Appendix 2

Engineering Servicing Strategy

Servicing Report
Plan Change, Creyke Road, Darfield

Prepared for Silver Stream Estates Ltd

September 2010

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Disclaimer

This report has been prepared at the specific instructions of Silver Stream Estates Ltd in connection with Silver Stream Estates Ltd's proposed development in Darfield.

Should anyone wish to discuss the content of this report with Davis Ogilvie & Partners Ltd, they are welcome to contact us on (03) 366 1653 or at 137 Armagh Street, First Floor, BNZ Building, Christchurch.

1.0 Introduction

Silver Stream Estates Ltd (SSEL) have engaged Davis Ogilvie (DO) to undertake a servicing feasibility study to support their application for a change to the Selwyn District Plan. The proposal will seek to alter the zoning of the site in accordance with the proposed Outline Development Plan, resulting in 45.3ha of Living 1 land, 45.8ha of Living 2A zoned land and 13.3ha of Business 2 zoned land on land that totals 113.4ha. The table below identifies all land subject to the plan change.

Legal Description:

Title	Lot Numbers	Area
CB35C/243	Lot 2 DP 59728	4.9690ha
CB35C/242	Lot 1 DP 59728	4.3660ha
CB32A/75	Pt Lot 2 DP 48841	7.6149ha
CB33A/1134	Lot 1 DP 56120	4.4786ha
370020	Lot 2 DP 391851 and Lot 2 DP 56120	7.9436ha
370019	Lot 1 DP 391851	1.0720ha
CB32A/73	Lot 2 DP 53747	58.4730ha
CB37B/678	Lot 1 DP 62768	6.0219ha
CB498/281	Part RS 27973	4.8562ha
CB628/88	Pt Lot 19 Darfield Village Settlement	1.2166ha
CB628/89	Pt Lot 19 Darfield Village Settlement	4.8537ha
CB35C/920	Lot 1 DP60556	1.0959ha
CB416/178	Lot 5 DP7804	1012m²
230692	Lot 1 DP356582	2.3049ha
230693	Lot 2 DP356582	1.2031ha
230694	Lot 3 DP356582	1.1581ha
CB19B/986	Lot 1 DP38197	1228m²
CB19B/987	Lot 2 DP38197	2825m²
CB11A/836	Lot 8 DP29053	2031m²
CB11A/837	Lot 9 DP29053	2031m²
CB11A/838	Lot 10 DP29053	2031m²

CB11A/839	Lot 11 DP29053	2031m²
CB11A840	Lot 12 DP29053	2031m²
CB11A/841	Lot 13 Dp29053	2031m²
CB27B/660	Lot 1 DP47376	1021m²
CB27B/661	Lot 2 DP47376	1001m²

The location of the proposed plan change is identified below:

Figure 1 – Development Area

The report investigates the following servicing issues:

- Earthworks
- Sewer reticulation
- Water reticulation
- Stormwater reticulation
- Telephone and power
- Roading

An application for subdivision consent was lodged with Selwyn District Council (SDC) for 53 residential lots within the proposed L1 zone. This application was declined and following discussions with SDC a plan change application prepared and lodged in as a draft in August 2010. Subsequent discussions and consultation with the council and neighbours have resulted in this amended plan change

2.0 Servicing Strategy

2.1 Earthworks

The development area is gently sloping with the land grading to the southeast. There is an approximate fall over the site of 8m with an average grade of 1 in 110. The topology of the site is such that any roads and right of ways proposed for the development will require excavation level below the current ground level. Generally this material will be spread on site achieving a cut/fill balance.

The existing soils have good bearing capacities and the site is well suited to residential development, with very limited earthworks required. At time of engineering approval an erosion and sediment control plan will be prepared to address all aspects of the earthworks disturbance and mitigation measures, this will be done in accordance with Environment Canterbury's Erosion and Sediment Guidelines 2007.

2.2 Sewer Reticulation

Currently there is not a reticulated sewer system in Darfield. All sewer is managed via onsite treatment systems. Therefore there are two options for the reticulation and treatment of sewage:

1. Individual on site treatment.
2. Reticulated system to a new treatment plant.

It was proposed in the earlier subdivision application that the sewage from the residential lots be treated by a transportable membrane bioreactor (MBR) system (NovaTainer or NovaSkid), with an adjacent disposal field in the balance lot. The system is a proprietary sewer treatment plant offered by WaterGurus New Zealand Ltd as described on the attached datasheets (see Appendix A). The plant is re-locatable in nature so that it can be replaced with a larger plant at a later time.

Consent for the discharge of the treated effluent from the formally proposed 53 lot development, and the associated pipework required to install the system has recently been obtained from Environment Canterbury (ECan) (CRC100960, CRC100959, see Appendix F).

The manufacturer, Water Gurus New Zealand Ltd have had discussions with SDC about the potential for this system to be expanded to cater for all of Darfield's sewer treatment facilities should a sewer reticulation and treatment system be built for Darfield. However, this is in early stages and it is not known if a reticulated system will be provided for Darfield in the near future.

Alternatively individual onsite treatment systems could be utilised for sewage treatment and disposal on each lot, inline with the existing Darfield area.

In conclusion sewer can be managed by either individual on-site sewage treatment systems, or a sewer reticulation system similar that that of which consent from ECan has already been obtained.

2.3 Water Reticulation

The existing Darfield water supply is at present of very poor quality. Information published by SDC (see Appendix B) and data extracted from the Water Information for New Zealand (WINZ) database (see Appendix C) has indicated the following issues within the existing system:

- Low water grade Ee – Treatment plant grade E (unacceptable level of risk), Reticulation grade e (unacceptable level of risk).
- Use of large amounts of water.
- High leakage rate – currently 26%.
- System does not meet the regulations of NZ Fire Service Fire Fighting Code of Practice.

The current standard of water does not meet the requirements of the Drinking-Water Standards for New Zealand (DWSNZ), 2005 (revised (2008)).

Several options have been considered for water reticulation for the proposed plan change area. The options include:

1. Using the 'new source' of water located to the northwest of the existing Darfield township.

2. Upgrading the existing infrastructure to manage with the additional amount of water required.

3. Using water from Kirwee and pumping to Darfield.

4. Recycling water by treating the sewer effluent to a very high grade and double plumbing the new development. Recycled water that is used on gardens and toilet flushing will reduce the excessive demand in the existing township. Recycling is an option that can be integrated into any of the above supply methods.

Option 1

From discussions with the SDC Asset Manager Hugh Blake Manson we understand that the SDC is in the process of seeking to formalise an 83 l/s water supply located to the north of the township. The ground water take consent is currently held by Stanwood Holdings (CRC093539), however SDC are in negotiation with ECan to develop an appropriate set of conditions for this to become a community supply well.

Council is promoting the use of this new water supply for the Darfield township, and have confirmed that subject to confirmation by hydraulic modelling, once this supply becomes available, there will be supply for the proposed development area.

The most cost effective solution is to use the 'new source' of water and reticulate to the site. The existing infrastructure in Darfield will require the necessary upgrades to provide a system that has the capacity to supply water for future developments adjacent to the proposed subdivision.

Option 2

Upgrade the existing infrastructure and town supply. Presently the existing infrastructure has a low water grade (Ee) and a high leakage rate therefore upgrades to the existing system will be costly, and it is therefore considered a less desirable option. To improve the quality of the water and reduce leakage, significant costs would be required for the upgrade of the water take, treatment plant and pipe network. This would require significant expenditure and a funding programme through the LTCCP process that may include development contributions for all new connections as well as either a general or targeted rates for existing connections.

Option 3

The Kirwee source is nearing the extent of its current consent conditions and will be exceeded by this proposal; therefore additional water take from this well will require a new consent and additional water treatment. The source is located approximately 7km away from Darfield and therefore will require large booster pumps and extensive pipework infrastructure. This proposal would provide significantly better quality water than the current Darfield supply.

Option 4

Modelling of the existing network and the current proposal shows that approximately 35% of an individual households' demand can consist of recycled water via a double plumbing system (e.g. for use on laundry, toilet, gardens etc). This amount of water is not considered enough to supply the new development on its own. Recycling water will require a high level of treatment which is expensive and will require double plumbing to reticulate back into the proposed development. Whilst this option has been discounted in favour of the 'new source' of water, the developer is keen to investigate the option of installing double plumbing systems so some level of recycling is able to be undertaken in the future.

All lots will need to be supplied as per the requirements of NZS 4404:2004 Land Development and Subdivision engineering. After the necessary upgrades to the existing water reticulation system have been made, all lots will be supplied to meet the requirements of SNZ PAS 4509:2003 New Zealand Fire Service Fire Fighting Water Supplies Code of Practice.

In conclusion water for this development is best supplied from the "new source" identified by the SDC once the conditions of the existing consent have been amended and ownership changed to the Council. Should this not occur there are alternatives available.

2.4 Stormwater Reticulation

Subsurface soakage testing has been carried out on the site, and shows an average soakage rate of 1750mm per hour (see Appendix D for infiltration test results). Surface infiltration rate testing has also been carried out on the site. It shows that surface infiltration is between 30 and 52mm per hour degrading to an ultimate infiltration rate of 2-5mm per hour (see Appendix E for

infiltrometer test results). This concurs with previous projects completed in the area (Pemberton Drive) and ECan well data for the area.

Due to the large depth to groundwater (85m below ground surface), stormwater disposed of through the use of soak pits is considered appropriate. Stormwater from individual lots will be disposed of via household soak pits (see Figure 2 below). Stormwater from the road reserve will be conveyed by grass treatment swales to sumps. The sumps will connect via a trapped outlet to soak pits in the order of 3-4m deep (see Figure 2 below). The development will require soak pits placed at 90m intervals along the internal roads. ECan has recently issued discharge consent for the previously proposed residential development by Silver Stream Estates Ltd, for the discharge of stormwater from roofs and hardstanding areas (CRC100957, see Appendix F).

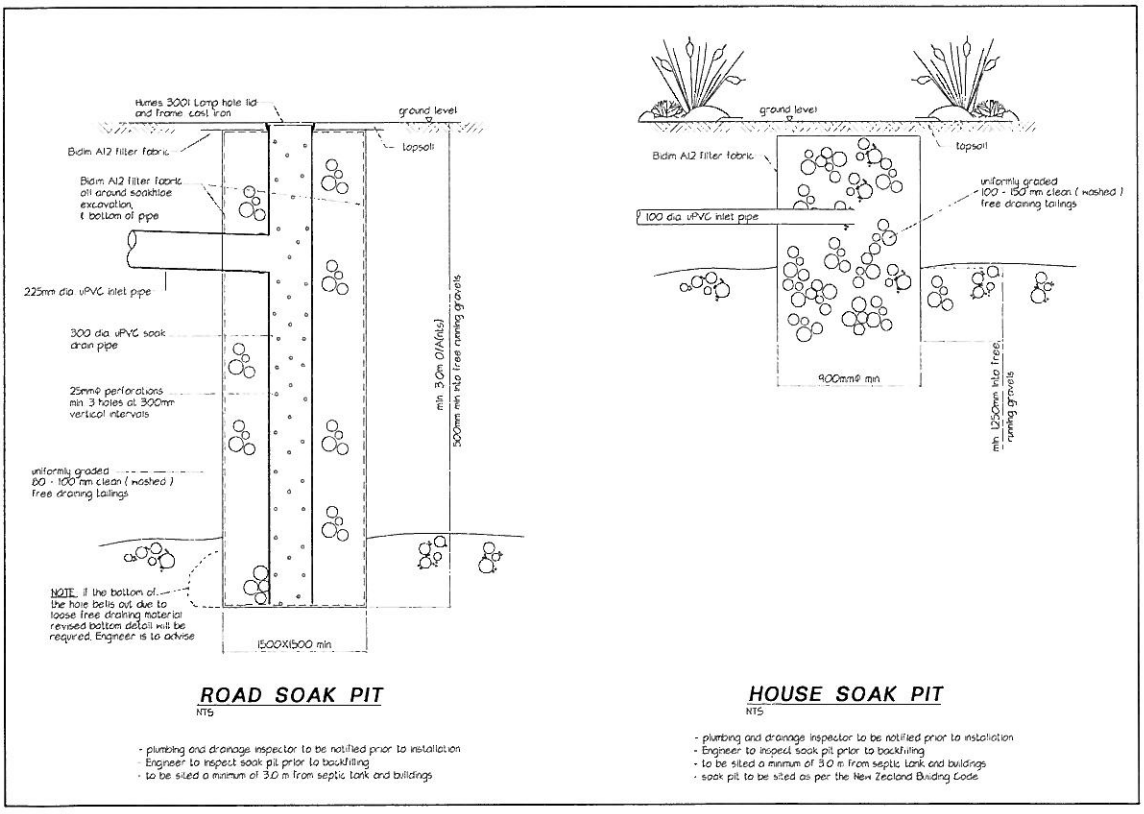

Figure 2 – Soak Pit Details

2.5 Telephone and Power

Chorus Ltd has confirmed that there is sufficient capacity to extend their existing telecommunications network to provide telecommunication reticulation for 443 lots at the proposed site location. Orion NZ Ltd has confirmed that their existing power reticulation has sufficient capacity to supply 50 to 150 lots at the proposed site location. We have requested that they provide confirmation for the additional lots to meet the new amount of 443, this will be forthcoming. Telecommunication and power services will be installed and connections made to the net area of each lot. See Appendix G for confirmation letters.

2.6 Roading and Right of Ways

Roading will be designed in accordance with NZS 4404:2004 and the Selwyn District Plan. The ODP prepared identifies the main linkages through the development.

3.0 CONCLUSION

This report assesses the feasibility of providing services and developing the proposed site in Darfield.

Current capacity deficiencies within the existing Darfield water supply network have been identified by SDC and are reflected in the underlying deferred nature of the Living 2A zone. Discussions with the SDC have indicated the new bore has the capacity to supply this proposed rezoning, although this would require confirmation from additional modelling once the final consent to take water is granted.

The site is well suited to infiltration as a method for disposal of stormwater. Ground water level is located well below the existing ground level, and infiltration rates are high.

The topology of the site allows for residential development with limited earthworks.

Sewer treatment can be provided buy onsite treatment solutions (inline with the existing Darfield township), or a reticulated system if this becomes available to the development area.