Memorandum

To	Callum Feely
Copy	
From	Albie Ford
Office	Invercargill
Date	4 April 2023
File/Ref	6-CO082.00
Subject	Mt Cooee Landfill Development - Stormwater Design

Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Clutha District Council ('**Client**') in relation to the Landfill Development Plan and Resource Recovery Centre ('**Purpose**') and in accordance with the Short Form Agreement with the Client dated 11 November 2021. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

This report is based on the landfill development current as of 9 March 2023. All pipes have been sized using assumed grades with final alignment, grade, and diameter to be confirmed during detailed design. No sizing of the existing stormwater retention ponds has been undertaken and they are assumed to be performing adequality.

This report relies on third party information supplied by Clutha District Council as well as information sourced by NIWA and NZGS. This information has not yet been validated on site.

1 Introduction

WSP New Zealand Ltd (WSP) has been engaged by Clutha District Council to prepare a development plan for the Mt Cooee landfill development in Balclutha. This plan includes for a new transfer station and resource recovery area as well as expansion of the landfill.

The existing landfill is 16ha and is located adjacent the Clutha (Mata-Au) River. The site is bounded by the Kaitangata Highway to the west and south and the Mail South Line railway to the north. There is a rural neighbour to the east.

The purpose of this report is to develop a preliminary stormwater design of the proposed works.

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2 Catchment Overview

2.1 Topography

The site is undulating with ~20m of height variation over the site. The site is made up of active landfill and access roads with the remainder in pasture. The majority of the site falls towards the southwest towards the river. There is an area to the north of the site that falls northwards towards the railway line to an open drain.

2.2 Existing Stormwater runoff

Stormwater is managed on the landfill site via a series of culverts, drains and retention ponds. Runoff from upgradient is captured at the boundary between the golf course and railway line on the northwestern side of the site. This runoff is conveyed via an open channel, through a culvert under the Kaitangata Highway and discharged to the Clutha River (Mata-Au). This stormwater diversion was constructed in 2021 and further details can be found in Fluent Solutions (2020). No surface water inflow into the site is expected from the northern boundary as this flow is all diverted by the stormwater diversion.

Within the landfill site, stormwater is conveyed from the northwest side of the existing landfill cells and discharged into a 1000 m3 retention pond. Stormwater produced from the access roads and completed landfill areas that is not captured by this northwest drain is conveyed along the southern end of the existing landfill area and discharged to a 600 m3 retention pond. Once they exceed capacity, both stormwater retention ponds are designed to discharge to a culvert that runs between the ponds, underneath the Kaitangata Highway and flow to the Clutha River (Mata-Au).

2.3 Flooding Risk

Otago Regional Council has identified the lower lying areas of the site adjacent Kaitangata Highway to be at risk of flooding. This map is high level and does not reflect the topography of the site. Landfill filling has increased the ground level since previous flooding. The flooding risk of the site requires further investigation during detailed design to ensure the levels of new structures assets are built higher than the maximum flood level expected.

Figure 1: Flooding risk

2.4 Geology

The geology of the site is displayed in Figure 2: . The higher areas of the site are Undifferentiated Caples terrane sandstone and siltstone with the lower areas adjacent the river being Holocene river deposits. This has been confirmed by the presence of a historic rock quarry at the site which confirms the presence of rock. The existing leachate and stormwater ponds have been excavated in the river deposits. The scale of the mapping is 1:250,000 which means the boundary between the geological units is indicative.

Figure 2: Geology - reference: GNS Science (Te pū ao)

2.5 Ground water

Ground water monitoring bores have been installed. Level records will be reviewed and incorporated into detailed design.

3 Design Criteria

3.1 Design Criteria Applied

The following design criteria was applied to meet the required objectives:

- All pipework sized to convey a 10% AEP rainfall event
- Check effect of 1% AEP flood event
- Minimise or avoid adverse downstream effects
- Allow for the projected impacts of climate change

3.2 Relevant Design Standards

Below outlines the relevant design standards and guidance applicable to the stormwater design of the project.

- AS/NZS 2566.1: Buried flexible pipelines – Design
- Resource Management Act 1991 (RMA)
- NZS4404:2010 Land Development and Subdivision Infrastructure
- NZBC E1 Surface Water

4 Overall Design Philosophy

The Design Philosophy is to collect the surface flow from the built environment including the buildings and discharge it to the existing stormwater retention ponds.

Secondary flows are to be directed away from buildings towards the Kaitangata Highway.

Leachate collected from the transfer station is to be captured and directed towards the existing leachate pump station. Leachate from the landfill is outside of the scope of this report.

Stormwater from the expanded landfill is to be directed to a new retention pond for initial sedimentation but will also enter the existing stormwater retention pond prior to discharge.

5 Design Methodology

5.1 Rainfall Data

Design rainfall is based on NIWA HIRDS V4 outputs for the Balclutha area as produced on 9 March 2023. All design rainfall events include an increase in rainfall depth and intensity compared to historic data to allow for the effects of climate change. This is based on RCP8.5 (2081-2100).

5.2 Sizing

The following rainfall events were used for design:

- Pipe sizing – 10% AEP storms

The design rainfall was applied as follows:

- 10% AEP is used to size pipework
- 1% AEP is used to consider overland flow paths, to ensure flow is contained without causing significant flooding

5.3 Secondary Flow Paths

In extreme rain events the stormwater network can be inundated resulting in overland flow. Consideration of overland flow paths is necessary to ensure there is no damage to property or buildings. Existing overland flow paths in the southeast where no works are proposed will remain. The overland flow path for the transfer station and resource recovery area will be directed towards the Kaitangata Highway where it can back up at the existing DN900 culvert.

The events that cause peak discharges on the site will be short duration events of high intensity which will be less than 1 hour in duration. This is due to the small catchment of the landfill site. These types of events are unlikely to have any significant effect on the flow or level of the Clutha (Mata-Au) River which due to its large catchment is affected by long duration rainfall upstream.

6 Design

6.1 Landfill Stormwater

The proposed landfill expansion is made up of three cells as detailed below.

Table 1: Landfill cell areas

Cell	Area
Cell 1	1.97ha
Cell 2	0.89ha
Cell 3	0.37ha
Total	**3.23ha**

The cells will be developed progressively however there will be a large area of disturbed soil as the landfill earthworks are undertaken. It is proposed to direct stormwater within the landfill to a toe drain and then into a new sediment retention pond. This will allow suspended sediment to settle out within the pond. This pond will also aid in the attenuation of flow which will limit the effect downstream in large rainfall events.

It is proposed to construct a pond with a volume of 650m^3 which is 2% of the area of the contributing catchment. This will be refined further during detailed design but is in line with best practice.

Key features of the pond should include:

- Pond size approx. 15m width by 45m long
- Ratio of length:width between 3:1 and 5:1
- Forebay in advance of the pond
- Level spreader at inlet
- Floating decants
- 1050mm concrete manhole as primary spillway
- Emergency spillway
- 300mm outlet pipe
- Maximum pond depth of 2.6m allowing 2.0m max water depth, 0.3m freeboard to the emergency spillway and a further of 300mm of freeboard.
- 2:1 internal batter slope
- Vegetated external batter slopes

Flocculants may be required if there are difficult to settle fine particulates. This can be accommodated on site if required.

The discharge from this pond will be via a DN300 pipe which will discharge into the existing retention pond.

6.2 Transfer Station

The transfer station area consists of three drop off areas. There are uncovered concrete pads for green waste and hard materials respectively. The final area is a covered refuse transfer station (RTS).

As the uncovered concrete pads store waste material any stormwater runoff from is considered dirty and therefore leachate. This discharge must be separate from other stormwater discharge. It is proposed to collect this discharge along with discharges from within the RTS and pipe it to the existing leachate pump station. This is separate from the leachate discharge pipe from the landfill expansion. It is assumed that the existing leachate pump station has capacity for this additional discharge.

It is proposed that the concrete areas have push walls on three sides with a formed hump at the open end. The pads shall be tilted towards the back at 2% grade to a dish channel and collection sump.

A DN125 PE100 SDR13.6 pipe is proposed which will accommodate a 10% AEP event. There is sufficient capacity within each pad to accommodate a 1% AEP event. This results in no expected overflow of the pads over their lifecycle. The storage also provides sufficient storage to allow for blockages in the sump or pipe during its life or other maintenance.

The transfer station itself is a covered building which will have stormwater collection system. This pipe will discharge into a DN375 stormwater main which will discharge into the existing stormwater retention pond. The hard stand area will have catchpits which will have syphons for catchment of sediment and lighter than water contaminants such as fuels and oils. Catchpit baskets such as EnviroPod are also proposed which will collect other gross pollutants.

6.3 Resource Recovery

The resource recovery area is made up of a recycling drop off and a building for recycling of household items. This area has an access road, drop off area and associated car parking. These areas will collect stormwater via catchpits and downpipes and discharge to a small stormwater network. The existing overland flow paths to the existing stormwater retention pond will remain in place and be utilised. Catchpits will have syphons and gross pollutant baskets as per the transfer station hard stand.

6.4 Reticulation

The reticulation proposed as a result of these works are as follows:

Area	Conveyance type	Discharge
Uncovered green waste and hard material yards	DN125 PE100 SDR13.6	Leachate
Transfer station building	As per NZBC E1 assume DN100 PVC-U	Stormwater
Landfill stormwater	Toe drain to flow into sediment retention pond with DN300 outlet	Stormwater
Transfer station hard stand	DN375 and DN450 PVC-U stormwater main with DN110 subsoil drain	Stormwater
Resource recovery buildings	As per NZBC E1 assume DN100 PVC-U	Stormwater
Resource recovery hardstand	DN300 PVC-U	Stormwater

Refer to Appendix A for proposed alignment.

6.5 Outlets

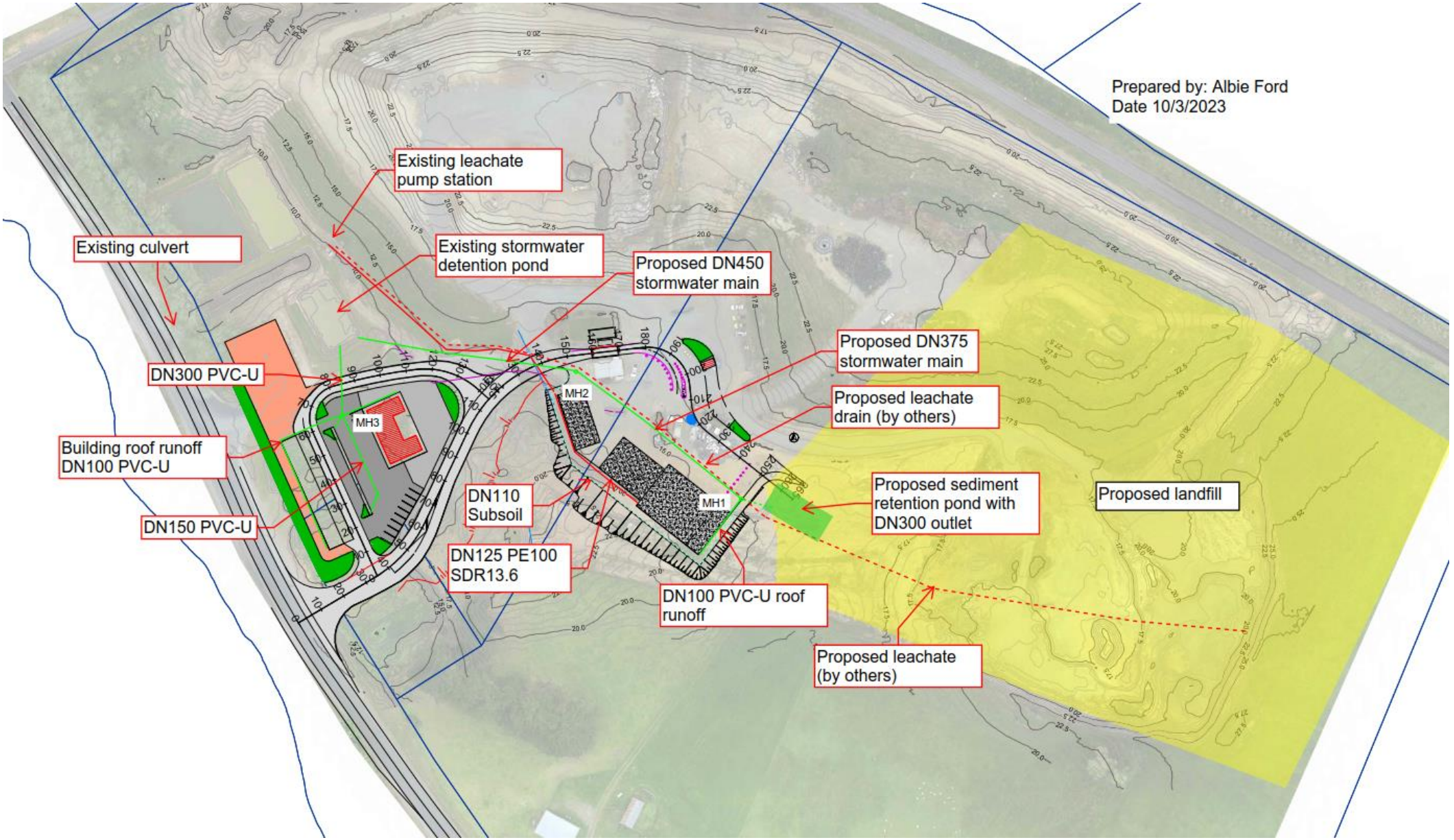
There are three stormwater outlets on the site's southern boundary through the Kaitangata Highway and a fourth slightly to the north. These outlets are indicated on Figure 3: Stormwater outlets.

Figure 3: Stormwater outlets

7 Conclusions and Recommendations

The stormwater generated from the proposed works is able to be collected and discharged in a way that will capture gross pollutants and sediment and attenuate flow created by the development. It is recommended to adopt this design for the purpose of the Resource Consent Application and to proceed to the detailed design stage once approved.

Appendix A – Sketch of Stormwater Layout


Prepared by: Albie Ford
Date 10/3/2023
Existing leachate pump station
Existing culvert
Existing stormwater detention pond
Proposed DN450 stormwater main
Proposed DN375 stormwater main
DN300 PVC-U
Proposed leachate drain (by others)
MH2
MH3
Building roof runoff DN100 PVC-U
DN110 Subsoil
MH1
Proposed sediment retention pond with DN300 outlet
Proposed landfill
DN150 PVC-U
DN125 PE100 SDR13.6
DN100 PVC-U roof runoff
Proposed leachate (by others)