



**LAKESIDE
TE KAUWHATA**

STORMWATER MANAGEMENT REPORT

Project: 1239



DOCUMENT CONTROL RECORD

Client Lakeside Development 2017 Limited

Project Lakeside, Te Kauwhata

Document Stormwater Management Report

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1 EXECUTIVE SUMMARY

This report has been prepared by Candor³ to provide more detailed information on stormwater management for the proposed Lakeside development as requested by Council via Bloxam, Burnett and Oliver in their letter of 25 May 2017. The information is provided in support a Plan Change application for land located off Scott Road, Te Kauwhata as shown in Figure 1 in this report.

Stormwater runoff from the proposed Lakeside development will discharge to Lake Waikare with treatment prior to discharge via a system of swales, raingardens and wetlands to be constructed within the development in accordance with good industry practice and relevant standards. It is proposed that some limited filling of the existing floodplain may take place to rationalise lakefront boundaries for development and to achieve coherent roading patterns however this will be offset by excavation in other areas to replace the floodplain volume lost to any filling such that hydrologic neutrality will be maintained post development.

The report sets out appropriate treatment targets, rainfall data and runoff factors for use in designing the ultimate stormwater reticulation for the development.

2 EXISTING SITE DESCRIPTION

The proposed development is located at the end of Scott Road, Te Kauwhata, immediately west of Lake Waikare and to the north-east of Rangiriri. The area displayed in Figure 1 has a total area of approximately 194 hectares.

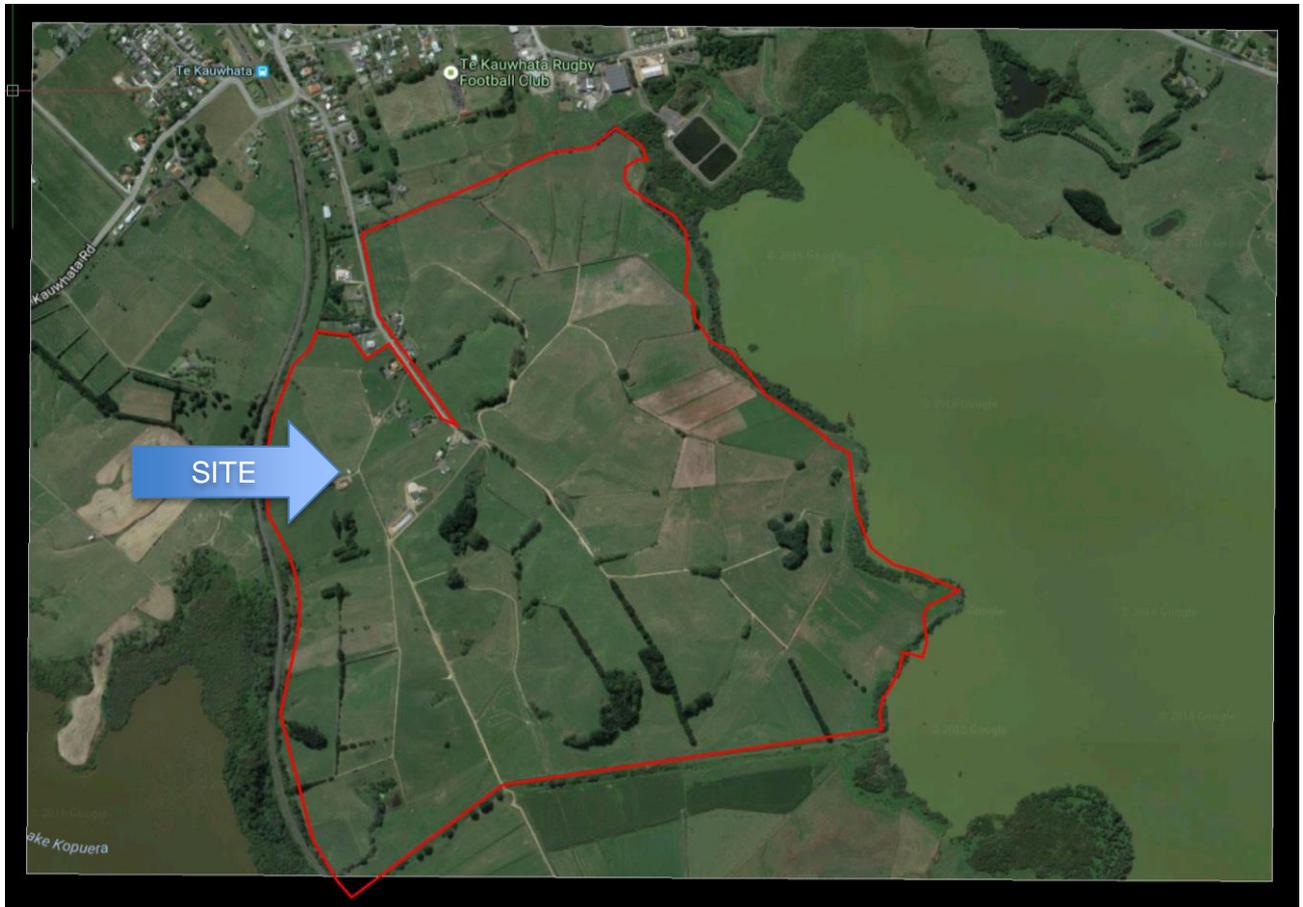


Figure 1 Site location, figure reproduced from Google Maps.

The North Island Main Trunk railway (NIMT) runs along the western boundary of the site and the Waikato Expressway (SH1) is located approximately 1km further to the west with a new interchange to serve Te Kauwhata under construction. Lake Kopuera lies to the south-west of the development, on the western side of the railway and low lying flood prone farmland sits along the southern boundary.

There are a number of farm buildings, associated with a working farm operation, located at the end of Scott Road. Stands of trees are dotted throughout the property as can be seen from the aerial photo with many having been planted as wind breaks to support farming operations.

The land is undulating in contour with the central and western portions being elevated in comparison to the low-lying flood prone land that borders Lake Waikare in the east and along the southern boundary.

3 STORMWATER DESIGN OBJECTIVES

3.1 Treatment Targets

Contaminants generally associated with residential subdivisions comprise gross pollutants, suspended solids, heavy metals and smaller amounts of hydrocarbons and bacteria. Suspended solids can arise from a number of processes including erosion of exposed surfaces, hydrocarbons from vehicle fuels and airborne dust. Metal contaminants are associated with the wearing of vehicle components such as brake linings, tyres and bearings. Stormwater Quality control typically aims to reduce the suspended solids load, as this also removes heavy metals present in particulate form and some bacteria.

The stormwater contaminant load deriving from this subdivision is considered likely to be moderate with most long-term contamination being derived from the proposed roading network and it is intended to treat stormwater runoff before discharge to achieve the contaminant removal target. This will be achieved through a treatment train and multiple mechanism approach, involving source control, swales, filter strips, rain gardens, proprietary devices and/or wetlands, all designed to best practice standards and applied as appropriate. Furthermore, due to the flat nature of the land that lies between Lake Waikare and the extent of the proposed development channels will be formed to carry stormwater runoff rather than utilising piped networks. These channels will be designed to look as natural as possible and will have extensive riparian planting along them further filtering and polishing runoff before discharge to the lake.

Altering the land use from farming to urban development will also have positive benefits on stormwater quality with a reduction in grazing activity from the site significantly decreasing suspended solid levels in the stormwater runoff as well as other common agricultural runoff contaminants (nitrogen/phosphorus and bacteria). For these reasons, stormwater quality is considered unlikely to decrease, and more likely to improve as a result of the development along with treatment and riparian planting.

Stormwater Treatment targets shall be in accordance with Auckland Council's Technical Publication 10 May 2003. In summary these are the removal of 75% total suspended solids with some potential benefit from secondary processes such as attachment to plant material, biological filtration, nitrification and denitrification and cation exchange to precipitate metals and phosphorus.

3.2 Detention Targets

The Waikato Regional Council advised, at a meeting held on 14 March 2017 with Mr Hugh Keane, Mr Ghasan Basheer and Mr Brian Richmond) , that they will not require detention for this site and that treatment is adequate.

Detention of flows is not therefore proposed.

3.3 Peak Flow Mitigation Targets

Peak Flow mitigation is required for erosion protection of downstream waterways. Runoff from the proposed development is not intended to be discharged into existing waterways. Rather it is intended that discharge channels be designed and constructed to pass water from the edge of the proposed development, across the floodplain and into Lake Waikare. It is therefore possible to engineer these channels such that they are stable under outflow conditions. For example the channels can be sized to ensure that flow velocities are low and the channels can be lined with materials such as Enkamat before planting of vegetation to ensure robust stable banks.

The additional runoff generated by the proposed development is not sufficiently large to make any measurable difference to the Waikato River downstream of Lake Waikare and Peak Flow Mitigation is not therefore proposed.

3.4 Pipe Network Sizing

Pipe networks will be designed in accordance with the Hamilton Infrastructure Technical Specifications (HITS), Chapter 4, The Hamilton City Development Manual, Volume 5, District Council Supplement, Part 4: Stormwater Drainage and the Waikato District Council Addendum, Part 4: Stormwater Drainage.

In particular the reticulation systems shall be designed with a design life of 100 years and shall meet the relevant criteria set out in Table 4-1 Minimum Device Design Summary of the Hamilton Infrastructure Technical Specifications.

3.5 Flooding and Overland flows

The development will be designed to ensure that all sites are elevated above the calculated flood level of Lake Waikare with 500mm minimum freeboard above flood levels being provided.

The development will be designed with secondary flowpaths to deal with stormwater runoff events up to the 1 in 100 year ARI where the capacity of the piped network is exceeded and secondary flow can be expected. events. Where possible the roading network will be utilised as the secondary flowpath and in such cases the depth of water within the carriageway will not exceed the flotation depth of vehicles of 150mm as specified by the Hamilton Infrastructure Technical Specifications.

Flowpaths through private property will, for the most part, be avoided however where required flowpaths through private properties will be formed in accordance with section 4.2.3.4 of the Hamilton Infrastructure Technical Specifications and protected by way of easements and consent notices recorded against property tiles.

4 CATCHMENT RAINFALL DATA

NIWA's HIRDS v3 will provide the rainfall depths and intensities for the catchment, using the centroid coordinates of 6,418,000mN 2,701,000mE NZMG and a 2.1°C climate change. This gives the following Intensity / Frequency / Duration relationship (intensity in mm/hr):

	10min	20min	30min	1hr	2hr	6hr	24hr	48hr	72hr
2yr	69.6	47.1	37.2	25.3	15.6	7.2	2.7	1.6	1.2
10yr	106.8	72.6	58.0	39.4	24.4	11.4	4.4	2.6	2.0
50yr	155.4	106.2	85.0	58.2	36.1	16.9	6.5	3.9	2.9
100yr	182.4	124.8	99.8	68.2	42.3	19.8	7.6	4.6	3.4

The Depth / Frequency / Duration relationship is as follows (depth in mm):

	10min	20min	30min	1hr	2hr	6hr	24hr	48hr	72hr
2yr	11.6	15.7	18.6	25.3	31.2	43.3	65.9	78.9	87.8
10yr	17.8	24.2	29.0	39.4	48.8	68.3	104.5	126.1	140.5
50yr	25.9	35.4	42.5	58.2	72.2	101.6	156.5	189.4	211.9
100yr	30.4	41.6	49.9	68.2	84.6	119.0	183.1	221.8	248.0

The rainfall data from HIRDS v3 has been adopted for Te Kauwhata rather than the rainfall data from the Ruakura station as this is more than 40km away and rainfall patterns are significantly different.

5 CATCHMENT CURVE NUMBERS

The Geotechnical Report for the site indicates that soils are generally Class B soils which have a Curve Number of 61 for grassed and 98 for impervious surfaces. The initial abstraction will be 5mm in the pervious areas.

6 CATCHMENT IMPERVIOUS AREAS

In areas where the average density are less than 1 unit per 500m² it is proposed to use a C factor of 0.7 which is slightly higher than required by the Hamilton Infrastructure Technical Specifications for General Residential.

In areas where densities is higher than 1 unit per 500m² it is proposed to use a C factor of 0.8 which is as required by the Hamilton Infrastructure Technical Specifications for Residential High Density.

7 STORMWATER RUNOFF FROM PROPOSED DEVELOPMENT

7.1 Quality Treatment

A variety of industry proven best practice methods will be used to treat and control stormwater from the Lakeside development before discharge into Lake Waikare.

Stormwater reticulation will be designed to convey the 2 year ARI storm event in accordance with Council standards (Hamilton City Design Manual as adopted by Waikato District Council). The proposed reticulation will work in conjunction with “on-line” treatment devices such as rain gardens, swales and engineered wetlands before ultimate discharge into Lake Waikare. Where possible pipework will be minimised and swales will be used to collect and direct runoff to a discharge point. Typically such devices can be used where land is flat with pipework being used on steeper terrain where stormwater runoff velocities will be higher and erosion can be problematic.



Figure 3 Raingardens / Streetscape at Long Bay Auckland



Stormwater swales Albany Centre Auckland

Engineered wetlands are also very effective at removing contaminants from stormwater and providing attenuation and there are numerous good examples of engineered wetlands that provide treatment, habitat and amenity. Figure 2, below, shows two examples of engineered wetlands that the applicants consulting team have been involved in designing and implementing.

Designs for these devices will be in accordance with Auckland Regional Council Technical Publication TP10 May 2003 (Design guideline Manual Stormwater Treatment Devices) and TP124 (Low Impact Design) as well as relevant Hamilton City Council Chapter 4 and Waikato District Council requirements.



Figure 2 Pegasus Town Engineered Wetland



Stonefields Engineered Wetland

In summary these are the removal of 75% total suspended solids with some potential benefit from secondary processes such as attachment to plant material, biological filtration, nitrification and denitrification and cation exchange to precipitate metals and phosphorus.

7.2 Extended Detention

As stated in 3.2 above, there is no requirement for peak flow attenuation as the discharge is into Lake Waikare. Lake Waikare is a large body of water that will not be at risk from erosion due to this development (or cumulatively with similar projects) which is the primary purpose of the extended detention.

7.3 Existing Network Capacity

There is no existing public stormwater reticulation in the subject area and the development will not, therefore, impact on existing infrastructure in any way.

7.4 Flooding and Overland flows

Refer commentary under item 3.5 above.

8 CONCLUSION

This stormwater management report has been prepared in support of a Plan Change application to rezone approximately 194 hectares of land to the south of and immediately adjacent to the existing Te Kauwhata township. The information contained within this report can be used to set stormwater parameters and rules for the proposed development.

Most of the land proposed for development is well elevated above calculated flood levels in Lake Waikare. Some localised filling may be carried out in the proposed floodplains to rationalise roading layouts and where this occurs this land will also be raised above flood levels with appropriate free boards. Where filling of floodplains occurs additional flood storage will be provided in other areas to maintain hydrologic neutrality.

The land is able to be serviced adequately with stormwater reticulation including treatment in accordance with Council and Regional Council standards. A discharge consent will be required.

In our professional opinion, there is no technical impediment to providing the necessary stormwater infrastructure including treatment to serve the proposed Lakeside development and there are no engineering matters that prevent the rezoning of the land. With the construction of new stormwater systems as discussed in this document the proposal may have positive beneficial effects on Lake Waikare as the proposed urban land use should reduce contaminants typically associated with farming operations.

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