

Post Closure Rehabilitation Plan – Nyabing Refuse Site

Shire of Kent



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Acknowledgements

ASK Waste Management acknowledges the Traditional Owners of the land in which we work and live, and pays respects to Elders past, present, and emerging.

ASK also gratefully acknowledge the cooperation of the Shire of Kent staff that provided information and assistance in the development of this report.

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1 INTRODUCTION

This Post Closure Rehabilitation Plan 2022 (PCRP or the Plan) has been prepared to satisfy regulation 17 of the Environmental Protection (Rural Landfill) Regulations 2002 (the Regulations). It contains a plan for the rehabilitation of the site after landfilling on the site has ceased and contains:

- Site overview
- Current site layout
- Future use of the site after it has ceased to be a landfill site
- A conceptual site layout design for future use of the site
- Capping and closure design which includes:
 - the estimated final contours of the site, cap design, vegetation, drainage systems
- Post closure management and monitoring requirements

In accordance with the Regulations, the plan was to have been submitted to the Chief Executive Officer of DWER for approval within 18 months of the site being registered. The site was registered as a Category 89 landfill in 2004.

A Post Closure Rehabilitation Plan was developed for the site in 2007 however there are no records of this Plan being submitted have been found by DWER or the Shire.

This 2022 PCRP reviews and updates the previous 2007 plan to ensure compliance with the Regulations.

2 SITE OVERVIEW

The Shire operates the Nyabing Refuse Site which is located approximately 1km west of the townsite on Reserve 23430 Location 8912 on the Katanning/Nyabing Road. The site was registered as a Category 89 landfill in 2004. The area is 4.0469 hectares. The site has been operated by the Shire of Kent after being commissioned in 1923 under the Kent Roads Board.

The site currently falls from west to east with the boundary at the east side vegetated with natural bushland and no water ways exist on the site.

Trenching and fill has been used for many years. There are no records of historic waste disposal areas on site, but it is understood a substantial portion of the site contains buried waste which has already been capped, closed and revegetated. It is evident that some areas that have previously been land filled and are undergoing natural regrowth with native shrubs, however regrowth is slow and minimal.

General waste accepted on the site includes Greenwaste, Commercial Bulk Waste/Builders Demolition Waste, Liquid Waste, Asbestos, Commercial/General Putrescible Waste. The site is unstaffed so there is no record of quantities and types of waste disposed on site.

An aerial image of the facility and relevant detail is contained in Error! Reference source not found. and Error! Reference source not found. to follow.

Figure 2.1 Nyabing Refuse Site aerial image (Google maps 2021)

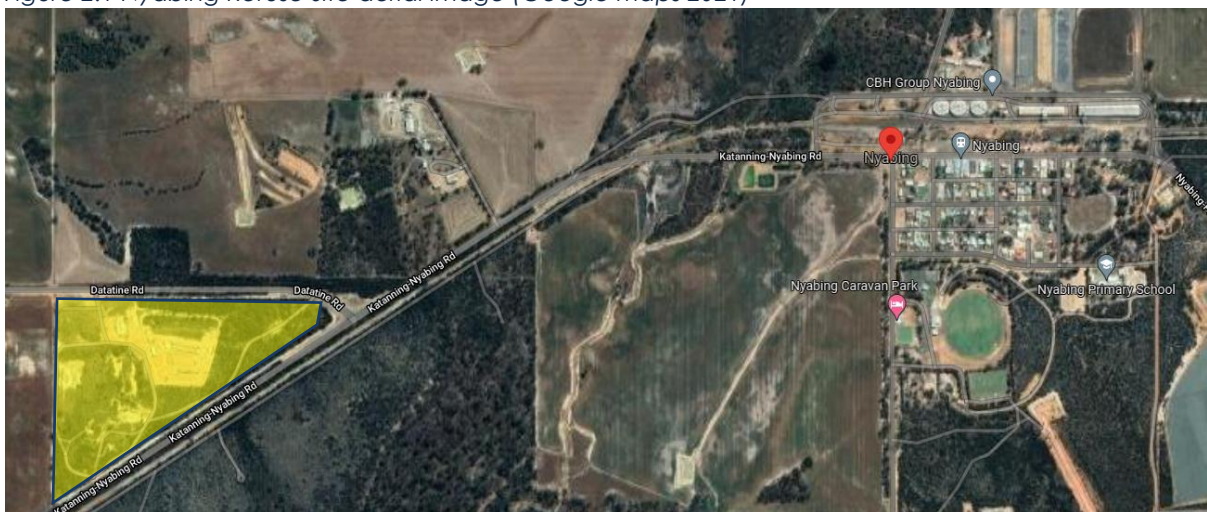


Figure 2.2 Site infrastructure



3 CURRENT SITE LAYOUT

The current site services and infrastructure is summarised in the **Table 3.1**.

Table 3.1 Site attributes

Waste types accepted	Greenwaste, Commercial Bulk Waste/Builders Demolition Waste, Liquid Waste, Asbestos, Commercial/General Putrescible Waste
Infrastructure on site	Storage shed, waste transfer station building, waste oil disposal facility, drummuster compound, solar panel and battery, CCTV, signage
Cell construction	Below ground trenches
Remaining capacity	Most of the site has already been used for below ground landfilling. There is potential for the construction of above ground cells but may require the importation of soil for cell construction, cover, and final capping.
Roads	Gravel roads
Equipment	None stored on site however access to 20 tonne excavator and 12 tonne wheeled loader
Utilities	No mains water supply or electricity connection (solar panel and battery storage system used to operate gate and CCTV)
Residential receptors	Closest residence 1km Northeast of site.

The site has been previously unstaffed and unsecured since its inception. The Shire recently secured access to the facility through a gated swipe card access system to prevent non-ratepayers from exploiting free waste disposal at the site.

The current site layout is provided in **Figure 3.1**. General waste is disposed into the active landfill cell. The cell is covered with soil and capped and closed at the end of the trench life which is approximately 18 months. Facilities are also provided for greenwaste collection, metal collection, drummuster and recycled oil. Greenwaste is burnt in accordance with the Regulations as required, and metal, drummuster and recycled oil is collected from time to time by recyclers.

Figure 3.1 Current site layout (Shire of Kent, 2021)



4 FUTURE USE OF SITE

The future use of the site will be transitioning from landfill disposal to transfer station only at the cessation of landfill airspace on site.

To this end facilities will be provided for collection of general municipal and commercial waste which will be transported at an alternate landfill for disposal. Other waste streams will be collected for off site recycling. A layout plan of the site, once landfilling ceases is shown in **Figure 5.2**.

The final landform for the waste disposal area can not be defined at this stage, as the operational life of the site for waste disposal cannot be defined until site investigations confirm the extent of areas that have not historically been used for waste disposal. Under the current regulatory framework, there is the potential for many decades of waste disposal at the facility. The waste disposal area should be progressively expanded and capped. While there are no guidelines for final landform gradients within the Rural Landfill Regulations, good practice would aim for pre-settlement gradients greater than 1(v):20(h) and less than 1(v):5(h), as slopes within these parameters facilitate the run-off of rain from the cap, while minimising the risk of cap damage from soil erosion.

It is envisaged the transfer station would receive less than 500 tonnes of waste per annum, as such it will not be required to be licenced under the *Environmental Protection Regulations 1987* as a Category 62 Solid waste depot.

The remainder of the site will be revegetated in accordance with this Plan.

5 CONCEPTUAL LAYOUT

5.1 SITE LAYOUT PLAN

A site layout plan has been developed in conjunction with the Shire to guide the future development of the site leading up to and cessation of landfilling. Error! Reference source not found. (an A3 version of the layout plan is provided in Appendix A) provides detail as to site improvements planned for implementation during 2022. **Figure 5.2** provides a conceptual site layout plan for the site once landfilling on site ceases. The proposed site layout detail and considerations are contained in **Table 5.1** to follow.

Table 5.1 Nyabing site layout considerations

Element	Detail
Site footprint	A reduced site footprint is proposed through the relocation of stockpile areas from the greater site to a location in close vicinity to the current recycling materials/bulk storage drop off area. This provides for greater control of material disposal locations, minimises public liability and safety issues in relation to greater site access and minimises the operational costs associated with maintenance of a smaller site area.
Recycling materials/bulk storage drop off area	The current area on site used for recycling materials/bulk storage drop off area will be upgraded to provide a levelled hardstand area comprised of compacted insitu clay for the storage of bulk recycled materials. The hardstand will contain a perimeter bund to manage for stormwater management.
Site access	The public access to the greater site is proposed to be restricted to the immediate recycling materials/bulk storage drop off area and transfer station through the provision of fencing.
Traffic flow	A one-way traffic flow is proposed using a loop circuit in and out of the facility. Sufficient area is provided for vehicles to manoeuvre and reverse safely without affecting traffic flow to other areas. Effective traffic control devices such as signage and speed limits will be required.
General waste disposal	<p>Whilst the landfill is operational, customers will unload domestic self-hauled mixed general waste into a waste receival area adjacent to the landfill cell. Waste will then be pushed from this area into the cell by Shire operators. Waste will be covered fortnightly or as required. Temporary fencing and signage will be used to restrict customer access to the landfill cell whilst staff are not onsite.</p> <p>Once landfilling on the site ceases, the existing transfer station shed will house a bulk waste bin for domestic users to drop off waste materials. Customers will unload domestic self-hauled mixed general waste into the bin.</p> <p>Any items that due to their size and/or dimensions is unable to fit in bins, the customer will need to self haul to an alternate landfill for disposal.</p>
Greenwaste stockpile	<p>Greenwaste will be placed on a compacted insitu clay banded hardstand in the recycling materials/bulk storage drop off area. The area will contain two banded areas, one for seasoning of greenwaste in preparation for burning, and the other for fresh greenwaste.</p> <p>Customers will unload material directly into stockpile areas.</p>
Scrap metal stockpile	<p>Given the site will no longer be 'landfilling' waste, a compacted insitu clay banded hardstand will be constructed in the recycling materials/bulk storage drop off area to contain metal and whitegoods. Material will be stockpiled for collection by a metal recycler.</p> <p>Customers will unload material directly into stockpile areas.</p>
Tyre stockpile	A storage area is proposed for the recovery of separated tyres. The tyre collection area should be fitted with a hardstand of sufficient size and have adequate drainage. Tyre stockpiles should be located away from flammable material and ignition sources.

Element	Detail
Drummuster compound	The current drummuster compound will be relocated to an area within the recycling materials/bulk storage drop off area.
E-waste, HHW, gas bottles	An area will be provided within the within the recycling materials/bulk storage drop off area for materials not generally suitable for landfill disposal including e-waste, HHW and gas bottles.
Oil recovery	Waste oil recovery infrastructure is to remain in its current location
Asbestos	Once landfilling ceases on site, no asbestos will be accepted and will need to be taken to an alternate landfill (e.g. Katanning) by the generator for controlled disposal.
Area for expansion	Sufficient area is provided within the recycling materials/bulk storage drop off area to allow for expansion in drop off streams to be provided by the Shire at a later date. This could include comingled recyclables, etc..
Signage	Signage will need to provide consistent information and be clearly and prominently displayed.

Figure 5.1 Site Layout Plan 2022

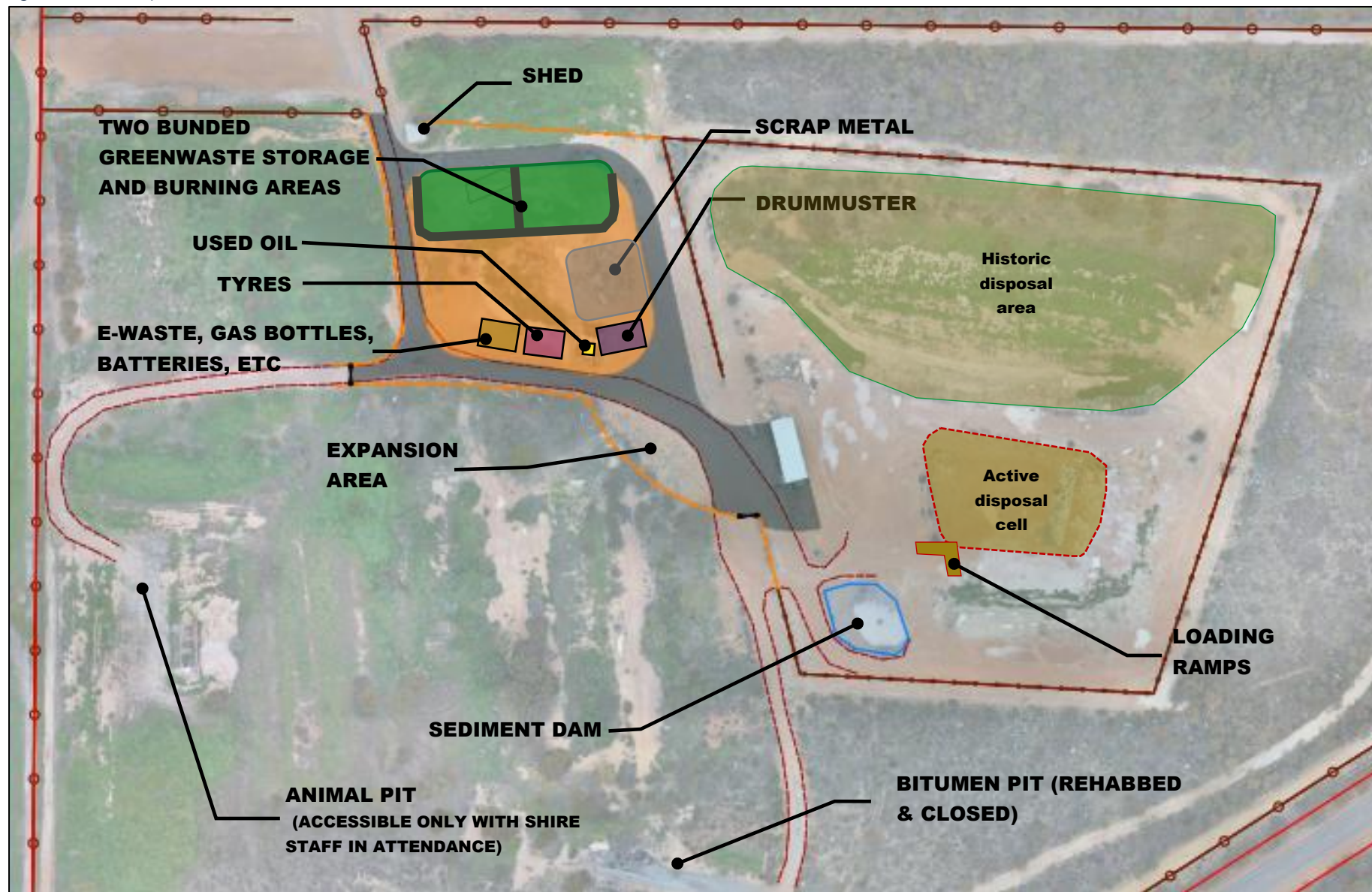
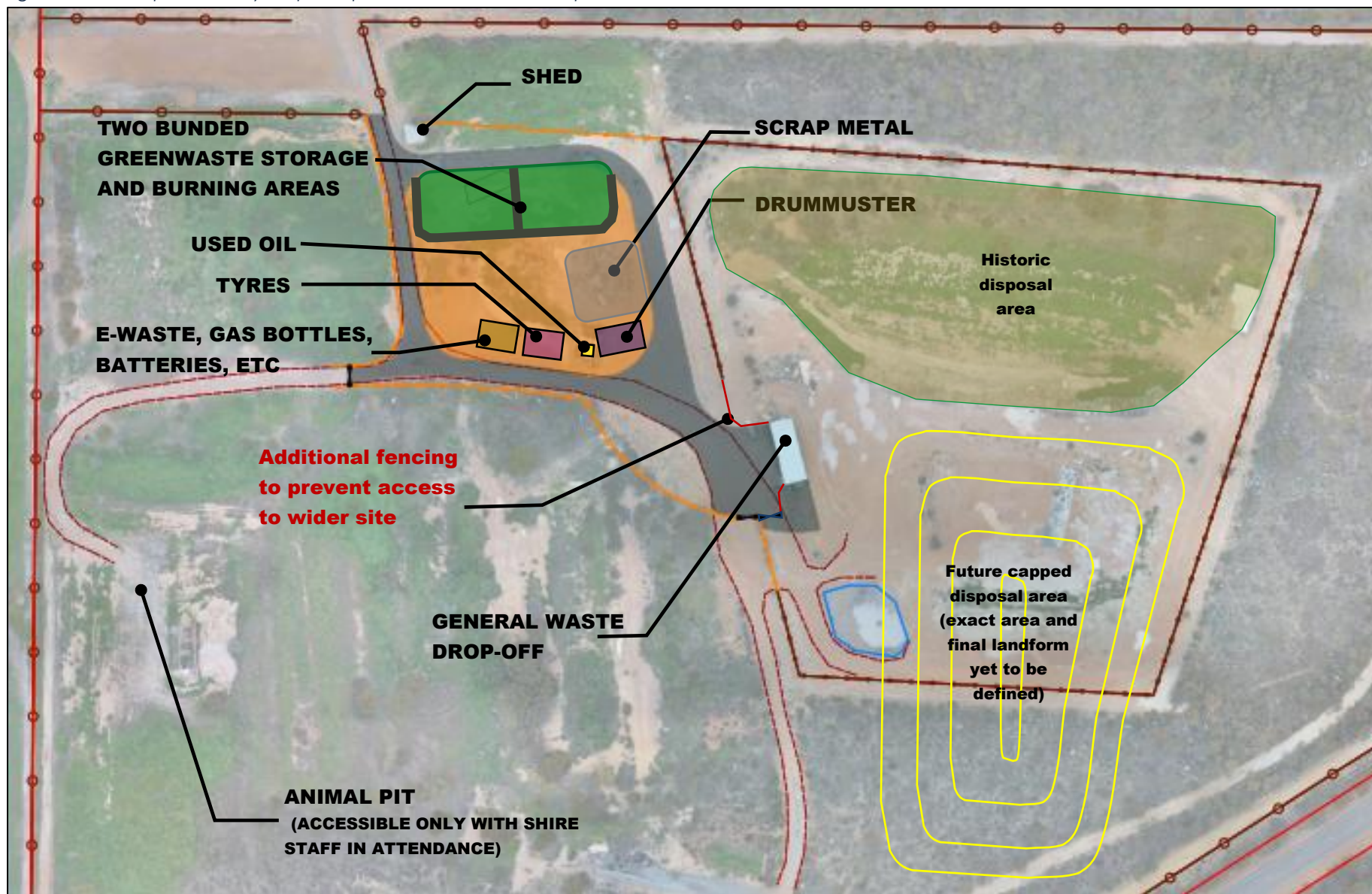


Figure 5.2 Conceptual site layout plan upon cessation of landfill operations on site



6 CAPPING AND CLOSURE DESIGN

In line with the best practice guidance, the objective of the cap design is to:

- provide a long term stable barrier between waste and the environment
- Improve the visual amenity of the site.
- Manage surface water flows to minimise the potential for leachate generation and surface ponding.

The following sections provide detail on the proposed cap design for the below ground landfill cells/trenches on site and general provisions for the greater site to ensure it does not pose a risk to the environment after the site stops receiving waste for onsite disposal.

6.1 ESTIMATED FINAL CONTOURS OF THE SITE

The schematic final landform for the site has been developed to facilitate surface run-off, while avoiding the pooling of water or the risk of erosion to the cap. The development of the final landform is constrained by the historic disposal areas on site.

6.1.1 *Historic disposal areas*

The most recent historic disposal area (shown in **Figure 6.1**) appears to have been constructed with no final landform in mind. This area should be shaped to ensure there are no low points where water could pool (and therefore infiltrate into the waste below). Once this area has been reshaped to avoid water pooling and encourage surface run-off, the Shire should ensure there is a capping layer of at least 700mm across this area.

The old trenches located within the site should be assessed to ensure they are capped with at least 700mm of soil and form a domed mound to facilitate surface run-off. It is assumed the old trenches will only settle a further 10% (200mm for a 2m deep trench). Caps over trenches will be monitored, and if there is excessive settlement resulting in a risk of rain pooling over the waste, additional capping material will be added.

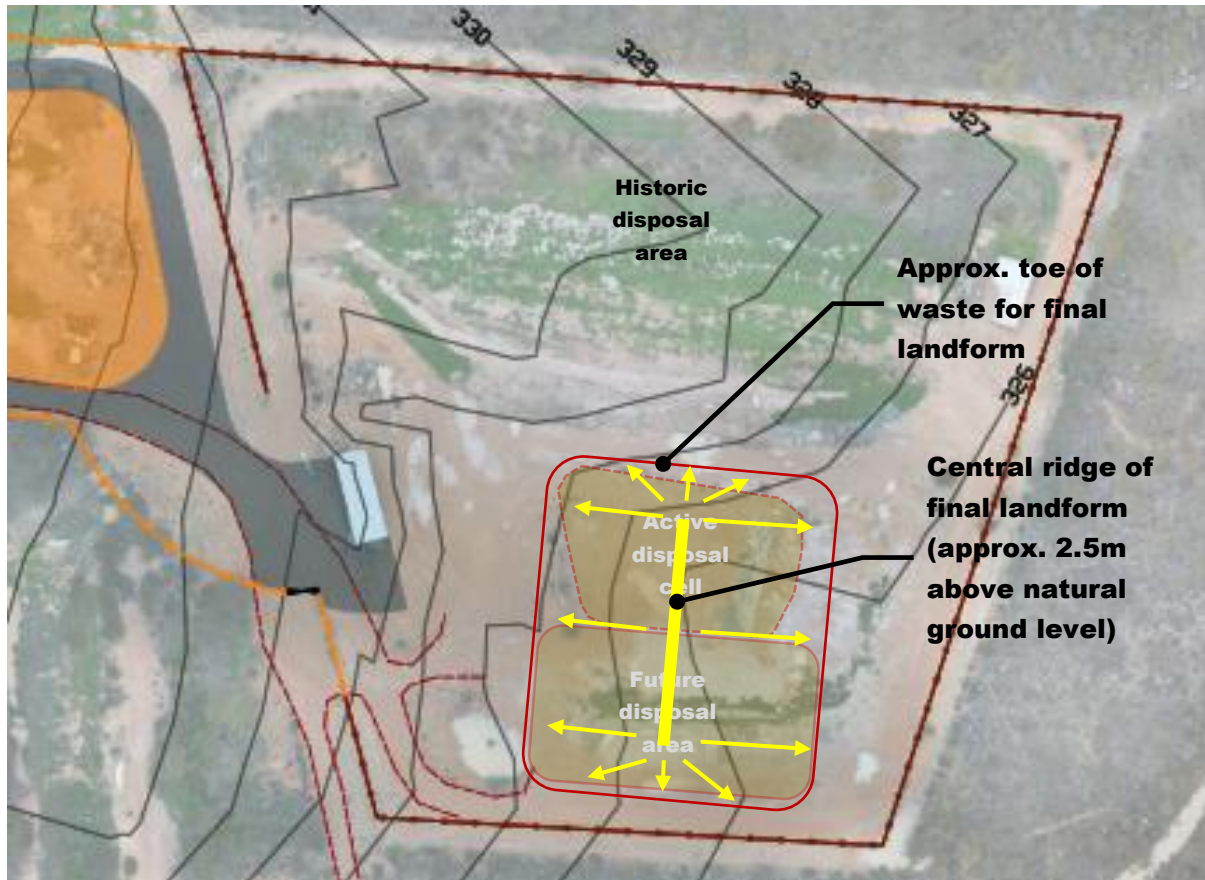
6.1.2 *Active and future disposal area*

The active disposal area was constructed in later 2022 and comprises a large single cell. Once this cell is full to ground level, above ground waste disposal should continue to construct a domed final landform. Based on the information available, the ridge of the final landform should run approximately north – south at a height of approximately 2.5m higher than the original landform (see **Figure 6.1**). This will result in slopes (pre-final settlement) between 1(v):10(h) and 1(v):15(h) from the ridge to the surrounding land, these slopes align with best practice guidance as they maximise surface run-off while minimising the risk of erosion from the landfill cap.

It may be possible to excavate more disposal cells continuing to the south of the site. Test pits would need to be dug to ensure this area does not contain any historic waste disposal trenches. If this is possible and cells are excavated future south (beyond the current fenceline) the profile of the final landform could continue, with the ridgeline extending future south.

As the annual rate of waste disposal is low for the site, most of the settlement will occur while the cells are still active. Therefore, the new disposal cells would settle only 10% - 20% in the first few years after closure (approx. 450mm - 900mm at the ridgeline). Even if the maximum estimated settlement was to occur, a slope greater than 1(v):20(h) would remain post-final settlement, which would still meet best practice guidance.

Figure 6.1 Schematic final landform



6.2 CAP DESIGN

The Pingrup landfill is unlined, therefore the base of the cells / trenches are constructed from naturally occurring subsoils that are largely comprised of low permeability clays.

There is no current Western Australian standards or guidelines as to the capping design for registered landfills and as such guidance is taken from current industry practice.

The cap design for landfill cells will comprise of the following layers.

1. **Soil / vegetation rooting zone.** This 200mm layer of topsoil will provide the rooting zone for the cap's vegetation.
2. **Low permeability layer.** A 500mm low permeability (clay rich soil) layer has been provided. This will be spread and tracked in / compacted over the interim cover layer within 12 months of the trench being filled.
3. **Interim cover layer.** An interim cover layer of 300mm will be spread over the last layer of waste to ensure a uniform layer with no exposed waste that the capping can be constructed over.

Portions of the existing site that have already been closed will be revegetated where required in line with this plan.

6.3 VEGETATION

The landfill will be rehabilitated to natural vegetation after its closure; therefore, the plantings should be of species found in the surrounding natural vegetation.

Advice should be sought regarding suitable species that are indigenous to the area and local provenance. To avoid inappropriate planting, ensure the species are adoptable to the local climate; and enhance the local habitat.

Shallower rooting species should be used, as any roots penetrating the low permeability layer into the waste body may provide a conduit for water to flow through the cap. In addition, as the waste is likely to be producing small quantities of methane (which is a toxic gas to flora) for a number of years after capping, any roots penetrating the cap would be exposed to methane and possibly result in the death of the plant.

6.4 PROPOSED DRAINAGE SYSTEM

A surface water management system for the Facility has been developed to minimise the environmental risks associated with the potential infiltration of surface water into the waste cells and to minimise the production of leachate.

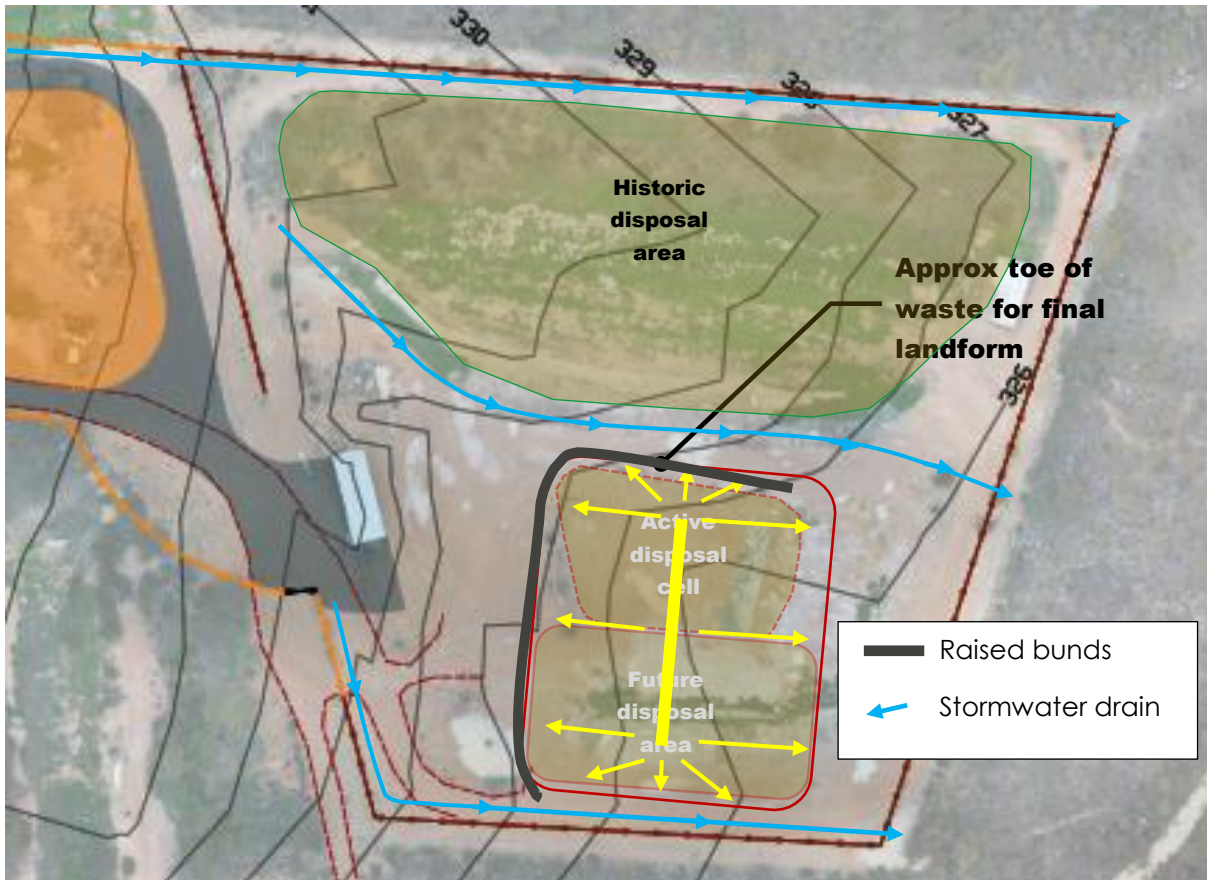
The key features utilised to achieve these objectives include:

- Capping of active landfill trenches at completion
- Development of a perimeter drainage system around the site to divert stormwater.
- Diversion of stormwater away from the active waste trench through the use of soil bunds

A conceptual stormwater management design is shown in **Figure 6.2**. Further detailed design work is required prior to construction to ensure the system will meet the local climatic conditions.

The schematic plan is based on stormwater drains (shown in blue) to divert clean stormwater away from the fenced portion of the site. In addition, a raised bund is required on the 'higher' side of the disposal cells to ensure surface run-off is diverted away from the cells.

Figure 6.2 Schematic site stormwater control



6.5 LANDFILL GAS MANAGEMENT

Landfill gas (LFG) is a natural by-product of the anaerobic biological decomposition of the organic fraction of solid waste disposed of in putrescible landfills. LFG consists primarily of Methane (CH_4) and Carbon Dioxide (CO_2) but may contain many other constituents in small quantities.

Given the input to the site of less than 500 tonnes per year it is unlikely that the site will produce significant quantities of landfill gases. Gases that have been produced over the years are likely to have progressively escaped.

As such no landfill gas management systems are proposed for the site.

7 POST CLOSURE MANAGEMENT AND MONITORING

Once the landfill ceases to dispose of waste, it must still be managed to prevent any environmental impact until the waste within the landfill has sufficiently decomposed or stabilised such that it no longer presents a risk to the environment. The standard industry period for post closure management and monitoring of a putrescible landfill is about 20 - 30 years.

7.1 MONITORING PROGRAM

Post closure management and monitoring procedures for the Facility shall include:

- Maintenance of site to:
 - o Prevent/control erosion on capped cells
 - o Restore depressions, seal and monitor cracks in the cap caused by settlement
 - o Restore/maintain vegetation
- Maintenance and operation of stormwater infrastructure

The Shire shall ensure that post closure monitoring of the site is undertaken in accordance with the specifications detailed in **Table 7.1**. Given the low volumes of waste disposed at the facility the proposed monitoring period is 20 years. The frequency of monitoring is annually for the first two – five years and then decreases as the cell cap stabilises and vegetation becomes established during the aftercare period for the following 18 years.

Table 7.1 Post-closure monitoring program

Aspect	Monitoring Method	Frequency	Duration
Surface water drainage channels	Physical inspections to identify damage or evidence of failure	Annually	First 5 years
Site maintenance	Site walkover inspections to identify: <ul style="list-style-type: none"> • Signs of erosion in capped cells; • Cracking of the cap on landfill cells; • Differential settlement; • Vegetation death; and • Surface water ponding 	Annually or after severe weather events	First 2 years
		Biannually or after severe weather events	Following 18 years
Site vegetation	Site walkover inspections to identify areas where vegetation needs to be restored or maintained	Annually	First 5 years

7.2 RECORDS AND REPORTING

Given the lengthy monitoring period the site inspections, monitoring and corrective actions will most probably be completed by a number of different officers. To ensure consistency and good record keeping, the Shire should use a standardised form for recording post-closure monitoring and maintenance activity. The record forms should include:

- Date and time of visit
- Results of all inspections / monitoring / actions
- Corrective actions completed (as required)
- Signed and dated by a responsible officer

All the forms should be recorded in the Shire's record management system and made available to DWER on request if required.

REFERENCES

Shire of Kent (2007). ***Post -Closure Rehabilitation Plan, Nyabing Refuse Site.***