

Mitigation of the adverse effects of Lake Hāwea Township stormwater entering Lake Hāwea

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1. Background

There are several stormwater drains that originate in Lakeview Tce and Capell Ave and exit onto the Lake Hāwea Foreshore and thence into the lake. These are all identified in QLDC's GIS mapping site. Figs 1 & 2 are reproduced from that site. The stormwater drains are green. Each stormwater drain has a unique QLDC identifier. For purposes of identification in this document the nearest street address is identified by red text in Figs 1 & 2.



Figure 1 Stormwater drains (green) from Flora Dora Tce to the access to Scott's beach



Figure 2 Stormwater drains (green) from Skinner Terrace to Muir Rd

The stormwater consists of a mix of runoff from private properties and the roading network along Capell Ave and Lakeview Terrace. By today's standards this discharge system would be non-compliant with the ORC Water Plan.

There are several of adverse effects of this system. Principal among them are pollutants¹ from the road surface entering Lake Hāwea, and erosion of sediment into Lake Hāwea.

In several instances adverse effects of these drains are mitigated by vegetation on the foreshore. In other instances there is limited vegetation mitigation. In the worst examples the discharges are causing substantial erosion to the cliff face and resulting in soil entering the lake and causing discoloration during heavy rainfall.

This document describes the storm water discharges and provides comments about any existing or possible mitigation. With respect to the latter, plantings will also add another benefit to the foreshore, namely enhancing the natural biodiversity.

This document is not intended to be a technical review with a comprehensive assessment of options. Rather the aim is to identify some issues and potential solutions as a means of facilitating action on the issue.

Discussion of the drains starts with the furthestmost eastern drain

2. 294 Lakeview Tce

2.1 Current situation

This is a significant system that is piped over the cliff face to the upper edges of the stone foreshore. There is tree lucerne (*Cytissus proliferus*) growing around the exit. There is no significant erosion associated with this discharge.

¹ Some of the key pollutants associated with urban stormwater include: sediments, pathogens, total and dissolved metals, hydrocarbons and oil, organics and pesticides, nutrients and gross pollutants [can you specify? Or delete – this term causes reader to question and you don't give answer].



Fig 2.1 294 Lakeview Tce (31 May 2019)

2.2 Potential mitigation

There is limited opportunity to improve vegetation mitigation, nevertheless it would be worth planting around the exit

3. 282/286 Lakeview Tce

3.1 Current situation

This appears to be a relatively recently installed stormwater discharge system which is associated with a house which was built in the last ten years. This is an unusual situation as it is the only discharge of its kind on the entire township foreshore. The stormwater is piped across the reserve and over the bank where it exits the pipe halfway down the bank and discharges onto grass thence gravel (Fig 3.1). There is no significant erosion associated with this discharge. The erosion shown in Fig 3.1 appears to be due to land run off or possibly excavation during placement of the drain.



Fig 3.1 282/286 Lakeview Tce exit (26 May 2019)

3.2 Potential mitigation

There is a significant opportunity to improve vegetation mitigation around and north of the exit.

4. Kirsty's Beach (236 Lakeview Tce)

4.1 Current situation

This is a small discharge that opens as it enters the reserve. The water then runs down a grass depression and terminates at the four wheel drive track to Kirsty's Beach. In the winter of 2018 the Lake Hāwea Foreshore Group sought to reduce the impact of this discharge by the planting of swamp flax (Fig 4.1) in the top half of the grass depression. These plantings have flourished and will provide a benefit in the future. Nevertheless water discharge north of these plantings is causing scouring of the 4WD track down to Kirsty's beach (Fig 4.2). During moderate rainfall there is ponding at Kirsty's beach (Fig 4.3). The flat grassy area at Kirsty's beach catches the erosion from the 4wd track.

4.2 Potential mitigation

The existing flax planting could be extended. A gutter could be constructed to divert the water down the side of the access track.



Figure 4.1: Kirsty's Beach: Swamp Flax Plantings (26/3/19)



Figure 4.2 : Kirsty's Beach: flooding below planted area (26/3/19)



Figure 4.3: Water eroding 4wd access track to Kirsty's beach (26/3/19)



Figure 4.4: Kirsty's Beach: Ponding at the northern vegetation edge, below the 4WD access (26/3/19)

5. Kitesurfers Beach (208 Lakeview Terrace)

5.1 Current Situation

Stormwater comes off Lakeview Terrace and down an open drain on the left side (heading north) of the sealed drive accessing Kitesurfer's Beach. It turns west for a short distance and goes under the access road to the Esplanade thence across grass (Fig 3.1) where it pools under a willow before draining into the gravel foreshore (Fig 3.2). Apart from grass there is minimal mitigation.

5.2 Potential Mitigation

The grass channel could be enhanced in much the same way as at Kirsty's Beach by the planting of swamp flax. Flax could also be planted under the willow tree.



Figure 5.1 Stormwater crossing grass below Esplanade access road (26/3/19)



Figure 5.2. Ponding at termination of stormwater from Kitesurfers (26/3/19)

6. 130/134 Lakeview Terrace

6.1 Current situation

The drain is covered and runs under the Gladstone walking track. Immediately north of the track it becomes an open drain which discharges into dense bush down to the esplanade picnic area (extreme western end).



Fig 6.1: 130/134 Lakeview Terrace: Pipe running under Gladstone Track (24/5/19)



**Fig 6.2 130/134 Lakeview Terrace: open exit point for drain
(24/5/19)**

6.2 Potential Mitigation

Not necessary

7. Upper Esplanade (86/90 Lakeview Terrace)

7.1 Current situation

This drain is open soon after it enters the reserve (Fig7.1) and runs across an open grassy area (Fig 7.2) thence under the foreshore track then through dense vegetation to the foreshore.



Fig 7.1 86/90 Lakeview Terrace Stormwater exit (24/5/19)



Fig 7.2 86/90 Lakeview Terrace (27/5/19)

7.2 Potential Mitigation

Adverse effects could be further mitigated by planting swamp flax in the grassy area.

8. 60/66 Lakeview Terrace

8.1 Current situation

This drain goes under the walking track at which point it opens. It then flows through quite dense vegetation to the stony foreshore. As is evident from Fig 8.1 a significant volume of water flows through the vegetation



Fig 8.1 Ex 60/66 Lakeview Tce (26/3/19)

8.2 Potential Mitigation

Vegetation options are limited given that there is excellent cover along the flow path. One flax was recently planted where the flow exits the bush. This planting could be complemented by others.

9. 34/40 Skinner Terrace

9.1 Current situation

This drain is piped throughout its entire length. It exits just above the shoreline onto large schist rocks (Fig 9.1) that presumably were placed to

reduce the risk of erosion. That strategy has been effective. The water is not filtered in any way prior to exiting on the foreshore.



Fig 9.1 34/40 Skinner Terrace (26/3/19)

6.2 Potential Mitigation

Mitigation is challenging given the large rocks around the exit. Nevertheless there is sufficient soil and gravel to allow the establishment of several plants.

10 Scotts Beach (110/118 Capell Ave)

10.1 Current situation

There is an open stormwater drain that runs down the bank to the west of the vehicle entrance to Scotts beach. It passes the pump house then runs parallel to a walking track (Fig 7. 1), goes under the foreshore track and exits onto the shoreline (Fig 7.2).

There is minimal vegetation mitigation and the stormwater forms a significant gut on the gravel foreshore. At times of high rainfall the drain cannot cope with the water flow and the water comes across the track and onto the picnic area (west of the track). There was a large natural sink-hole where the existing picnic area is. This was filled in following the 1990s flood and grassed over to make a picnic area.



Fig 10.1 Open drain Scotts beach (26/3/19)



Figure 10.2 Scotts beach: scouring (26/3/19)

10.2 Potential Mitigation

There is an excellent opportunity to form a small wetland. The walking track could be diverted such that it forms an arc to the west of the open drain. The area between the arc and the existing drain could be excavated slightly and then planted with swamp flax.

The gut on the beach is moderated to some degree when the lake level is high. This seems to be an increasingly rare event. The issue could be addressed by placing large rocks at the mouth of the drain to reduce the scouring.

11. Flora Dora Terrace² (opposite 8/12 Flora Dora)

11.1 Current Situation

The stormwater enters the reserve down a steep slope by way of an open drain that is corrugated to reduce the energy of the flow (Fig 11.1). The water passes under a small foot-bridge on the foreshore track. Soon after, the corrugated drain stops and the water then runs across a flat area before cascading over the cliff face at various points. The water is causing major erosion of the cliff face (Fig 11.2) and that in turn is resulting in a

² Flora Dora Terrace is the informal name which refers to the flat terrace below the foreshore slope north of Flora Dora Parade

silty plume (Fig 11.3) in the lake. The Thursday Group has sought to mitigate the adverse effects by creating small diversion channels and with flax plantings (Fig 11.4 a & b), but these efforts are insufficient given the flow during even mild rain conditions.



Fig 11.1 Open stormwater drain from Flora Dora Parade to Flora Dora terrace(26/3/19)



Fig 11.2 Flora Dora Terrace: eroding cliff (26/3/19)



Fig 11.3 Silt Plume caused by eroding Flora Dora Terrace cliff erosion (26/3/19)



Fig 11.4a Diversion and planting (26/3/19)



Figure 11.4b Diversion (23 May 2019)

11.2 Potential Mitigation

There is an urgent need to address the erosion of the cliff face. One option would be to create a series of deep channels parallel to the fence line filled with gravel.

12. Summary

Table 1 provides a summary of the characteristic impacts of the various drains. There is urgent need to address the Flora Dora drain.

Table 1 Summary of drain features and potential or improvement

Drain	Flow	Erosion	Existing Vegetation	Potential for improvement
294 Lakeview Tce	moderate	none	moderate	low
282/286 Lakeview Tce	low	minor	low	low
Kirstys Beach	moderate	minor	moderate	moderate
Kitesurfers	high	none	moderate	high
130/134 Lakeview Terrace	high	none	high	none
Upper Esplande (86/90 Lakeview Terrace)	moderate	none	moderate	moderate
60/66 Lakeview Terrace	high	none	high	none
34/40 Skinner Terrace	high	none	none	low
Scotts Beach (110/118 Capell Ave)	high	none	low	high
Flora Dora Terrace (opposite 8/12 Flora Dora)	high	high	low	high