Tahimana Stormwater Detention Basin

Draft Operations & Maintenance Manual

Tahimana Limited

J000087-RPT-001-A

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Appendix A – Detention Basin As Built Drawings – To be confirmed

Appendix B – Resource Consents – To be confirmed

1. Introduction

Envirolink Limited have been engaged by Tahimana Limited (the Client) to investigate stormwater management for a development including on approximately 70 hectares of land off Stagecoach Road, Tasman, in the Tasman District.

The site of development is shown in Figure 1.1 below.

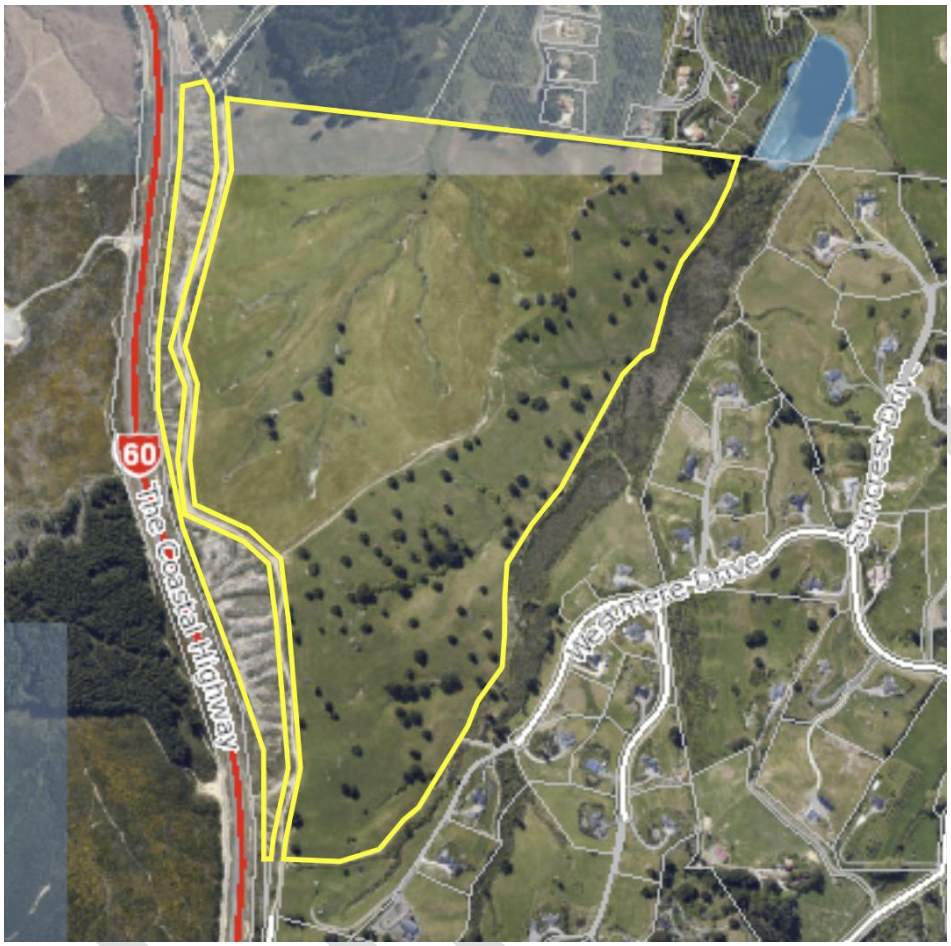

Figure 1.1: Proposed development site. Site boundaries in yellow.

To manage additional stormwater runoff, Envirolink have designed a stormwater detention basins to attenuate runoff to not exceed pre-development flows.

This document presents Operation and Maintenance activities required to operate the detention basins. All basins are a slightly different design and a specific manual will be prepared for each basin as part of the detailed design process. The purpose of this plan is to ensure that those who are landowners of the site(s) which include one or more detention basins understand how the systems work and what maintenance and inspection is required.

2. Regulatory Context

Resource Consents for Land Use and Stormwater Discharge will include additional requirements for the proposed basins. The consent holder (and any subsequent landowner of the lot upon which the detention basins are located) must be familiar with those conditions.

The basin will not be classified as large dams under the Building Code.

Whilst the dam is not classified as a “Large Dams”, the New Zealand Society on Large Dams (NZSOLD) dam safety guidelines provide useful advice and background for dam operators. It is recommended that the consent holder is familiar with these guidelines.

3. Responsibilities and Plan Updates

Responsibility for operation and maintenance of the basin lie with the consent holder, Tahimana Limited, for a period of 2 years. A contractor who is suitably experienced in the maintenance of dams and large-scale stormwater infrastructure should be engaged to carry out maintenance works. Routine inspections can be undertaken by a site manager who is experienced in the supervision of civil infrastructure installation and earthworks. These inspections do not necessarily need to be completed by a civil or geotechnical engineer however it is recommended that a suitably qualified engineer inspects the dam prior to the end of the 2-year period during which Tahimana Limited are responsible for maintenance. Following this inspection, it is recommended that a suitably qualified engineer inspects the dam every 3-5 years, and immediately following identification of a significant defect, as discussed subsequently. This plan is intended to be a live document which is amended by the site operators as and when required.

4. Basin Overview

The basins are designed to attenuate stormwater runoff such that it is equal to, or less than predevelopment levels. To achieve this, basins will store water during rainfall events. It follows that the outlet structure of the basins must be kept clear and free of debris. This includes addressing grass growth and vegetation growth, and immediately remediating any areas which may on inspection be found to be eroded. The basins are not intended to retain water other than during and immediately following a rainfall event.

Basin Details

All basins include different outlet configurations. Details will be provided in final manuals, including design drawings, to be attached as Appendix A. A general outlet configuration is as follows:

- A 150-200mm primary outlet in the basin floor.
- Secondary and tertiary outlets, consisting of 100-300mm holes core drilled in the side of a manhole riser, typically 1-2.5m above the pond floor.
- An open manhole with a debris grille to function as an overflow outlet, typically located at or close to top water level.
- A spillway providing as close as possible to the 500mm of freeboard to top water level, as required by the NTLDM.

Fish passage may be required for some basins and this will be highlighted in the manual if relevant.

The basins will include a spillway to allow for controlled overtopping. The purpose of the spillway is to spread the flow over a wide area to reduce potential erosion.

Rock rip rap will be placed at both the inlet and outlet of the dam. The design specification for the rip rap will be determined at detailed design. A nominal specification is:

- Two layers of D_{50}=200-500mm rock on the outlet. 5-10m long, 3-8m wide apron (measured at downstream extent), laid on the class D Geotextile, 4m long and 4m wide.

Debris covering outlets will restrict flow to less than that required, potentially causing the basin to reach capacity and overtop before intended. The diameters of pipework and inlets should not be altered. If they are damaged, they must be reinstated to the same size, at the same elevation.

If the basin ever overtops, it is possible that rock and geofabric may be dislodged. Both the rock and geofabric must be reinstated under the direction of a suitably qualified Engineer/Contractor if this ever occurs.

Topsoil and grass must be provided on all internal side slopes of both basins. Increased maintenance will be required immediately following construction to establish grass cover. If grass cannot be established prior to the end of the 24 month maintenance period, or should grass be removed at any time after it is established, for instance following flood damage, then a suitably qualified engineer should be engaged to determine the most appropriate repair method.

5. Dam Failure Mechanisms

NZSOLD guidelines typically deal with dams that are designed to permanently retain water, as opposed to these structures which are designed to hold water during and following a rainfall event. Regardless, it is good practice for operators to understand possible dam failure mechanisms. Some of these possible failure mechanisms are outlined below.

Seepage Failures

Water can seep from dam walls, most commonly at either the interface of the bund with in-situ materials, or from the interface between the dam wall and structures such as the outlet pipe.

Structural Failures

This could be evidenced by cracking, slumping or subsidence. The width and depth of crack/settlement and evidence of any moisture should be noted.

Scour or Overtopping Failures

The basin spillway is designed to release water in excess of the capacity in a controlled manner. Any event which can overtop the basin is by its nature an extreme event. Erosion or scour could be minor initially but, if left unrepaired, could lead to a major failure such as undercutting the geotextile, "peeling" layers of geotextile and rock from the face of the dam.

If any evidence of failure, settlement or scour is observed, written and photographic records should be maintained, with measurements for future reference. It is recommended that advice is sought from an experienced geotechnical or dam engineer as soon as any failure is observed. If there is ongoing evidence of minor failure, a sudden significant change, or any potential safety concerns such as large cracks, an experienced geotechnical or dam engineer should be engaged to conduct an inspection as soon as possible. The regulatory authority (Tasman District Council) should be notified.

6. Maintenance Procedures

It is recommended that, where practical, maintenance inspections are undertaken by a person familiar with development such as the development owner or maintenance contractor. Continuity of inspection personnel will help to ensure that changes in basin condition can be observed. This person should be accompanied by a suitably qualified civil or geotechnical engineer at the frequencies discussed in Section 3 above. Maintenance inspections should be staged at variable times including during prolonged dry periods and after heavy rainfall. As such, some flexibility with the timing of inspections is required.

Written records of inspections and any maintenance work should be maintained including the date, time and individuals present for the inspection. The maintenance tables on subsequent pages have been provided on separate sheets in this document to enable use as a template for inspections.

7. Maintenance Activities

The required routine inspections and maintenance, and the frequency of this work, is tabulated below. The basin is to be planted with appropriate endemic wetland species or grass. If large trees such as wilding pines grow within the "wetted area" of the basin, they should be removed to prevent them

encroaching on the basin's capacity. Shrubs and trees are not intended to grow on or close to the bund. Selected plant species should not regularly shed debris, this will increase the required frequency of maintenance. If mowing or slashing of vegetation is required, trimmings which have the potential to block the intake must be removed from the basin. The size of the basin outlets will reduce the risk of blockage by small debris such as fine mulch.

Table 7.1 Debris Clearance	
Maintenance Tasks	**Frequency**
Date:	Time:
Personnel Present:	
Basin:	
Walk over basin from intake structure upstream, look for loose vegetation and debris which could block the intake structure. Remove debris for offsite disposal as required.	Every 2 months for the first 12 months after construction. If debris requiring removal are only identified 1-2 times in 2 months, frequency can be reduced to 6 monthly. This may be timed seasonally depending on the vegetation species.
Record observations	
Follow Up Actions	

Table 7.2 General Basin Inspection	
Specific Activities	**Frequency**
Date:	Time:
Personnel Present:	
Basin:	
Walk over basin from intake structure upstream, removing loose vegetation etc as per debris clearance above. Look for evidence of scour within the dam body.	6 monthly
Look at intake pipe for evidence of sediment accumulation. Sediment accumulation could contribute to blockage and in an extreme case, alter the basin's capacity.	
Inspect up and downstream faces of dam and internal side slopes of the basins. Look for wet or soft areas indicative of seepage failures or evidence of scour. Look for growth of trees or shrubs on the bund or adjacent to the bund toe. Any shrubs/trees on or close to the bund should be removed. Geotechnical advice may be required to ensure the removal doesn't lead to a weak point prone to scour.	
Walk over dam wall/bund, looking for settlement or cracking as described in section 5 above.	
Walk over spillway and look for evidence of scour, displaced rocks, exposed geofabric etc.	
Inspect pipes, manholes and grilles for evidence of blockage, damage, chipping of concrete etc.	
Inspect scour protection, look for evidence of rock movement, correct as required by placing additional rock rather than moving rocks back into position.	
Record observations	
Follow Up Actions	

Table 7.3 Extra-Ordinary Basin Inspection	
Specific Activities	**Frequency**
Date:	Time:
Personnel Present:	
Basin:	
Pre-Event: Inspect basin for debris and remove as per "Debris Clearance"	On a day prior to a severe weather (rainfall) warning
Post Event: Inspect basin as per "General Basin Inspection"	Subject to the nature of the event. Highly localised events could affect the basin whilst not being regionally significant. Additional inspections should be completed as necessary, determined by the operator's judgement including: After an earthquake in the Nelson/Tasman Region, defined as Strong or greater by Geonet or as appropriate. After a rainfall event of high intensity (e.g. 1 in 10 year event and greater), significant rainfall total (> 60-80mm/day) or any event where the basin overtops.
Record observations	
Follow Up Actions	

8. Remediation

Repair of simple defects such as a shrubs growing on the bund or minor scour can be completed by a suitably qualified contractor, remediating the structure back to its original condition as specified on the design drawings. If any more significant damage is observed such as severe scour, large quantities of sediment deposition or pipe damage, a suitably qualified engineer should be engaged to determine the most appropriate repair method. If significant repairs are needed that could alter the capacity or shape of the basin, or the elevation of pipework, a surveyor and engineer should be engaged to confirm the design capacity of the basin and associated pipework are still met.

9. Limitations

This plan has been prepared for the benefit of our Client, Tahimana Limited. It is acknowledged that the plan will be provided to the Tasman District Council and the operators of the basins. The reliance on this plan by other parties without our written acceptance is at their risk.

Envirolink have undertaken the hydraulic design only. This excludes the geotechnical design such as the bund and any water cut offs for pipework.

This plan has been prepared by Envirolink Limited based on our understanding of the basin's design and operation to date. Future operating conditions may require alteration or updating of design procedures.