Appendix E. Buronga Landfill Concept Design – Basis of Design Report (Tonkin, 2021)

202597L01RevB

5 July 2021

Director Finance and Policy
Wentworth Shire Council
26-28 Adelaide Street
WENTWORTH NSW 2648

Attention: Simon Rule

Dear Simon,

BURONGA LANDFILL CONCEPT DESIGN – BASIS OF DESIGN REPORT

Objectives

Tonkin has been engaged by Wentworth Shire Council (Council) to prepare an Environmental Impact Statement (EIS) for the proposed expansion of the Buronga Landfill. The EIS is required as a part of the Development Application for the expansion of the existing facility. As a part of the preparation of the EIS Tonkin have been engaged to prepare a concept design for the landfill facility.

The site is owned by Council and comprises approximately 124 Ha. The site is subject to Environmental Protection Licence (EPL) #20209 which covers the full 124 Ha extent of the site. The existing landfill operation occupies approximately 19 Ha in the southern area of the site, with one lined landfill cell operational and a historical, unlined landfill adjacent. The proposed expansion will include a staged expansion of the landfill to occupy the central area of the site, expected to comprise approximately an additional 56 Ha.

This concept design includes the design of the site in accordance with the *Environmental Guidelines: Solid Waste Landfills,* Second Edition (NSW EPA, 2016) (The Landfill Guideline) and concept layouts and detailing of the site. The concept design also includes a description and context for the design, operational measures including management of stormwater and leachate, monitoring requirements and proposed rehabilitation and post-closure management requirements.

This report has been prepared to establish the basis of design for the concept design of the Buronga Landfill expansion.

Key Design References and Criteria

The following site background information and input data have been referenced in undertaking this design:

Project Brief

- Tonkin (2020). *Buronga Landfill Expansion – Engagement and Management of Specialists for Environmental Impact Statement Inputs and Preparation of EIS,* Revision 2, 18 December 2020, Ref: 202597P001Rev2

Development Application Requirements

- Department of Planning, Industry and Environment (2020). *Planning Secretary's Environmental Assessment Requirements,* 11 November 2020, Application Number: SSD-10096818

Regulatory Requirements

- NSW Environment Protection Authority (2016). *Environmental Guidelines: Solid waste landfills,* Second Edition, April 206, Ref: EPA 2016/0259.
- NSW Environment Protection Authority (2017). *Environment Protection Licence, Licence - 20209,* 24 November 2017.

Site Survey

- Price Merrett Consulting (2021). *Buronga Landfill, Contour and Feature Plan,* Revision 0, 4 March 2021, Ref: F8648-6257-1-Rev0

Other Input Data

- Tonkin (2017). *Buronga Landfill New Cell, Issued for Construction Drawing Set,* Revision A, January 2017, Ref: 20155461
- Tonkin (2020). *Buronga Landfill Proposed Expansion, Preliminary Scoping Report,* Revision 2, 8 October 2020, Ref: 20180746R001
- Tonkin (2021). *Geotechnical Investigation Report, Buronga Landfill Expansion,* Revision A, 14 April 2021, Ref: 202597R02A
- Tonkin (2021). *Groundwater Impact Assessment, Buronga Landfill Expansion,* Revision 0, 22 April 2021, Ref: 202597R03Rev0

Expected Waste Streams

The existing Buronga Landfill facility has experienced increased waste tonnages in recent years, with 23,800 tonnes received in 2017-18 increasing to a projected 29,000 tonnes of waste in 2019-20. Tonnages are expected to continue to increase in future years. The site is currently licenced to accept up to 30,000 tonnes of general waste for disposal per annum, the proposed development will be designed to allowance the acceptance of up to 100,000 tonnes of general solid waste per year.

The Buronga Landfill currently provides facilities for public drop-off of recyclable wastes into separate areas to facilitate resource recovery. The proposed expansion to the facility will improve these facilities and allow for the acceptance of additional recyclable material. It is expected that recyclable wastes accepted will include:

- Construction & demolition waste such as concrete, tiles and masonry;
- Waste oils;
- Clean soils;
- Green waste;
- Scrap metal;
- Glass and plastic containers; and
- Cardboard and paper.

The site also currently has a Community Recycling Centre (CRC) constructed under a NSW EPA Initiative. This facility accepts hazardous waste from the public including paints, waste oils, household batteries, car batteries, fluorescent lighting, gas cylinders and smoke detectors. The proposed expansion will retain drop off facilities for these household hazardous wastes.

Key Site Constraints Identified

Existing Waste Disposal Areas

The southern area of the site is an existing landfill operation. The site was first used for waste disposal in 1934, and in 1967 the site was trusted to the Wentworth Shire Council for use in landfilling. The site has been operated by various parties but has been operated by Council since 2015. Historically landfilling has been undertaken on the eastern portion of the existing landfill site, with the majority of the filling occurring above ground. The first lined landfill cell was completed in 2017 in accordance with The Landfill Guideline and is the current active landfill cell at the site.

The proposed expansion is to occur to the north of the existing waste disposal operation. The design of the expansion is expected to consist of filling against the existing waste batter slopes and away from the existing landfill. This approach will allow for a consistent landform across the site instead of two isolated landfill footprints. This facilitates efficient usage of the site for waste disposal and minimises environmental impact.

The Landfill Guideline sets out requirements for landfilling over an existing closed landfill cell, these requirements include:

- The proposed cell should be self-contained and operate separately from the old cell on which it is placed, and should not compromise ongoing collection and management of leachate and gas from the old cell.
- The leachate barrier should not be damaged by settlement of waste in the old cell.
- There should be a stiff foundation or bridging layer below the leachate barrier to protect it from deformations.
- The liner system should have adequate slope stability and should not compromise the stability of existing slopes.
- The cell design should consider the generation of landfill gas beneath the barrier system.

The extent of historical waste filling is not well understood. It is likely that the expansion will include filling over the closed cells in the southern area of the site. This will require consideration during detailed design to better understand the extent of waste and any requirements for lining over existing landfilled waste. The concept design will nominate the approximate extent of landfilled waste and piggyback lining required, but this will need to be further investigated during detailed design of the facility.

Existing Infrastructure and Services

The site currently has several buildings and structures associated with the landfill operation located in the south western corner of the site. Buildings include a weighbridge on the access road to the site, small site offices and sheds and a community recycling centre. The weighbridge is proposed to remain in the same location; however all other sheds and structures can be moved as a part of the development.

Telecommunications services run along Arumpo Road and enter the site along the access road. A Dial-Before-You-Dig (DBYD) search suggests that the telecommunications services that enter the site are inactive. TransGrid fibre optic communications services run along Arumpo Road. According to mapping available through a DBYD search, this cable runs within the site along its extreme western margin in some areas. The concept design will avoid impacting the area as shown from the DBYD mapping, however the location of this cable should be confirmed by Council prior to construction or detailed design.

Hydrogeology & Groundwater

A groundwater impact assessment (GIA) was prepared by Tonkin as a part of the EIS preparation (Tonkin, 2021). No piezometers are present at the site to indicate standing water levels (SWLs) however groundwater was encountered in boreholes produced as a part of geotechnical investigations undertaken by Tonkin is 2021. Groundwater was observed between 6.8 m below ground level (mBGL) and 9.7 mBGL, with one day stabilisation at between 5.9 mBGL and 9.5 mBGL in boreholes that did not collapse. The GIA suggests that true groundwater levels may be within the order of 5.0 to 7.5 m BGL based on the investigations undertaken and the regional groundwater levels. It was identified that groundwater levels are controlled by regional and local recharge, and prolonged heavy rainfall periods could see rises in the groundwater level.

The facility design will consider the groundwater surface identified as a part of the GIA. In line with best practice the design will provide 2 m separation to the lowest point of the floor of the cell, with the leachate sumps being 300 mm below this level.

Geotechnical Conditions

A geotechnical investigation was undertaken by Tonkin in early 2021 consisting of 12 boreholes advanced across the proposed expansion footprint. Investigations extended to up to 10 metres below ground level.

Geotechnical conditions are not expected to present an issue to the expansion of the landfill with favourable conditions for excavatability and excavation stability. Clay and Sandy Clay soils described in the report may be suitable for use in cell lining works. Clay and Sandy Clay soils were encountered at various depths across the site; with the top of the unit encountered between 3.5 mBGL and 7.1 mBGL across the site, with the exception of the north eastern corner of the site where these soils were encountered from within 0.1 m of the surface. The selection of the liner profile will consider the available quantities of material within the cell excavations.

Site Topography

The site has been modified by the existing landfill operation in the southern area of the site and by historical quarry and borrow pit activities in the central area of the site. The southern area of the site that has been filled has a peak of approximately 56 mAHD with batters at grades of approximately 1V:5H to the surrounding ground level. The existing landfill cell is currently being filled and is at levels similar to the surrounding ground level. Filling will continue in this cell to reach similar levels to the surrounding historical landfill.

Several low points and ridges are present in the central area of the site. This area has been disturbed by former quarrying activities and is currently used as a borrow source for soil for the landfill operations. In general, the western side of the site falls from high points in the centre and the south-west near the entrance from Arumpo Road to the north western corner of the site. The eastern side of the side falls away from high points in the centre and south east of the site to the north east. Overall elevation change across the site (with the exception of landfilled and quarried areas) are relatively small.

Climate Conditions

Per the data presented in the Preliminary Scoping Report, Buronga has a warm (persistently dry) grassland climate, with hot dry summers and cold winters. Climate data required for the concept design will be sourced from the Bureau of Meteorology Mildura Airport climate station.

Resource Recovery

The current site provides drop off areas for recyclable wastes to be diverted for resource recovery as detailed above. Some materials (crushed bricks, concrete and tiles and clean soils) are used for operational purposes as appropriate. Other recyclables are removed from site by contractors for resource recovery. Appropriate areas for drop off and storage of recyclables will be provided on site.

The proposed development will include a 'zero-cost items' area where reusable items can be dropped off for no fee. This area will be located at the front end of the site where it can be accessed without entering the waste drop off areas of the site via the weighbridge. This area will also provide facilities for the resale of these items.

Proposed Site Layout

Waste Drop-off Facilities

Facilities for waste drop off will be provided in the south western area of the site. A zero-cost items area will be located off the access road prior to the weighbridge, with all vehicles accessing other areas of the site to pass over the weighbridge. Heavy vehicles will drop waste off directly at the tipface, with public vehicles turning to access a public waste drop-off area. This area will have separate drop off areas for various waste streams. A bulk-up area will be located near to the public waste drop off facility where commercial loads of recyclables can be dropped off and waste can be stored prior to removal from site for resource recovery. Council does not have accurate records of the volumes of recyclables to use in accurately sizing these areas so estimates will attempt to overestimate the likely footprint with further investigations required prior to design.

Separation Distances

200 m minimum separation distances will be provided from the proposed landfill cells to the site boundary to attenuate noise, odour and dust impacts to surrounding receptors and to allow supporting infrastructure and operational areas to be located outside of the landfill footprint. Existing vegetation within the site along Arumpo Road will be retained to screen operations, with additional planting to occur to improve screening if required.

Cell Layout

The proposed expansion to the landfill will be separated into several discrete cells to facilitate the staged construction, operation, and closure of the landfill cells. Cells will be sized to provide a lifespan of 4 to 5 years of filling in each cell, based upon a filling rate of 60,000 tonnes per annum at a density of 0.85 t/m^3. Cells are expected to extend to approximately 5 metres below ground level with the exact depths dictated by the groundwater separation requirements. The design will provide 2 m separation to the lowest point of the floor of the cell, with the leachate sumps being 300 mm below this level. All cells will be lined with engineered lining and leachate collection systems consistent with the requirements of The Landfill Guideline.

Cell staging is proposed to progress from south to north on the western side of the site, followed by progress from west to east on the eastern side of the site. This staging is proposed to facilitate the two final landforms and to screen progressive filling works from Arumpo Road. This staged approach will also facilitate the capping and closure of the site to an appropriate landform should the site be closed prior to the full waste disposal capacity being exhausted.

Final Landform

The final landform will be designed in accordance with the requirements of The Landfill Guideline to facilitate the rehabilitation of the site following closure. The final landform is anticipated to extend to a height slightly higher than the landform of the existing waste disposal operations (approximately 59 mAHD). The final landform will be designed with grades no steeper than 1V:5H (20%) and no flatter than 5% to facilitate the drainage of stormwater and minimise the risk of erosion and scour of cover materials. A landform similar to parallel dunes in an east-west orientation has been selected as being sympathetic to other regional landforms.

The landform has been separated into two stages divided by a water management corridor to allow for final heights to remain below approximately 59 mAHD. This approach also allows for the first stage of the landform to be fully developed with minimal impacts to the remnant vegetation present in the eastern side of the site.

Leachate Management

The site currently has a single lined leachate pond which receives leachate collected from within the existing lined landfill cell for disposal via evaporation. The historical landfill area is unlined and does not contain a leachate collection system. The mean annual evaporation (2,190 mm) in Buronga greatly exceeds the mean annual rainfall (285 mm) leading to conditions that are favourable for the disposal of leachate through evaporation.

All future cells will include an engineered lining and leachate collection system meeting the requirements of The Landfill Guideline. The selection of the liner profile will consider the availability of suitable clay resources for clay liner construction. Leachate will be pumped from the cell sumps to a leachate basin or basins for disposal via evaporation. The basin/basins shall be lined to a standard equivalent to that of the landfill cells in accordance with the requirements of The Landfill Guideline. Landfill cells will be designed to exclude stormwater ingress and separate all leachate from uncontaminated stormwater.

A high-level leachate balance will be undertaken in accordance with the methodology nominated in The Landfill Guideline. This methodology consists of a leachate balance based upon assumed infiltration parameters and climate data to develop an appropriate sizing for the leachate basin/basins as a part of the concept design. The basins shall be sized to ensure compliance with the requirements for pond capacity under EPL 20209. Leachate basins will be located outside of the footprint of the landfill.

Stormwater Management

The LEMP requires that all stormwater runoff from disturbed areas is detained on site to prevent the discharge of any sediment laden water from site, stormwater shall only be released from site once the water quality is suitable for discharge.

As a part of the concept design, conceptual stormwater controls shall be nominated to prevent stormwater run-on to landfilled areas and to capture and detain stormwater on site. It is anticipated that these conceptual controls will identify the locations of drains and ponds but will not include sizing of these structures. The controls will be nominated to meet the required outcomes of Section 3 of The Landfill Guideline. These controls will be in accordance with the principles of Sections 3.1 and 3.2 of The Landfill Guideline for erosion control and sedimentation control respectively. It is proposed to estimate stormwater requirements for two stages of the landfill being completion of the western portion and then completion of the landfill.

Capping and Closure

The concept design will detail the final capping of each cell and the closure and rehabilitation of the landfill. Concept design for the final capping will be developed to achieve the outcomes for final capping and revegetation as nominated by The Landfill Guideline. A final cap profile will be nominated in accordance with the requirements of Section 9.1 of The Landfill Guideline. Staging of final capping will be nominated based upon the cell layout and expected rates of filling to facilitate the final capping and revegetation of cells shortly following the final delivery of waste to each cell.

The concept design will also nominate high level post-closure management and monitoring measures to ensure the continued integrity of environmental protection measures at the site. General post-closure management measures will be nominated to achieve the outcomes nominated in Section 10 of The Landfill Guideline. Monitoring measures will be nominated in accordance with the relevant sections and outcomes of The Landfill Guideline and will consist of high-level monitoring measures for:

- Landfill cap integrity and performance
- Groundwater
- Surface water
- Air (Landfill gas)

Yours sincerely,

Melissa Salt

Discipline Principal – Waste and Environment

Tonkin