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KERR + PARTNERS
Civil + Environmental Engineers

Area SR1 - Izone Industrial Park, Rolleston

Selwyn District Council

Stormwater Management Assessment for Plan Change

August 2009
Reference 1003
Revision B

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1. *Introduction*

This report is prepared in support of an application to change the Selwyn District Plan to allow industrial and commercial zoning (Business 2) of approximately 48ha of land as an extension to the existing Izone Industrial Park, Rolleston. This area is notated as SR1 in proposed Change One to the Regional Policy Statement.

The report discusses the issues for managing stormwater in the proposed industrial area and assesses the feasibility of providing an effective and sustainable system.

2. *Site Description*

2.1 Existing and Surrounding Land Use

The subject site is characterised by land use activities typical of a rural setting, being paddocks demarcated by fencelines and shelterbelts and associated accessory buildings and landscape plantings.

2.2 Geology and Topography

The central Canterbury Plains are formed by scenes of coalescing glacial outwash and alluvial fans progressively built up from the erosion of the Southern Alps during the quaternay period.

The site is slightly sloping to the south east, however, it has a fairly flat and even gradient.

2.3 Rainfall

The monthly rain gauge averages from data collected from Wigram Aerodrome in Table 1 provide a reasonable approximation of Rolleston rainfall. This is compared to evapo-transpiration (based on 75% of average raised pan evaporation from Christchurch Airport), to give an average monthly moisture budget.

Table 1: Monthly Mean Rainfall and Evaporation (mm)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Yr
Rainfall	56	44	52	58	75	55	62	54	45	42	50	55	648
Evapo-transpiration	153	126	92	58	34	19	20	36	68	105	132	155	997
Balance	-97	-82	-40	0	41	36	42	18	-23	-63	-82	-100	-349

The table shows that rainfall exceeds evaporation for the winter months of May to August. The rainfall surplus is usually small.

2.4 Soils

According to the Environment Canterbury GIS system, the site is traversed by Eyre shallow sandy loam with bands of Templeton moderately deep silt loam also running through the area. Eyre and Templeton soils are associated with flood channels of the Waimakariri River of which a relict form is apparent in the site contours. Consistent with this origin, the soils are likely to be underlain by fine sands and clay silts in outwash gravel as has been revealed by test pits dug to 4 metres depth at other similar locations within Rolleston and borelogs from local wells.

Although the soils have good water retention capabilities 70-110mm (average 85mm water holding capacity) and 90-150mm (average 120mm) respectively, they are also described by Cox (1974) as well drained, of a depth between 0.5 and 1 metre and may be suited to cropping if retained within common ownership and managed appropriately. Infiltration is expected to be in the range of 30 to 50mm/hr in common with measurements from other sites of similar soil type in the vicinity.

2.5 Groundwater

The site is located over a semi-confined or unconfined aquifer within the Selwyn-Waimakariri Groundwater Allocation Zone. There are a number of wells in the vicinity of the site that range in depth from 25m to 195 m bgl with an average depth of 104 m bgl (or 46 m bgl if the 5 deep wells at or about 195 m bgl are disregarded). No wells have been successfully commissioned at depths less than 25 m. The shallowest water of any kind is at 20 m bgl on the top of a clay rich layer. This may well be percolated surface water.

Although water-level observation data shows that groundwater levels can come within 10 m of the surface, the geology would indicate that this is unlikely to represent a water table aquifer, with confinement of the deeper water bearing strata by the above mentioned clay rich layer providing sub-artesian pressure. This confinement is supported by the initial static water levels which are consistently less than half the average well depth.

For most of the wells in this area, yields are only moderate (specific capacity between 0.215 to 0.72 L/s/m) due to aquifers of limited areal extent or the presence of tight clay rich gravels that extend to as much as 135 m bgl where free gravels are encountered and yields increase substantially (e.g. SC of 11.97 L/s/m at 195 m bgl for the Izone industrial bore).

According to the piezometric information contained in Table WQL20 in the Proposed Natural Resources Regional Plan (PNRRP), public supply bore M36/2495, 1700 m to the east and 101 m deep, is recorded as having a groundwater flow direction of 99 degrees, and bore M36/3922, 1080 m to the Southeast and 200 m deep, has a flow direction of 116 degrees. This means that groundwater in the locality runs in a general east-south-east direction.

2.6 Surface Water and Drainage

No functioning natural or constructed surface water bodies are located on the site. Land drainage under existing land use on the site is to the ground with no visible off-site runoff.

3. *Issues*

3.1 Receiving Waters

As no natural or man made surface water systems exist in the area, the only option is to discharge stormwater to ground. This replicates pre-development conditions.

3.2 Land Use Options

The proposed business 2A zoning provides for a wide range of enterprises to be developed at the industrial park. This leads to the possibility that enterprises which have the potential to discharge significant amounts or toxic levels of contaminants may be established. The stormwater system will need to be appropriately designed to manage the risk of diffuse pollution from the sources as well as the potential for accidental spillage of hazardous substances.

An individual stormwater system will need to be designed for each site.

3.3 Water Quality

The contaminants referred to above, along with contaminants discharged from more typical land uses and road traffic will have the potential to adversely affect the groundwater quality. This groundwater feed wells downstream are used for domestic supply as well as stock and irrigation. There is a small possibility that this may include the Christchurch City water supply however studies to date indicate that the groundwater entering in this area traces to the south of Banks Peninsula. Therefore, it is essential that any discharge is appropriately treated to remove the risk that contaminants will affect human health (in line with Drinking Water Standards for New Zealand 2005) and stock water guidelines (ANZECC 2000).

3.4 Flood Risk

The creation of hardstand and roof areas, and the establishment of assets in the area that demand a suitable level of flood protection raises the issue of how intense rainstorms will be managed to ensure water does not enter buildings or otherwise cause damage or threaten safety. The system will have to be appropriately designed to ensure that this can be achieved.

3.5 Stormwater consents for existing stages of IZONE

Three separate 'global' stormwater consents have been granted by Environment Canterbury for the Izone Industrial Park. Consent CRC06044.2 covers the discharge of stormwater from all impervious surfaces within stage one to four of the industrial park, being the currently constructed area and the land rezoned by change 5 of the Selwyn District Plan. CRC091824.1 (roading) and CRC091220 (individual lots) cover area SR2 to the east of stages one to four and similarly authorise stormwater discharge. As such, there is no requirement for any lot owner to obtain a consent to discharge stormwater provided that they can meet the conditions of the consent. An application for a similar global consent for the area subject to this plan change application has been lodged with Environment Canterbury.

The consents cover the discharge of stormwater from each individual lot, and all the roads in the development areas. A combination of swales, soakage pits, Humesceptors and soakage basins are used for the public road network. Options involving swales, raingardens, oil/grit separators and soakage pits are used for the on-lot works.

Activities undertaken that fall within Schedule WQL3 of the Proposed Natural Resources Regional Plan (PNRRP) are not covered by the consent. (WQL3 lists activities where hazardous substances could be used).

4. *Stormwater Management Options*

4.1 Treatment Options

The proposed land use, being potentially contaminant producing enterprises, coupled with the sensitivity of the receiving groundwaters demand a reasonably high level of treatment before discharging to ground waters.

Treatment Options identified as offering promise either alone or in series include:

- Infiltration basins
- Infiltration swales, trenches and raingardens
- Humesceptors, cartridge filter system and other similar propriety devices
- Sand filters
- Oil and grit separators
- Sumps

4.2 Flood Risk Protection Options

Flood risk management options that offer promise include:

- Soakage chambers
- Soakpits
- Swales
- Infiltration basins

4.3 Potential System Combinations

The following combinations of the above elements offer potential for managing stormwater in the industrial park:

For road runoff and light industrial enterprise yards.

- Humesceptor or cartridge filter to soakage chambers (smaller catchments).
- Humesceptor or cartridge filters to soakage pits with overflow to infiltration basins.
- Infiltration basins with sumps or swales providing pre-treatment.
- Infiltration swales and raingardens with overflow to soakage chambers (smaller areas only).

Heavy Industrial Yards

- Sump, Humesceptor or cartridge filter or sand filters to above ground infiltration swale with overflow to soakage chamber(s).
- As above, however with infiltration basins in place of swale and soakage chambers.

Roofs

- Soak pits to ground, sealed from surface water ingress

Carparks, driveways and other areas

- Infiltration swales.
- Any other system used for road runoff outlined above.

4.4 Likely Stormwater System

The concept as outlined in the plan change application documentation, notably the Harrison Grierson Outline Development Plan has been reviewed to develop the likely stormwater system to be used in the development.

The proposed scheme is outlined below, and generally follows the scheme used for the earlier stages of the Industrial Park.

4.4.1 On-lot stormwater

Each part of the lot is divided into one of four categories and the system is specified for each one. These are as follows:

Land Use Type	System
Driveways	Discharge to soakage swale/infiltration trench, swale or raingarden
Carparks and pedestrian areas	
Storage and loading yards	Sumps, then oil/sediment traps, then soakage swale/infiltration trench, swale or raingarden before discharging to ground via an infiltration trench
Roofs.	Discharge to a soakpit via a sealed system

4.4.2 Road Runoff

The runoff from the public roads is likely to be managed as with the previous stages of the development, as follows:

- Kerb and channel will pick up runoff from carriageways, footpaths and berms.
- Sumps with traps will then discharge to a Hydrodynamic Separator such as a Humesceptor.
- The hydrodynamic separators will discharge to rapid soakage chamber which will discharge the treated runoff to ground.
- Secondary flows in excess of the capacity of the hydrodynamic separators will be conveyed via pipelines (20% AEP capacity) and overland flow paths (2% AEP capacity) to an infiltration basin in the stage five roundabouts or at the junction towards the western end of the stage five road corridor. These will be sized to accept the 2% AEP event, with an allowance for freeboard, before over topping. Suitable areas have been set aside in stage five of the existing developed site for these basins.
- Extreme events will pass along the carriageways and discharge as they do prior to development.

4.5 Management of activities that may discharge hazardous substances

Schedule WQL3 of the PNRRP provides a list of activities that use hazardous substances. Due to the risk to the groundwater presented by these types of substances, it is proposed that these activities will not be included in any global stormwater discharge consent sought from Environment Canterbury. Hence specific

system design and discharge consent will be required for such activities should such enterprises seek to establish on the site.

5. *Assessment*

5.1 Feasibility of providing a sustainable solution

There are a large number of systems available for treating and discharging stormwater runoff to ground from the proposed development.

Infiltration basins, raingardens, Humesceptor and the cartridge filters available are all able to treat runoff to a high standard. Using these will result in high levels of treatment. In addition, as the groundwater is some 20 m below ground level, and as there is some distance between the site and the nearest well then there will be additional treatment provided by the unsaturated (vadose) zone.

Some industrial enterprises will require particular design, particularly those listed in schedule WQL3 of the PNRRP. Provided that the discharge from these enterprises are appropriately managed as described in the preceding sections and the discharge to an above ground swale or basin (to allow monitoring of spills more easily) then these issues are able to be managed without undue cost or risk to the environment. If this is not feasible, then consent to discharge for the activity will not be able to be obtained from Environment Canterbury; hence excluding it from the development.

Appropriate groundwater quality modelling has been undertaken as part of the application for the global stormwater consent for the area to confirm that the system is able to discharge water of an appropriate standard and not adversely affect downstream wells. In addition, based on experience with previous stages of this development and others in the Canterbury region, it is clear that suitable solutions are be able to be found.

Therefore, as the receiving waters are all well separated from other users, and with the above measures put in place, we consider that there are suitable and cost-effective systems available to manage storm water from the proposed development and our assessment is that stormwater management does not represent a barrier to the proposed development of this site.

5.2 Assessment against Plans and Policies

Policy	Comment
Selwyn District Plan **Policy B1.2.1** Ensure all activities in townships have appropriate systems for water supply, and effluent and stormwater treatment and disposal to avoid adverse effects on the quality of ground water or surface waterbodies .	Robust and previously consented stormwater system type propped for development of area designed to protect groundwater. No discharge to surface water.
Policy B1.2.2 Ensure land rezoned to a Living or Business zone can be serviced with a water supply and effluent and stormwater disposal without adversely affecting groundwater or surface waterbodies.	As discussed above.
Policy B1.2.4 Recognise and promote the need for protection zones around water supply bores, to reduce the risk of contamination from land uses.	Protection promoted through proposed system type.
Policy B2.2.1 Require that the need to supply utilities and the feasibility of undertaking, is identified at the time a plan change request is made to rezone land for residential or business development.	As outlined in this document, it is demonstrated that it is feasible to provide stormwater management services to the proposed development.
Policy B2.2.2 Ensure activities have access to the utilities they require at the boundary prior to any new allotment being sold; or prior to any new activity taking place on an existing allotment.	All allotments will discharge to ground within their own boundary.

Policy B2.2.4 Ensure provision is made for the ongoing maintenance and repair of utilities which do not vest in the Council, and that the users of these utilities are informed of any responsibility they have for ongoing maintenance or repair.	Regional Council Discharge consents, with relevant maintenance requirements will be transferred to each individual lot owner.
Policy B2.2.5 Avoid potential 'reverse sensitivity' effects of activities on the efficient development, use and maintenance of utilities.	No effects identified for stormwater management.
Policy B2.2.6 Ensure the effects of utilities are compatible with the amenity values and environmental characteristics of the zone in which they locate, also having regard to operational, functional and economic constraints.	Stormwater options fit well with landscape scheme of development proposal.
Policy B3.1.2 Avoid allowing new residential or business development in areas known to be vulnerable to a natural hazard, unless any potential risk of loss of life or damage to property is adequately mitigated.	No hazard identified
Policy B3.1.3 Avoid locating dwellings and other principal buildings in the following areas: – Between any waterbodies and any stopbank designed or used to contain floodwater from that waterbody; or – Within the bed of any lake or river.	Site in these locations.

Regional Policy Statement	
Chapter 9, Water Policy 11 Promote land use practices which maintain and where appropriate enhance water quality. Policy 12 Activities which could result in a release of hazardous substances should not be located in areas where water resources are vulnerable to contamination unless adequate precautionary measures are implemented to avoid that contamination	 Restriction likely on Schedule WQL3 activities as part of discharge consent As above
Ch 12 Settlement and the Built Environment Policy 2 The use of land for urban development and the physical expansion of settlements should be discouraged and the adverse effects of network utility use and provision minimised where such use would: (a) result in the contamination of sources of drinking water. (b) have an adverse effect on flows and level regimes of water bodies, including the flow regimes of spring-fed streams..... Policy 6 Use of land for urban development or the physical expansion of settlements should be discouraged where there are significant adverse effects from natural hazards. Policy 7 The development and expansion of rural towns should enable people and communities to provide for their wellbeing, health and safety, and have particular regard to the efficient use and development of natural and physical resources.	 Robust and proven stormwater treatment system using swales, Humesceptors, raingardens and soakage basins designed to mitigate the effect of contaminants being discharged. Returns all water to ground as pre-development, hence no effect on springs Stormwater effects can be mitigated by use of effective treatment system, as demonstrated in earlier stages of development. By keeping system within the road reserve this makes efficient use of the land

Ch 17 Hazardous Substances Policy 1... (b) District/city councils shall have the following particular responsibilities in their own areas for developing objectives, policies and rules relating to the control of the use of land: (i) prevention or mitigation of any adverse effects of the storage, use, disposal or transportation, outside the coastal marine area, of any hazardous substances that are not listed under (a) (ii) above. (ii) prevention or mitigation of any adverse effects, other than adverse effects on the quality of water in water bodies or coastal water, of the storage, use, or disposal, outside the coastal marine area, of the hazardous substances that are listed under (a) (ii) above. (iii) prevention or mitigation of any adverse effects, of the transportation, outside the coastal marine area, and other than through a pipe, of the hazardous substances that are listed under (a) (ii) above.	Refer comments above regarding WQL3 activities and effectiveness of treatment systems.
<u>Chapter 12a (RPS Change One)</u> Policy 7: Development Form and Design Development of Activities in Greenfields, Intensification Areas, and Key Activity Centres should give effect to urban design best practice. The principles of the Urban Design Protocol (Ministry for the Environment, 2005) shall be observed when preparing or assessing any urban development and the following matters shall be provided for: .....provision for the protection of surface and groundwater quality, including appropriate stormwater management facilities to avoid down stream flooding and to preserve or enhance water quality,	Sufficient area has been set aside in these elements to accept road runoff in previous stages. Each lot will manage runoff from within the site, and the lots are sufficiently large to enable this to be achieved.

Policy 8: Outline Development Plans and Changes of Zoning in District Plans Development of urban activities within the greenfields areas defined in Map 1 shall occur in accordance with an Outline Development Plan. This Plan shall be prepared when it is proposed to amend the district plan and be included in the district plan to provide for urban activities (Greenfields land). Outline Development Plans shall: ..... (vi) show land required for stormwater treatment, retention and drainage paths, (j) Show how other potential adverse effects on the environment, including the protection and enhancement of surface and groundwater quality, are to be avoided, remedied or mitigated,	Roundabouts and intersection shown as part of existing stage five System described in preceding sections
Policy 15: Circumstances for Altering Growth and Sequencing The Canterbury Regional Council, following relevant territorial authority input, shall initiate a reconsideration of the extent, location and timing of land for development as provided for under Policies 1 and 6 if any of the following situations occur: .... In reconsidering the extent, location and timing of land for development any alteration to the Urban Limits, Greenfields, Intensification Areas, or provision for new business land shall give effect to the following: .... urban land use, including industrial and commercial activities, does not increase the risk of contamination of drinking water sources, including the groundwater recharge zone for Christchurch's drinking water	Refer comments above regarding effectiveness of system.

Conclusion
From analysis of the plans and policies that have authority over the proposed development, there are no matters with regard to stormwater management that present a barrier to the development proceeding.

Rob Kerr
August 2009
End of report