);
- Design subgrade CBR of in situ silty soils will likely be low (depending locally on sand and gravel content). Materials suitable for granular fill and the sub base of roadways are readily available on site.

5 Infrastructure capacity assessment

5.1 Introduction

Within the limitations of the information available to us, we have assessed the capacity of the existing public wastewater and water supply infrastructure to service the proposed plan change.

Mackenzie District Council has advised that the proposed development must comply with NZS 4404:2010 – Land development and subdivision guidelines[4] – with no amendments.

The assessment is based on the following information:

- As-built infrastructure information from Mackenzie District Council's publically-available, internet-based GIS system;
- Correspondence with Bernie Haar, Asset Manager for Mackenzie District Council regarding details of MDC services;
- The requirements of the following standards:
  - NZS 4404:2010 – Land Development and Subdivision Infrastructure;
  - AS/NZS 1547:2012 – On-site domestic wastewater management;
  - SNZ PAS 4508:2008 New Zealand Fire Service Fire Fighting Water Supplies Code of Practice.
- Review of "Option 1" for the proposed subdivision (Appendix D) and information about development density supplied by Planz Consultants Ltd (28 April and 8 May 2014), including:
  - Retaining the existing travellers' accommodation in the Residential 2 zone except for the "lifers" caravan area;
  - Development of the "lifers" caravan area and residual land into individual lots at Residential 2 levels; and
  - Development of the proposed Residential 1 zone to 90 dwelling units.
- Discussions with service providers (Chorus, Alpine Energy) and services plans provided (Appendix E).

Note: MDC's GIS system lacks some of the technical detail (e.g. pipe grades, operation of pump stations and reservoirs) required for a comprehensive review of services for a land development project. Therefore this pre-feasibility assessment is based on limited information and design guidance set out in NZS 4404:2010 and AS/NZS 1547:2012 – On-site domestic wastewater management[5]. Details of specific information gaps are identified in each section below.

5.2 Wastewater

5.2.1 Description of existing system

A 150mm PVC gravity main (constructed c1990) conveys wastewater from the existing holiday park to a booster pump station at the holiday park entrance, which discharges to a new gravity main near Simpson Lane that flows to the main pump station on the west bank of the Tekapo River head. The main pump station pumps wastewater across the Tekapo River on SH 8 (across the Tekapo Dam), then south to the treatment plant.

[4] Standards New Zealand, NZS 4404:2010 – Land development and subdivision guidelines, Wellington 2010.
[5] Standards New Zealand, AS/NZS 1547:2012 – On-site domestic wastewater management, Wellington 2012.

Information gaps on the existing system include:

- Number, size, and location of connections into the 150mm gravity main;
- Longitudinal grade of the 150mm gravity main;
- Details of the booster pump station at the holiday park entrance, including wetwell volume, pump size and capacity, and emergency storage volume.

Information on each of the above items is required to accurately assess the remaining capacity in the existing wastewater system, identify required upgrades to the existing wastewater system (if any) to allow build out of the full development proposed (Option 1), and determine how much development can occur at the holiday park before those, if needed, upgrades are required.

5.2.2 Estimated wastewater generation rates

We have used the New Zealand Standards NZS 4404:2010 and AS/NZS 1547:2012 to estimate peak wet weather wastewater generation rates of the existing and proposed (Option 1) land use scenarios. These rates are summarised in Table 5.

Table 5: Summary of estimated wastewater generation rates

	Existing land use		Proposed land use (Scenario 1)		Percentage change	
	EDUs	**PWWF (l/s)**	**EDUs**	**PWWF (l/s)**	**EDUs**	**PWWF (l/s)**
Minimum	234	5.3	331	7.9	41%	49%
Maximum	328	6.6	417	12.0	27%	82%

Notes:

EDU = equivalent dwelling units (single family homes)

PWWF = peak wet weather flow rate, which includes a dry weather peaking factor of 2.5 and wet weather infiltration factor of 2.0 as required by NZS 4404:2010

Minimum and maximum generation rates are included in this table to account for the lower and upper generation rates set out in AS/NZS 1547:2012, and for the lower and upper household population information set out in NZS 4404:2010.

Rates include an allowance for holiday park staff living off-site.

5.2.3 Capacity of existing system

We have completed a preliminary hydraulic assessment of the 150mm gravity main under the maximum peak wet weather flow rate estimate of 12.0 l/s assuming the gravity main is laid at a slope of at least 0.5% (which is the minimum pipe slope under current design standards). This calculation indicates that a 150mm nominal diameter pipe at 0.5% slope would be flowing full at a rate of approximately 12.5 l/s. It therefore appears that the existing 150mm gravity main would have sufficient capacity to cater for the proposed Option 1 development. However, the actual diameter and slope of the gravity main should be confirmed through a site survey, and detailed hydraulic calculations performed to ensure it has sufficient capacity for the overall proposed development.

It is understood from MDC (Bernie Haar, Asset Manager) that the existing pump station and rising main is basically designed to accommodate the existing holiday park. To determine if this is the case, as-built details of the pump station should be confirmed, and a detailed hydraulic assessment of the pump station and rising main should be carried out in consultation with MDC at a future subdivision stage. This will also allow the nature and timing of any upgrades required at the pump station and rising main to be identified.

Mr Haar also advised that the new gravity main downstream of Simpson Lane (the main pump station in town) and rising main to the treatment plant are all sized to account for the existing Residential zoned areas and another 50 years of future development. We assume MDC's assessment of the available capacity of the wastewater network downstream of Simpson Lane is correct and have not independently verified this. An assessment of pipe and pump capacity may be needed at the subdivision design stage to identify any alterations that may be needed (for example, a new pump).

It is expected that the proposed development would incur impact fees to take advantage of the capacity in MDC's wastewater system downstream of Simpson Lane.

5.2.4 Additional work recommended

The following work is recommended at a future subdivision stage to confirm if any upgrade requirements to the wastewater system:

- Confirm as-built details of 150 mm gravity main and pump station at holiday park entrance;
- Hydraulic assessment of wastewater system, including within the project site.

5.3 Water supply

5.3.1 Description of existing system

Water is abstracted from near Braemar Road (RL 820 m), and is conveyed to Tekapo township through a 200mm main in Braemar Road and SH 8. There is a 1,150 cubic metre reservoir (RL 780m) near State Highway 8, some 500m above the 100mm branch pipeline (RL 740m) into the existing holiday park.

Information gaps on the existing system include:

- Height and normal operating level of reservoirs;
- Target working pressures in the system.

Information on each of the above items is required to accurately assess the performance of the existing water supply system, identify required upgrades to the existing water supply system to allow build out of the full development proposed (Option 1), and determine how much development can occur at the holiday park before those upgrades are required.

Based on an assumed velocity of 2 m/s (the maximum allowable velocity set out in NZS 4404:2010), the existing 100mm main to the site has a capacity of about 15 l/s.

5.3.2 Capacity of existing system

MDC (Bernie Harr) has advised us that the Tekapo water supply system has sufficient water supply volume to accommodate development within the proposed zones. We assume MDC's assessment of the availability of water for the proposed development is correct and have not independently verified this.

Our assessment (set out below) indicates upgrades and extensions to the existing reticulation system within the project site may be required to 1) provide adequate flows and pressures to the proposed development under normal operating conditions (potable supply), and 2) provide adequate flows and residual pressures during a firefighting event.

5.3.2.1 Flow

We have estimated the potable water supply demand from the estimated wastewater generation rates described in Section 5.2.2, assuming that 85% of potable water supply demand becomes wastewater[6]. The estimated potable water supply demand is 14.1 l/s.

Fire demand was estimated based on PAS SNZ 4508:2008 – New Zealand Fire Service firefighting water supplies code of practice. PAS SNZ 4508:2008 requires water supply flows of 25 l/s for normal residential buildings (no sprinklers in houses, Fire class FW2), and 50 l/s for sleeping activities (motels, etc.) having a fire cell size[7] less than 600m^2 (Fire class FHC 1).

Given the relatively low potable water supply demand (maximum of about 14.1 l/s), fire demand (25 l/s) will be the controlling design criteria.

Indicative pipe sizing to supply the required fire flows to FW2 and FHC 1 structures is 150mm and 200mm, respectively, and subject to residual pressures, which are discussed below. Thus the existing 100mm water supply pipe appears inadequate, unless alternative firefighting water supply arrangements (e.g. from Lake Tekapo, storage on site) are already in place for the Tekapo Holiday Park.

5.3.2.2 Pressure

NZS 4404:2010 requires normal operating pressures to be between 25m and 80m head. We have made preliminary calculations to determine the operating head at key locations in the proposed Option 1 development (Table 6) using the following data and assumptions:

- Elevations of key infrastructure from 20m contours available on MDC GIS viewer;
- Existing and proposed systems to operate under gravity flow only (no pressure booster pumps);
- Pipes operate at maximum head loss allowed in NZS 4404:2010 (3m per km of pipe for pipes ≥ 200mm, and 5m per km of pipe for pipes ≤ 150mm). This is a conservative assumption, and head losses may actually be less than assumed, which would result in higher than estimated pressures;
- Water supply network upgrades required to provide adequate flow are installed, such as the following indicative design concept: A new 150mm pipe in the paper road (to be partially developed under Option 1) from SH 8 to the northwestern site boundary, with a looped connection (to improve pressures, minimise water age, and ensure water quality) to a new 150mm pipe that replaces the existing 100mm pipe.

[6] This assumption is based on Auckland Council advice that in their region 75% of potable water supply becomes wastewater (some water is consumed, used to water gardens or wash cars, etc.). We have increased this rate to 85% to account for the nature of the site as much of the existing holiday park is to be retained, and thus large usage in gardens and car washing is not anticipated.

[7] We used the MDC GIS viewer to measure building areas on the existing site. The largest building on site was measured to be 550m^2.

Table 6: Estimated water supply pressures at key locations

Location	Elevation (m RL)	Pressure head (m)			
		Design min	Design max	Estimated (Scenario 1)	Criteria met?
Braemar Road intake	820	-	-	-	N/A
SH 8 reservoir	780	-	-	-	N/A
Existing branch at SH 8	740	25	80	40	Yes
Tekapo Holiday Park entrance	715	25	80	60	Yes
NW corner of site[1]	760-780	25	80	15-0	No
Notes: 1. Assumes a 150mm main is connected to 200 mm main below SH 8 reservoir. Also note that if the 150mm main is connected above SH 8 reservoir, head losses are expected to result in inadequate pressures (<25m) at the site as well.					

The northwestern corner of the site is roughly the same elevation as the SH 8 reservoir, which results in inadequate pressures supplied to this portion of the site (Table 6). To remedy this, pressure sustaining valves and a pressure booster pump could be required if a more detailed analysis of the water supply network confirms our preliminary calculations.

In summary, an indicative design concept that would provide the required fire fighting flow and pressure could include new 150mm pipe looped within the development with two connections to the 200mm main in SH 8, with pressure sustaining valves and booster pump station to serve development above RL 740m (approximate). A more detailed analysis of the network should be undertaken in consultation with MDC at the subdivision design stage to confirm the sizing, layout, and operation of the site's network and connections to the 200mm main in SH 8.

It is expected that the proposed development would incur impact fees to take advantage of the capacity in MDC's water supply system.

5.3.3 Additional work recommended

The following work is recommended at the subdivision stage to confirm upgrade requirements to the water supply system:

- Confirm as-built details and operational regime of existing water supply network;
- Hydraulic assessment of water supply network and proposed upgrades within the project site.

5.4 Flooding

The proposed development is located in a relatively small catchment (it appears to be less than 50 ha), and has no significant water bodies.

At the northern end of the site there are two defined gullies, though these sub-catchments are 7 to 10 ha in size and the vegetation cover suggests there have been no major flows in these streams in the past 60 years.

Water levels in Lake Tekapo are managed via the hydroelectric scheme, and have an historical operating range of about 9 m (RL 704m to RL 713m)[8]. Water levels in Lake Tekapo are not expected to influence building levels on site as Lakeside Drive is at or above RL 713m.

Based on our preliminary site visit and limited information on the catchment, the site does not appear to have a significant flood hazard.

5.5 Stormwater network

Based on our preliminary site visit no significant stormwater network appears to be present on site. Our review of ECan's consent database indicates no existing stormwater consents are in place for the site.

A new stormwater system and outfalls to Lake Tekapo will be required. A stormwater discharge consent will be needed from Environment Canterbury at the time of development.

Given that the receiving environment for site stormwater will be Lake Tekapo, it is possible that a low impact approach to stormwater management may be required for development. This would require engineering design input at the time of subdivision or development. Low impact stormwater designs have been consented at recent subdivisions in Lochinver Avenue and Sibbald Lane, Tekapo.

It is expected that with good engineering design, low-impact stormwater design could be achieved, and stormwater management should not be a barrier to the proposed zone change.

5.5.1 Considerations for stormwater design (at subdivision stage)

NZS 4404:2010 describes the low impact approach as including:

- Reducing peak flow discharges;
- Eliminating or reducing discharges by infiltration or soakage. Based on our preliminary assessment of the site soils (glacial till material in a terminal moraine comprising silt with gravel and boulders), soakage is considered technically infeasible due to the impermeability of the site soils;
- Improving water quality by filtration;
- Installing detention devices for beneficial reuse.

Further design considerations include:

- The nature of the primary stormwater system (swales vs pipes) to accommodate storms up to and including that having a 10% Annual Exceedance Probability (commonly known as a 10-year storm);
- The design of a secondary stormwater system to provide overland flow paths for stormwater flows in excess of the capacity of the primary drainage systems up to and including the 1% AEP event (100-year storm);
- Selection of appropriate stormwater treatment and management devices;
- The integration of the stormwater system, particularly the secondary stormwater system, with the road layout.

At the subdivision stage, engineering input into the type and nature of the stormwater system should be integrated with the subdivision layout plan and roading layout prior to their

[8] Electricity Commission report "Lake level history", Opus International Consultants Ltd, 27 February 2009, www.ea.govt.nz/dmsdocument/8722.

confirmation. This process would include discussions with both MDC and ECan to confirm stormwater design concepts.

An indicative design concept could include detention tanks on individual lots that have a throttled connection to outflow to the primary stormwater system in the roads (e.g. swales). However, some consideration needs to be given as to how the stormwater connection is made on sloping lots that are accessed from the top. Given the sloping nature of the site, swales along the road may be inefficient in detaining stormwater flows; some form of attenuation may be required adjacent to Lakeside Drive (e.g. dry detention ponds or swales, or shallow wetlands). The roads could be expected to provide overland flowpaths for the secondary stormwater system.

The following work is recommended at the subdivision design stage:

- Develop a concept design for the stormwater system. This will require engineering design in consultation with the roading and site layout designers;
- Prepare draft stormwater management plan, including consultation with MDC and ECan, and consideration of issues highlighted above.

5.6 Telecommunications

Preliminary as-built information of a telephone line to the existing holiday park was obtained from Before You Dig. We have been in contact with Chorus to determine the capacity of the neighbouring copper network and telephone exchange, and capacity and availability of the local broadband internet facilities.

We have been informed by Chorus that they are currently installing fibre optic cabling in the area, and would look to install fibre from the Lake Tekapo exchange to the development site, and reticulate fibre within the development. Chorus (Don Baskett) have prepared a preliminary layout based on an older development plan (2010 Urbanismplus layout) and provided the following advice:

> *Establish the fibre feeder from the Exchange at LTK to the subdivision site – estimate around $70,000.00 (exc GST)*
>
> *Reticulation around the subdivision area estimated at $1,000.00 (exc GST) per allotment, based on 150 lots being created.*
>
> ***Please note that the plan and estimated costs are only approximate at this time and are intended to give the developer some indicative information.***

Telecommunications do not appear to be a significant constraint on the proposed zoning change. Project specific discussions should be entered into with Chorus when a firm concept plan is developed.

5.7 Electricity

Alpine Energy (Richard Webb) informs that they are currently developing transmission infrastructure along the SH 8 corridor between the proposed development and the Tekapo township, and expects that this infrastructure will be completed by the end of 2014.

Electricity supply does not appear to be a significant constraint on the proposed zoning change. Project specific discussions should be entered into with Alpine Energy when a firm concept plan is developed.

5.8 Infrastructure summary and implications

The infrastructure capacity assessment has not identified significant constraints to the proposed zone change. However, some upgrade works may be required to support development of the site. These would be most appropriately assessed at subdivision stage, when details of the development are known.

The following aspects would need to be addressed at subdivision stage:

- Wastewater capacity: The existing 150mm gravity main for wastewater appears to have sufficient capacity to cater for the proposed Option 1 development, but a site survey and hydraulic calculations are required to confirm this. A hydraulic assessment of pump stations and rising mains should be carried out in consultation with MDC at the subdivision design stage. It is expected that the proposed development would incur impact fees to take advantage of the capacity in MDC's wastewater system;
- Water supply: potable supply volume appears to be adequate, but upgrades may be required to provide the required fire-fighting flow and pressure. A hydraulic assessment of the water supply network should be carried out in consultation with MDC at the subdivision design stage, and when as-built details and operational regime of the existing network are known. It is expected that the proposed development would incur impact fees to take advantage of the capacity in MDC's water supply system;
- Stormwater: stormwater management is expected to require an engineered low-impact design solution. A stormwater discharge consent will be needed from Environment Canterbury;
- Potential costs to developer for fibre optic installation. Project specific discussions should be entered into with Chorus when a firm concept plan is developed;
- Project specific discussions should be entered into with Alpine Energy when a firm concept plan is developed.

6 Applicability

The works were carried out in accordance with our proposal dated 4 February 2014. This report has been prepared for the benefit of Tekapo Landco Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Wendy Whitley

Environmental Scientist

Barry McDowell

Senior Engineering Geologist

Authorised for Tonkin & Taylor Ltd by:

Casey Giberson

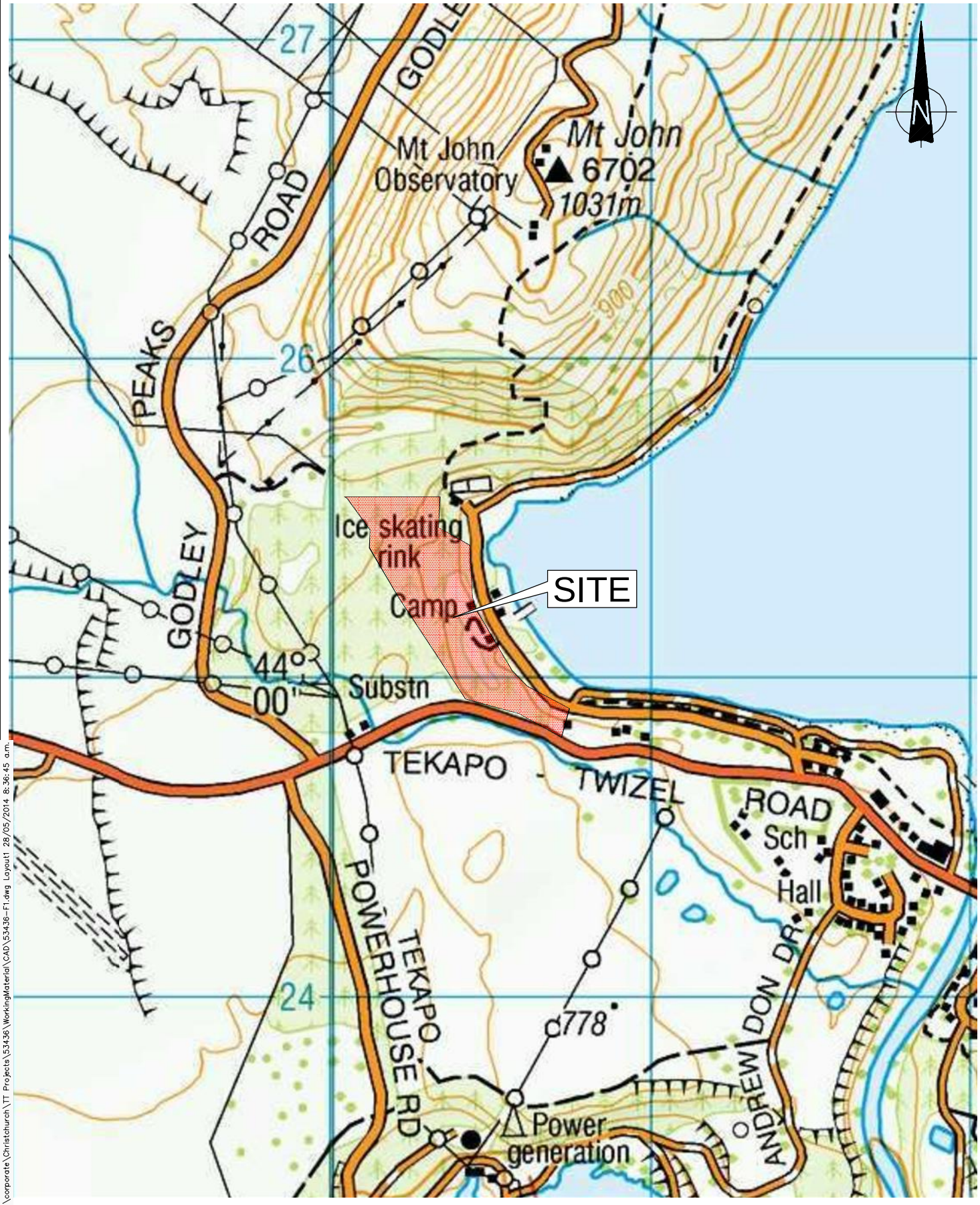
Senior Civil Engineer

Grant Lovell

Project Director

t:\christchurch\tt projects\53436\issueddocuments\rpt_tekapo_20140702.docx

Appendix A: Figures



NOTES:
1. Street map sourced from Terralink International (Copyright 2002–2005 Terralink International Limited and its licensors).

\\ttgroup.local\corporate\Christchurch\TT Projects\53436\WorkingMaterial\CAD\53436-F1.dwg Layout1 28/05/2014 8:36:45 a.m.

Tonkin & Taylor
Environmental and Engineering Consultants
33 Parkhouse Road, Wigram, Christchurch
www.tonkin.co.nz

DRAWN	NSW	May.14
DRAFTING CHECKED		
APPROVED		
CADFILE : \\53436-F1.dwg		
SCALES (AT A4 SIZE) NTS		
PROJECT No. 53436		

TEKAPO LANDCO LTD

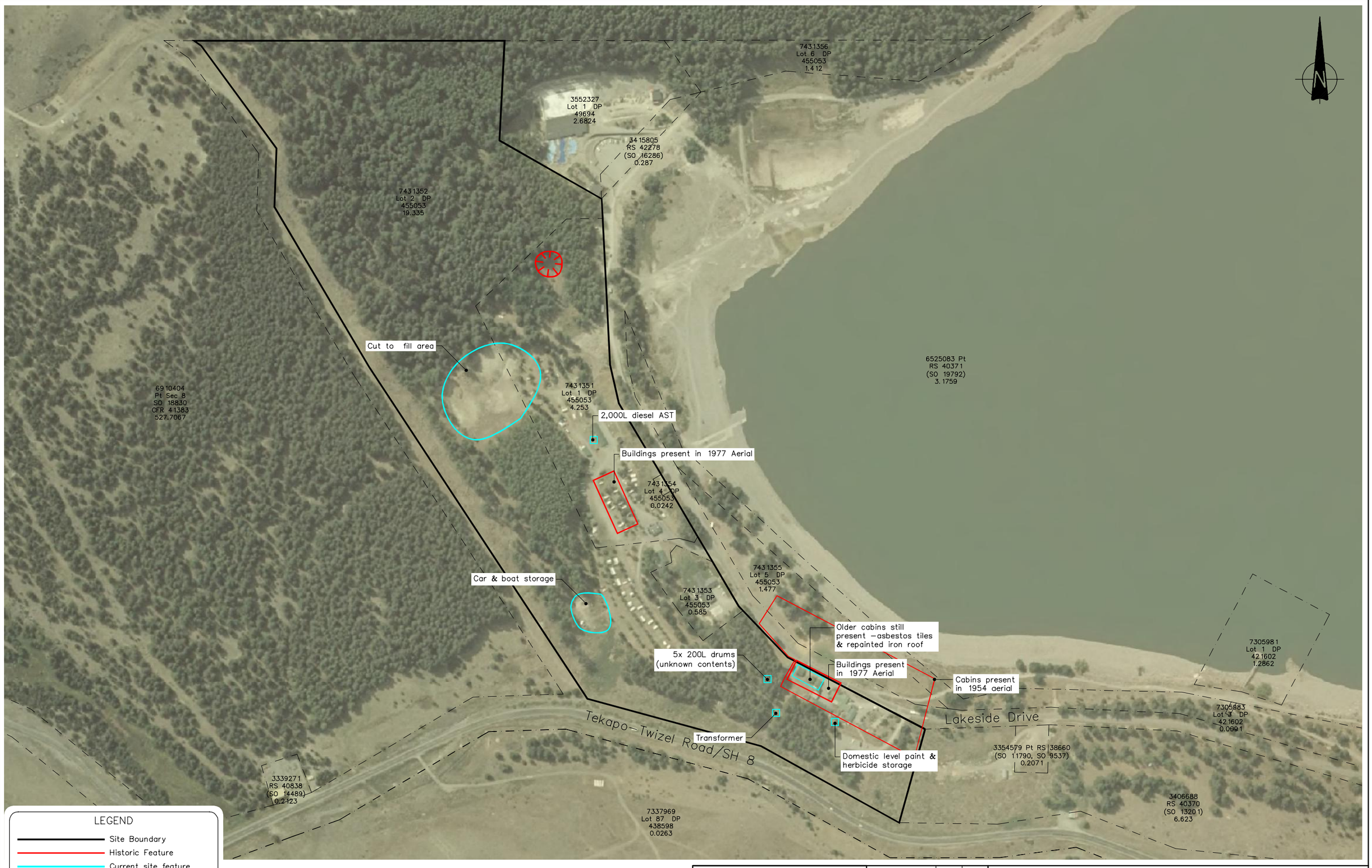
CONTAMINATED LAND, GEOTECHNICAL & SERVICES CAPACITY ASSESSMENT

LAKE TEKAPO HOLIDAY PARK

Site Location Plan

FIG. No. 53436-F1

REV. 0



LEGEND

- Site Boundary
- Historic Feature
- Current site feature
- Legal Lot Boundaries
- Kettle Hole(subdued form)

SCALE 1: 4000

0 40 80 120 160 200 (m)

NOTES:

1. Aerial photo sourced from Terralink International (Copyright 2002–2005 Terralink International Limited and its licensors).
2. Property boundaries sourced from Land Information New Zealand data (Crown Copyright Reserved).

Tonkin & Taylor
Environmental and Engineering Consultants
33 Parkhouse Road, Wigram, Christchurch
www.tonkin.co.nz

DRAWN	NSW	May. 14
DRAFTING CHECKED		
APPROVED		
CADFILE : \\53436–F2.dwg		
SCALES (AT A3 SIZE) 1: 4000		
PROJECT No. 53436	FIG. No. 53436–F2	REV. 0

TEKAPO LANDCO LTD

CONTAMINATED LAND, GEOTECHNICAL & SERVICES CAPACITY ASSESSMENT

LAKE TEKAPO HOLIDAY PARK

Site Layout & Historical Features

Appendix B: Historical aerial photographs


NZ Aerial Mapping Ltd
0800 680 690 www.nzam.com
SN 838 2301/28
12/05/1954 1:24000

NZ Aerial Mapping Ltd
0800 680 690 www.nzam.com

SN 5137 A/1

01/10/1977

1:10000

NZ Aerial Mapping Ltd
0800 680 690 www.nzam.com

SN 8595 H/20

09/02/1986

1:50000

6 9 9

Appendix C: LLUR listing

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Dear Sir/Madam

Thank you for submitting your property enquiry in regards to our Listed Land Use Register (LLUR) which holds information about sites that have been used, or are currently used for activities which have the potential to have caused contamination.

The LLUR statement provided indicates the location of the land parcel(s) you enquired about and provides information regarding any LLUR sites within a radius specified in the statement of this land.

Please note that if a property is not currently entered on the LLUR, it does not mean that an activity with the potential to cause contamination has never occurred, or is not currently occurring there. The LLUR is not complete, and new sites are regularly being added as we receive information and conduct our own investigations into current and historic land uses.

The LLUR only contains information held by Environment Canterbury in relation to contaminated or potentially contaminated land; other information relevant to potential contamination may be held in other files (for example consent and enforcement files).

If your enquiry relates to a farm property, please note that many current and past activities undertaken on farms may not be listed on the LLUR. Activities such as the storage, formulation and disposal of pesticides, offal pits, foot rot troughs, animal dips and underground or above ground fuel tanks have the potential to cause contamination.

Please contact and Environment Canterbury Contaminated Sites Officer if you wish to discuss the contents of the LLUR statement, or if you require additional information.
For any other information regarding this land please contact Environment Canterbury Customer Services.

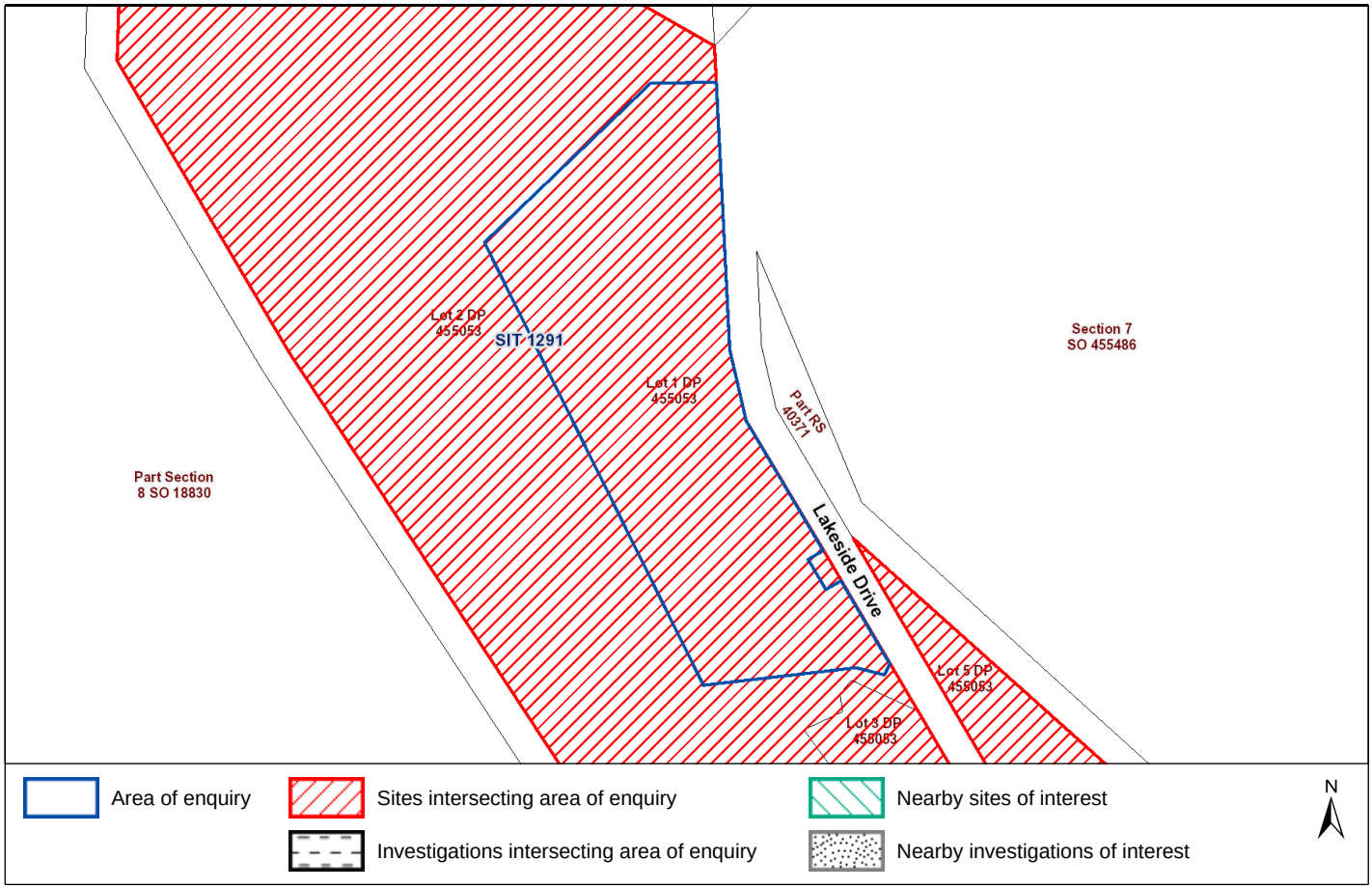
Yours sincerely

Contaminated Sites Team

Statement from the Listed Land Use Register

PO Box 345, Christchurch
General enquiries: 03 365 3828
Fax: 03 365 3194
Email: ecinfo@ecan.govt.nz
Customer services: 03 353 9007
or: 0800 EC INFO (0800 324 636)
Website: www.ecan.govt.nz

Date:	14 February 2014
Land Parcels:	• Lot 1 DP 455053 Valuation No(s):



Summary of sites:

Site ID	Site Name	Location	HAIL Activity(s)	Category
1291	Lake Tekapo Motels & Motor Camp	Lakeside Drive, Lake Tekapo	A17 - Storage tanks or drums for fuel, chemicals or liquid waste	Not Investigated

Please note that the above table represents a summary of sites intersecting the area of enquiry only.

Information held about the sites on the Listed Land Use Register

Site 1291: Lake Tekapo Motels & Motor Camp (Intersects enquiry area.)

Site Address:	Lakeside Drive, Lake Tekapo
Legal Description:	Section 1 SO 20259; RS 40294

Site Category:	Not Investigated
Definition:	Verified HAIL has not been investigated.

Land uses (from HAIL):

Period From	Period To	HAIL land use
1997	Current	Storage tanks or drums for fuel, chemicals or liquid waste

Notes

26 Mar 1999 The manager said that this site has two aboveground storage tanks (ASTs) which were both installed in December 1997. One is a 1000 L AST and the other a 2000 L AST both containing class 3(c) substances. They are used for the heating of hot water.

Investigations

There are no investigations associated with this site.

For further information from Environment Canterbury, contact the Contaminated Sites Officer and refer to enquiry number 29346.

Disclaimer:

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987 and Environment Canterbury's Contaminated Land Information Management Strategy (ECan 2009).

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the accuracy or completeness of this information. It is released only as a copy of Environment Canterbury's records and is not intended to provide a full, complete or totally accurate assessment of the site. It is provided on the basis that Environment Canterbury makes no warranty or representation regarding the reliability, accuracy or completeness of the information provided or the level of contamination (if any) at the relevant site or that the site is suitable or otherwise for any particular purpose. Environment Canterbury accepts no responsibility for any loss, cost, damage or expense any person may incur as a result of the use, reference to or reliance on the information contained in this report.

Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.

Listed Land Use Register

Site categories and definitions

Following verification of a Hazardous Activities and Industries List (HAIL) site with the property owner, Environment Canterbury assigns the site a category on the Listed Land Use Register.

If analytical information from the collection of samples is not available, and the presence or absence of contamination has therefore not been determined, the site is registered as:

Not investigated:

A site whose past or present use has been reported and verified as one that appears on the Hazardous Activities and Industries List (HAIL); and,

The site has not been subjected to investigation including, but not limited to, sampling and analysis of site related soil, water and/or ambient air, and assessment of the associated analytical data.

This category is for sites for which it is known that an activity or use as defined in the HAIL has taken place on the site, but there is insufficient information to characterise any risks to human health or the environment from those activities undertaken on the site. Contamination may have occurred, but should not be assumed to have occurred.

If analytical information from the collection of samples is available the site can be registered in one of six ways:

At or below background concentrations:

The site has been investigated or remediated. The investigation or post remediation validation results confirm that there are no hazardous substances above local background concentrations. Local background concentrations are those that occur naturally in the area. The investigation or validation sampling has been sufficiently detailed, in terms of locations sampled and analytes tested, to characterise the site.

Below guideline values for <land use>:

The site has been investigated. The investigation sample results show that there are hazardous substances present at the site, but indicate that any adverse effects or risks to people and/or the environment are considered to be so low as to be acceptable. The site may have been remediated to reduce contamination to this level, and samples taken after remediation confirm this.

Managed for <land use>:

The site has been investigated. Investigations show that there are hazardous substances present at the site in concentrations that have the potential to cause adverse effects or risks to people and/or the environment. However, those risks are considered managed because:

i) the nature of the use of the site prevents human and/or ecological exposure to the risks; and/or

ii) the land has been altered in some way and/or restrictions have been placed on the way it is used which prevent human and/or ecological exposure to the risks.

Partially investigated:

The site has been partially investigated. Investigations have been conducted that:

i) demonstrate that there are hazardous substances present at the site; however, there is insufficient information to quantify any adverse effects or risks to people or the environment; or

ii) do not adequately verify the presence or absence of contamination associated with all HAIL activities that are and/or have been undertaken on the site.

Significant adverse environmental effects:

The site has been investigated. Results show that sediment, groundwater or surface water contains hazardous substances that:

i) have significant adverse effects on the environment; or

ii) are reasonably likely to have significant adverse effects on the environment.

Contaminated (for <land use>):

The site has been investigated. Contaminated land means that has a hazardous substance in or on it that:

(a) has significant adverse effects on the environment; or

(b) is reasonably likely to have significant adverse effects on the environment.

(s2 RMA 1991)

Please contact Environment Canterbury for further information:

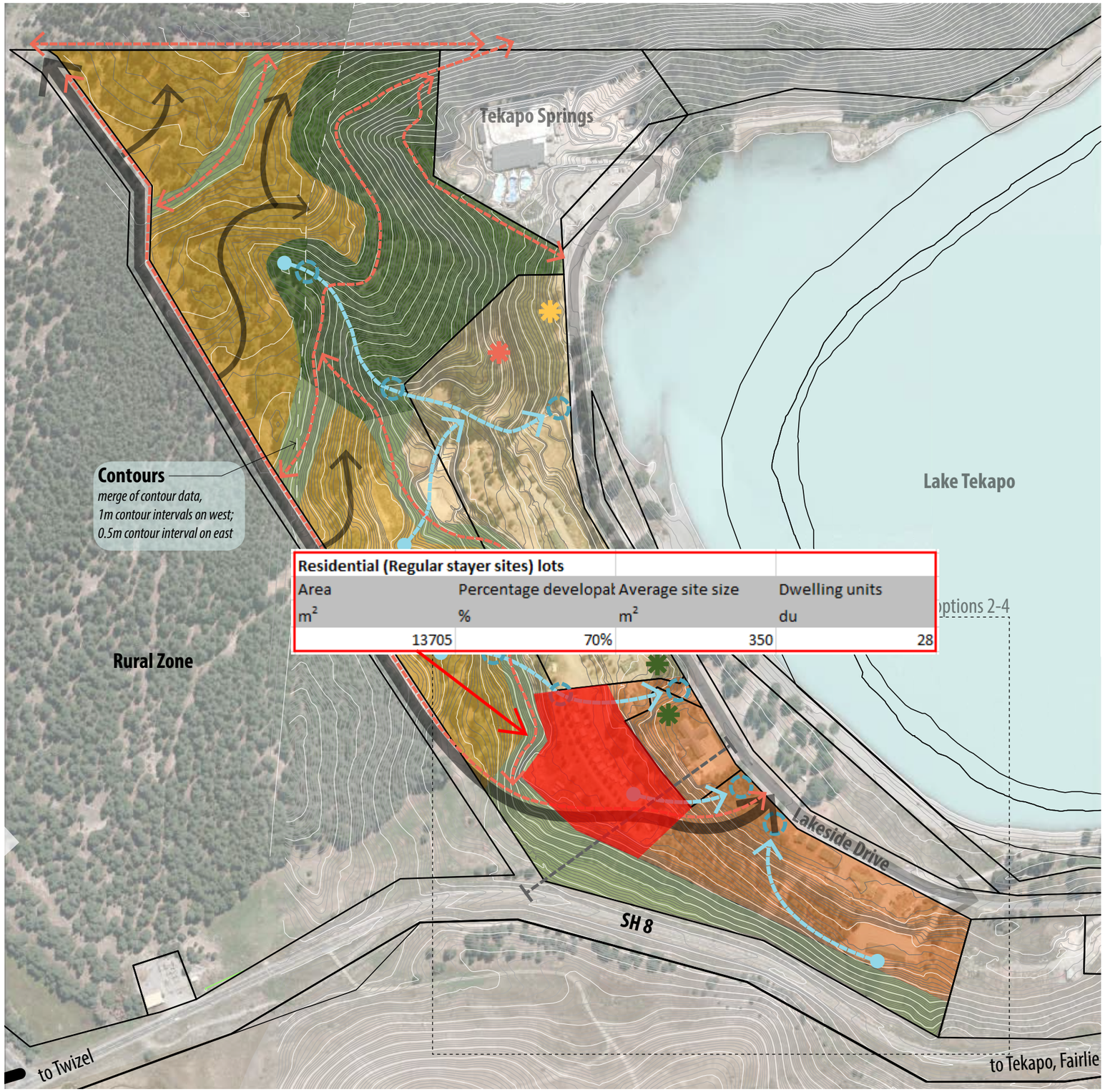
(03) 353 9007 or toll free on 0800 EC INFO (32 4636)
or email ecinfo@ecan.govt.nz

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Appendix D: Development Option 1

DRAFT

PROPOSED ZONING - OPTION 1



KEY

existing services

- water line
- sewer line
- road

proposed

- onsite water cleaning
- engineered stormwater network
- pedestrian access
- proposed road within residential zone
- proposed access to paper road

notes

possible loop road still to be discussed as it may not be possible with existing topography

Residential 1 Zone

- Low density development (as per existing MDC)
- Private or public owned green buffer to be confirmed
- Vehicle access from paper road along the western boundary

Residential 2 Zone

- High density development (as per existing MDC)
- Viability of camp ground extending into existing Residential 2 zoned land to be explored

Special Travellers Accommodation Zone

- Feasibility of camp size financial return vs residential viability of smaller camp to be explored
- Natural landscape feature to be protected
- Potential high density zone (motel or apartments)
- Camp office and/or other facilities to be relocated within this zone rather than Residential Zone, to be confirmed

Green Buffer

- 20m public buffer from SH 8, no build zone, planted in local native vegetation
- Provides screening between SH 8 and proposed Residential 2 Zone expansion, proposed Residential 1 Zone and the STAZ zone
- Private or public owned green buffer to be confirmed

Recreation P (Passive) Zone

- Possible MDC public reserve on difficult to develop land
- Allows for public access

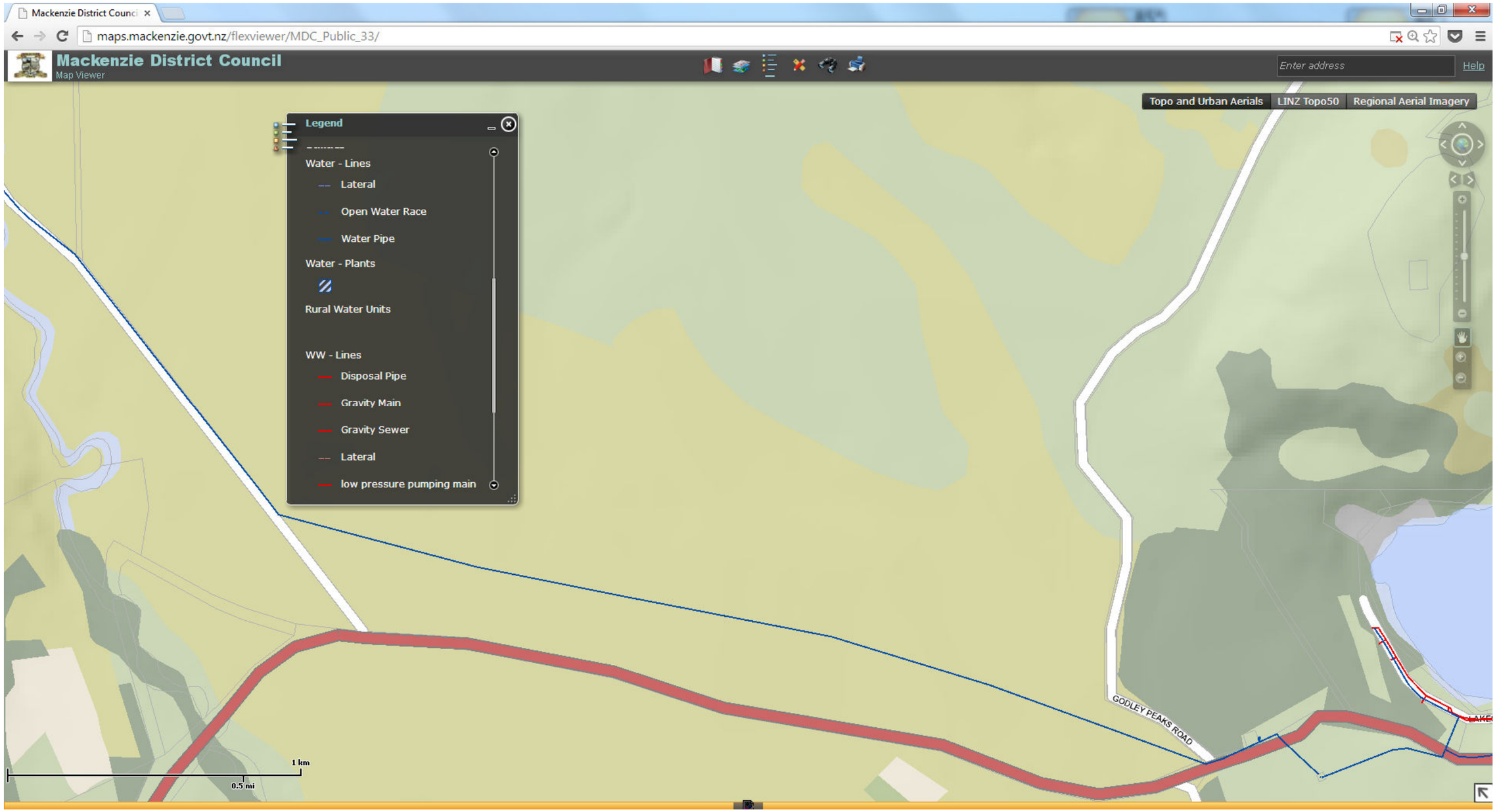
north

scale 1:2,000 @ A1, 1:4,000 @ A3

Tekapo Motels and Holiday Park

			Units	Capacity	Location in terms of Option 1
Back Packers	***Capacity 82***			82	Res 2 area
	Dormitory Rooms	4 bed	11		
		6 Bed	5		
	Double Rooms		2		
	Twin rooms		1		
	Ensuite room		1		
Ensuite Cabins	***Capacity 30***			30	Camp Grd sub zone
	Queen and Bunks		6		
	Queen and Single		2		
Kiwi Bach's	***Capacity 9***			9	Res 2 area
	Queen and bunks	1 bedroom	1	4	
	Queen Bunk and 1 single	2 bedroom	1	5	
Standard Cabins	***Capacity 48***			48	Camp grd Sub zone
	Double plus Bunks		3		
	Double plus two bunks		6		
Motel 1	***Capacity 16***			16	Res 2 area
	Queen and 2 singles	2 bedroom	2		
	Queen and single	1 bedroom	2		
	Queen	Studio	2		
Motel 2	***Capacity 10***			10	Res 2 area
	Queen and 3 singles	2 bedroom	2		
Powered Sites	***Capacity 256*** (average 4 per site)		64	256	Camp grd sub zone
Tent Sites	***Capacity 296*** (average 4 per site)		74	296	Camp grd sub zone
Regular stayer sites (lifers)	**Capacity 72** (average 4 per site)		18	72	Res 2 area
				828	

Appendix E: Services plans


Mackenzie District Council
maps.mackenzie.govt.nz/flexviewer/MDC_Public_33/
Mackenzie District Council
Map Viewer
Enter address
Help
Topo and Urban Aerials
LINZ Topo50
Regional Aerial Imagery
Legend
Water - Lines
Lateral
Open Water Race
Water Pipe
Water - Plants
Rural Water Units
WW - Lines
Disposal Pipe
Gravity Main
Gravity Sewer
Lateral
low pressure pumping main
GODLEY PEAKS ROAD
1 km
0.5 mi

Casey Giberson

From: Regan Robinson
Sent: Monday, 17 March 2014 3:16 p.m.
To: Casey Giberson
Subject: FW: LTK23721
Attachments: Scheme Plan marked up SOW Proposal 130314.pdf

Hey Casey,

Unsure what the letter was about/maybe different departments?

This information seems pretty good though. Hope it's not too late to relay this to the client.

Regan

From: Don Baskett [mailto:Don.Baskett@chorus.co.nz]
Sent: Monday, 17 March 2014 3:09 p.m.
To: Regan Robinson
Cc: 'nathan.kroening@downer.co.nz'
Subject: LTK23721

Regan

Job Number	LTK23721
Project Name	LTK: Lakeside Drive, Lake Tekapo - 150 lots - ABF

I am replying to your request for information about extending Chorus network cabling to the proposed subdivision location as part of an initial feasibility study.

At this stage, I can give you an overview rather than issue a reticulation contract as detailed information on the final layout of the development is not yet available.

Our service company designer has provided me with a high level scope of work narrative below and has attached a draft network layout plan.

Please note that the plan and estimated costs are only approximate at this time and are intended to give the developer some indicative information.

We would look to extend fibre optic cabling into the development area – approximate costs are as follows:

Establish the fibre feeder from the Exchange at LTK to the subdivision site – estimate around $70,000.00

Reticulation around the subdivision area estimated at $1,000.00 (exc GST) per allotment, based on 150 lots being created.

Please give me a call if you have any queries.

Nathan

Please save as "NDS note to Regan Robinson – indicative SOW and costs 17.03.14"

Regards

Don Baskett
Senior Delivery Specialist

T +64 3 546 0899 (extn 35899)
M 027 473 3261
F +64 3 548 4953
E Don.Baskett@chorus.co.nz

Level 2, Exchange Building, 30 Halifax Street Nelson Private Bag 27
www.chorus.co.nz

Aon Hewitt Best Employer in Australasia 2012

Don,

JT 149271
20598.8800
LTK: Lakeside Dr, 150 Lots
Feasibility Only
Viss LTK 23721

I have looked over this job & Checked the existing Network.

There is a 100mm pipe available from the Lake Tekapo Exchange up the hill that goes past the Paper Road that will go along the back of this proposed development.

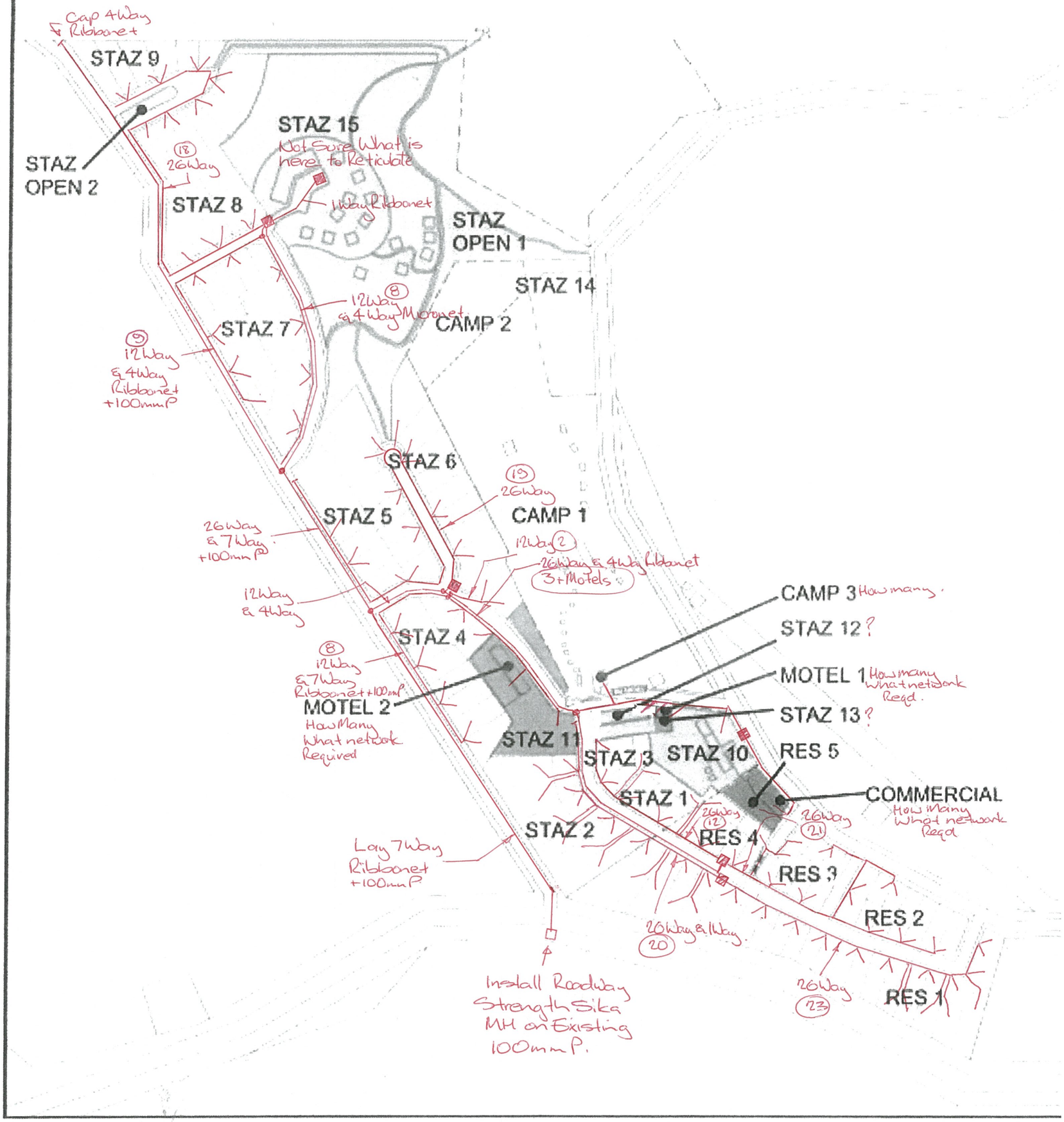
I propose that we install a 1.2x0.6 Sika Roadway Strength Manhole over this Pipe opposite the subdivision.
From here I would propose to Trench across the road & lay 2x100mm pipes to enter the Paper road.

Along the paper road I would lay 1x100mm pipe all the way thru the development to the far end.
As there is significant land around here for development plus the Paper road appears to carry on.
In addition I would lay a combination of 7 Way Micronet & 26 Way Ribbonet to service the Lots off the Paper road.

From the Paper road I would lay a combination of Micronet & Ribbonet around the various roads.
These will be used to reticulate the Lots as shown.
A fibre cable will then be hauled in from the exchange thru the various parts of the subdivision & 6 new ABFAT's established to reticulate the various parts of the development.
Please referr to the Plans.
I have designed this layout based on the sections shown, but have had difficulty estimating what some of the various zones may require.
At this stage this has resulted in probably over building.

This design is dependent on the staging of the development.
It is reliant on the Paper road being part of the initial stages.
If they start on the existing Lake side road, then this will add a significant cost to the job.
This would require about 750m of trenching & laying Pipes to get to the start of the development.

Please note this is only an estimate & could change significantly depending on the development staging.


Cap 4Way Ribbonet
STAZ 9
STAZ OPEN 2
18 26Way
STAZ 15
Not Sure What is here to Reticulate
1Way Ribbonet
STAZ 8
STAZ OPEN 1
STAZ 14
8 12Way & 4Way Micronet
CAMP 2
STAZ 7
9 12Way & 4Way Ribbonet +100mmP
STAZ 6
19 26Way
CAMP 1
STAZ 5
26Way & 7Way +100mmP
12Way & 4Way
12Way 2
26Way & 4Way Ribbonet 3+Motels
CAMP 3 How many.
STAZ 12?
STAZ 4
8 12Way & 7Way Ribbonet +100mmP
MOTEL 2 How Many What network Required
MOTEL 1 How many What network Reqd.
STAZ 13?
STAZ 11
STAZ 3
STAZ 10
RES 5
COMMERCIAL How Many What network Reqd
STAZ 1
26Way 12
26Way 21
STAZ 2
RES 4
Lay 7Way Ribbonet +100mmP
RES 3
RES 2
26Way & 1Way 20
26Way 23
RES 1
Install Roadway Strength Sika MH on Existing 100mmP.

Appendix B: Historical aerial photographs