Surface Water and Leachate Management Plan

Neerabup Resource Recovery Precinct – Stage 1

Prepared for City of Wanneroo

September 2025

Project Number: TW25033

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Ronan Cullen	Director & National Waste Leader	TW25033 - Neerabup RRP SWLMP_2.0
Signature		

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1 Introduction

The City of Wanneroo (the City) is progressing the development of its long-term waste management strategy through the establishment of the Neerabup Resource Recovery Precinct (NRRP) on Lot 600, 570 Wattle Avenue, Neerabup (the Site). Talis Consultants (Talis) previously assisted the City in preparing the NRRP Master Plan, which outlines the staged delivery of key waste infrastructure to address capacity shortfalls in Perth's northern suburbs. In line with the Master Plan recommendations, the City has engaged Talis to prepare a Surface Water and Leachate Management to support a Works Approval application for the following infrastructure (the Proposed Infrastructure):

- Waste transfer station (WTS): to consolidate residual waste from the City's kerbside collection services, and potentially other local governments, for bulk transport to recovery facilities in the southern Perth metropolitan area;
- Materials recovery facility (MRF): to accept, process and consolidate co-mingled recyclables from kerbside collections for downstream reprocessing; and
- Community Recycling Centre (CRC): to provide residents with a safe and accessible location to drop off household items for reuse, recycling or appropriate disposal.
- Supporting infrastructure including:
    - Shared weighbridge;
    - Access roads and services areas;
    - Surface Water and Leachate Management System (SWLMS).
    - Administration Centre and Workshop; and
    - Security (CCTV, fencing, etc).

Together, the Proposed Infrastructure will reduce haulage distances, improve diversion rates and support the City's transition away from reliance on Tamala Park landfill, which is expected to reach capacity in the coming years. Future stages will incorporate an Energy Recovery Facility (ERF) and the private development of additional resource recovery and waste processing facilities. The development of the Proposed Infrastructure represents a critical step in achieving the objectives of the NRRP Master Plan and addressing the waste management needs of the City and surrounding northern suburbs.

1.1 Objectives

This SWLMP summarises the design and operationally flexible leachate and surface water management systems at the Site. The SWLMP has been developed in general accordance with the following guidelines:

- Sustainability Victoria's Guide to Best Practice at Resource Recovery Centres; revised 2019 (Guidelines for Resource Recovery Centres)
    - Outlines a better practice approach to developing, managing and operating resource recovery centres (including WTSs) and provides guidance on better practice environmental risk design

The SWLMP shall address the following benchmark controls for surface water and leachate management at the Site as under Section 3.4.3 of the Guidelines for Resource Recovery Centres:

- Fully sealed surfaces in areas where waste is handled or stored, to prevent leachate infiltration into soil;

- Covered areas or enclosed buildings for waste receival and storage to minimise rainwater ingress;
- Separation of clean stormwater from contaminated runoff, including the use of bunds or gradient fall to direct leachate to collection points;
- Leachate containment and treatment systems, such as sumps or tanks, to manage runoff from washing or spills;
- Use of first flush diversion systems, where possible, for uncontaminated areas to reduce treatment volumes;
- Regular inspections and maintenance of drainage infrastructure to ensure ongoing function; and
- Monitoring of runoff and leachate systems to identify potential pollution events.

Additional design requirements may be considered based on the finalised surface water and leachate management strategy as discussed further in Sections 0 and 5.

1.2 Scope of Report

In order to meet the objectives discussed in Section 1.1, the SWLMP contains the following elements:

- Site Information;
- Surface Water Management Strategy:
    - Key infrastructure; and
    - Operational management and monitoring strategy.
- Leachate Management Strategy:
    - Key infrastructure; and
    - Operational management and monitoring strategy.
- Appendices, including Figures and Drawings.

2 Site Information

This section provides background information in relation the location, current and proposed site infrastructure, licencing, and key environmental attributes relevant to this SWLMP.

2.1 Site Location and Access

The Site is located at Lot 600 on deposited plan 302260 at 570 Wattle Avenue, Neerabup, within the Neerabup Industrial Area, approximately 39 km north of the Perth CBD. It is zoned 'Public Purpose – Special Use (Energy Generation)' under the City's District Planning Scheme and is owned and managed by the City. Access to the Site is provided via Trandos Road, which intersects with Old Yanchep Road and connects to major traffic routes like Joondalup Drive and Mitchel Freeway.

The location of the Site is shown in Figure 1 in Appendix A.

2.2 Licencing

The Site is freehold land owned by the City. It is not currently licensed for waste processing activities under Part V of the Environmental Protection Act 1986.

As part of this application, the City will seek a new Works Approval for Prescribed Premises Category 62 (solid waste depot) and Category 57 (Used tyre storage (general)), as applicable to the WTS, CRC and MRF operations, as shown in Table 2-1. Upon construction completion, the City will apply for an Operating Licence to enable commissioning and ongoing use.

Table 2-1: Proposed Prescribed Premises Categories

Category	Category Description	Production or Design Capacity
Waste Transfer Station		
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or re-use.	500 tonnes or more per year
Community Recycling Centre		
62	Solid waste depot	Premises on which waste is stored, or sorted, pending final disposal or re-use.
57	Used tyre storage (general)	Premises (other than premises within category 56) on which used tyres ae stored.
Materials Recovery Facility		
62	Solid waste depot: premises on which waste is stored, or sorted, pending final disposal or re-use.	500 tonnes or more per year

3 Environmental Attributes

The following sections outline the environmental attributes of the Site with relevance to the surface water and leachate management system strategies for the Site's redevelopment works.

3.1 Climate

The local climate is characterised by hot, dry summers and mild, wet winters, with low to moderate and highly variable annual rainfall, predominantly occurring during the winter months. The average monthly rainfall, the mean maximum and mean minimum temperatures and Pan evaporation from 1994 to 2024 are provided in Table 3-1. This data has been sourced from SILO, which is a database of Australian climate data from 1889 to the present that is hosted by the Queensland Department of Environment and Science (DES). SILO constructs datasets from observational data obtained from BOM, using mathematical interpolation techniques to infill gaps in time series and construct spatial grids.

Table 3-1: Monthly Climate Statistics Summary from 1994 – 2024

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)	13	14	18	35	92	129	151	119	75	39	24	8	716
Mean Evaporation (mm)	303	257	221	138	91	64	65	80	107	163	218	280	1985
Mean Max Temp (˚C)	31.3	31.6	29.4	25.7	22.0	19.1	18.1	18.6	20.2	22.8	26.1	29.0	24.5
Mean Min Temp (˚C)	17.6	18.1	16.7	13.9	11.3	9.6	8.9	8.8	9.6	11.0	13.5	15.8	12.9

The average annual rainfall recorded at the Site since records began is 716 mm, with the minimum and maximum values ranging from 8 mm and 151 mm per month, respectively. The average annual potential evaporation rate is approximately 1,985 mm, which is nearly three times the average annual rainfall and occurs at higher rates during the warmer, drier months of the year.

The wind direction generally ranges from easterly to northerly in the morning (9am), changing direction to south-westerly to westerly in the afternoon (3pm). Winds at the Site are typically moderate in the morning and the afternoon. The wind rose for morning and afternoon winds can be seen in Diagram 4-1. The provided Wind data was recorded at Pearce RAAF (Station Number: 009053), approximately 23km to the northeast.

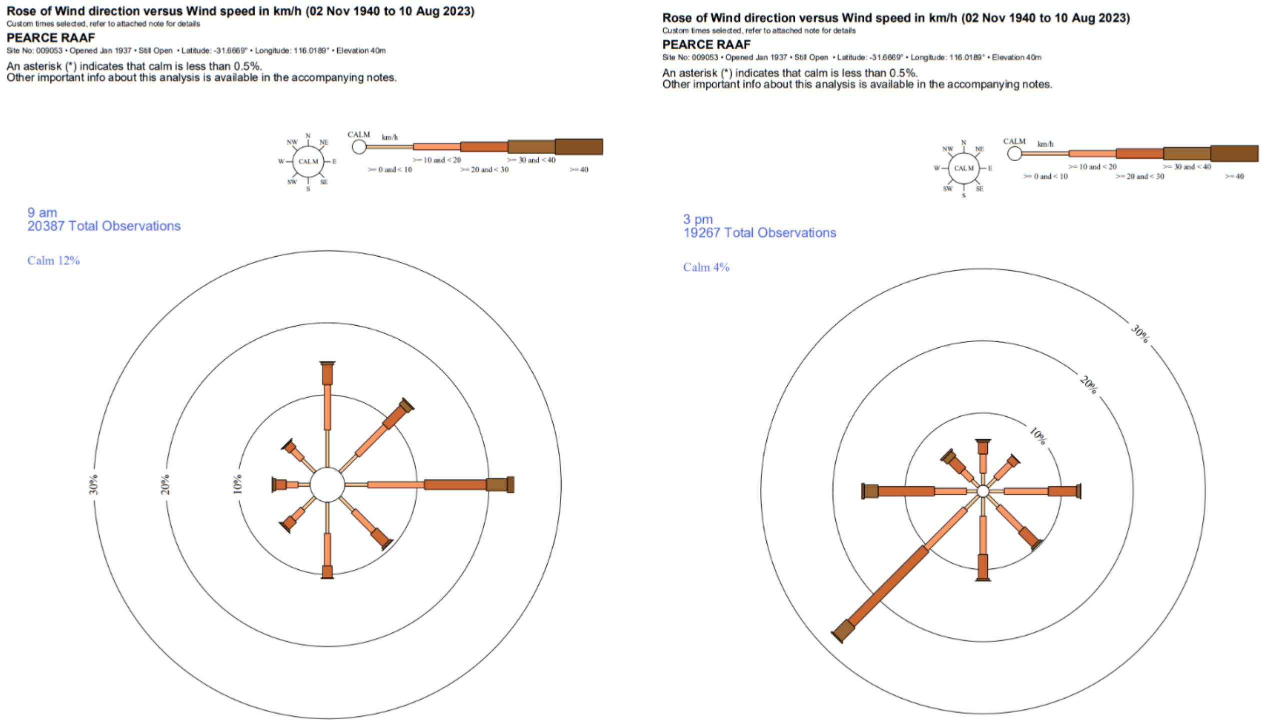

Diagram 4-1: 9am (left) and 3pm (right) Wind Rose for Perth Metro Station

3.1.1.1 *Short Duration Design Rainfall*

Rainfall Intensity Frequency Duration (IFD) data for the Site was obtained using the BOM Computerised Design IFD Rainfall System (CDIRS) and the Australian Rainfall and Runoff 2016 database (ARR2016). CDIRS produces a complete set of IFD curves and associated weather data based on user-defined coordinates (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016).

Table 3-2 summarises the Annual Exceedance Probability (AEP) of storms with 1 to 72-hour durations. The equivalent Average Recurrence Intervals (ARIs) for each storm event is also outlined. These values can be used to estimate precipitation rates at the Site for a range of events.

Table 3-2: Summary of Annual Exceedance Probabilities for Site (ARR2016)

Storm Duration	1 in 1 yr	1 in 10 yr	1 in 20 yr	1 in 50 yr	1 in 100 yr
	63%	10%	5%	2%	1%
	Rainfall Depth (mm)				
1 hour	17.2	29.6	34.3	41.2	46.9
2 hour	22.1	37.9	44.3	53.8	61.9
3 hour	25.4	43.9	51.6	63.1	73.1
6 hour	32.1	56.1	66.5	82.3	96.3
12 hour	40.2	70.4	83.5	104	122
24 hour	49.7	85.5	100	123	143
48 hour	61.1	101	115	137	155

72 hour	69.4	111	124	145	162

A 1-in-20-year, 24-hour storm event has a rainfall depth of 99mm, and a 1-in-100-year AEP, 24-hour storm event has a rainfall depth of 149mm.

3.2 Topography

The topography across the Site does not vary significantly, with elevations ranging from 56 metres Australian Height Datum (mAHD) in the south-western corner, to 44mAHD on the eastern border of the Site. On average there is a 1.6% change in grade across the Site.

The topography for the Site is shown in Figure 4 in Appendix A.

3.3 Geology

Based on the published regional geology (1:50,000 Department of Mines and Industry Regulation and Safety Map of Muchea 2020), Lot 600 is located within an area of sand with a majority of Karrakatta Sand Grey phase and small parts of Karrakatta Sand Yellow phase in the south-west part of the Site.

The surface geology at the Site is shown in Figure 5 in Appendix A.

3.4 Hydrogeology

Lot 600 is part of the Neerabup Industrial Area (NIA) which is situated within the Gnangara Groundwater System, specifically in the Wanneroo Proclaimed Groundwater Area and borders to the Gnangara Proclaimed Groundwater Area in the north, as pictured in Figure 9 in in Appendix A.

The anticipated maximum depth to Groundwater varies from 18 meters below ground level (mbgl) in the southwestern corner to 4mbgl on the eastern border of Lot 600. Within the Stage 1 development area, groundwater is expected to occur at depths between 4 and 7 mbgl. The groundwater contour lines, detailed in Figure 9 in Appendix A are based on publicly available data by the Department of Water and Environmental Regulation (DWER) from 2021.

3.5 Surface Water

Lot 600 is in the Swan Avon Lower Swan catchment and partially intersects the Lake Pinjar geomorphic wetland in the east. No drainage lines or other hydrological features intersect the survey area of Lot 600.

The Public Drinking Water Source Area Gnangara Underground Water Pollution Control is located 250m north of the site boundaries. A significant stream connected to Lake Pinjar extending 250 meters from Site alongside the eastern Site boundary.

The Surface Water around Lot 600 is shown in Figure 10 in Appendix A.

4 Surface Water Management Strategy

Environmental risks associated with leachate and surface water within the overall Site boundary will be managed through the implementation of a Surface Water Management Strategy (SWMS). To appropriately manage these risks, the SWMS must achieve the key objectives of minimising leachate generation; and proactively managing surface water. The design features which have been implemented to achieve these objectives are summarised in Table 4-1.

Table 4-1: Objectives and Associated Design Features of the Surface Water Management System

Objective	Design Feature
Minimise Leachate Generation	Implement a best practice surface water management system in general accordance with *DWER Composting Guidelines* and *Guidelines for Resource Recovery Centres*
	Ensure that the processing areas are covered as far as practicable to eliminate leachate generation through precipitation
	Construct the processing areas such that stormwater run-off inflow is mitigated
	Develop a drainage system across the Site's operational areas that includes strategically located discharge points away from the processing and storage areas
Proactively Manage Surface Water	Develop hardstands that are graded to ensure the capture of all stormwater run-off within the Site's operational areas
	Ensure the surface water management system is appropriately sized to manage a 1-in-100-year Annual Exceedance Probability (AEP), 24-hour duration storm event
	Consideration of the environmentally sensitive areas around the Site (i.e., wetlands)
	Establish controlled discharge points for surface water

The proposed SWMS to meet the objectives outlined in Table 4-1 is discussed in the following sub-sections.

4.1 Key Infrastructure

4.1.1 Surface Water Ponds

A series of surface water infiltration ponds will be constructed to manage onsite runoff to effectively retain sediment during minor rainfall events and provide a controlled discharge during a 1-in-100-year, 24-hour storm event.

The ponds will be an earth dam construction, with an uncompacted base to promote infiltration of surface water, and will feature a passive spillway, which will allow for a controlled release of surface water offsite.

4.1.2 Truck Washdown Bay

The washdown bays will be sealed and bunded to contain any contaminated wash water or surface water runoff which be collected via a sump and 2000L underground containment tank and removed from Site by a licensed external contractor for appropriate disposal.

4.1.3 Hardstands, Surfacing & Bunding

All of the Site's operational areas will consist of hardstands comprised of either asphalt, gravel (initially) or concrete, which will provide an effectively impermeable surface to mitigate potentially contaminated runoff infiltration in the Site's operational areas.

Areas of the Site that process putrescible and other higher-risk wastes are roofed to prevent leachate generation. and surface grade and bunding will be used to separate stormwater runoff from potentially leachate generating areas.

4.2 Surface Water Modelling

In general accordance with DWER Composting Guidelines, the SWMS has been designed to contain and control surface water runoff from a 1-in-100-year AEP, 24-hour storm event, at a minimum.

The Site's proposed surface water management infrastructure consists of a pit and pipe network and surface water attenuation ponds as discussed in Section 3.1. To determine the appropriate design for this infrastructure, assessment was undertaken to ensure post development stormwater discharge from the site does not exceed predevelopment rates. Assessment was undertaken to determine required basin sizing to contain additional surface water volumes due to increased runoff coefficients for each sub catchment area, considering local climate data including rainfall depth and intensity.

4.2.1 Catchment Areas

To assist modelling, the Site was split into five (No. 5) general catchment areas, which are shown in Figure 4-1, based on topographical data and the design of Site infrastructure. The following subsections discuss the design criteria for the catchments.

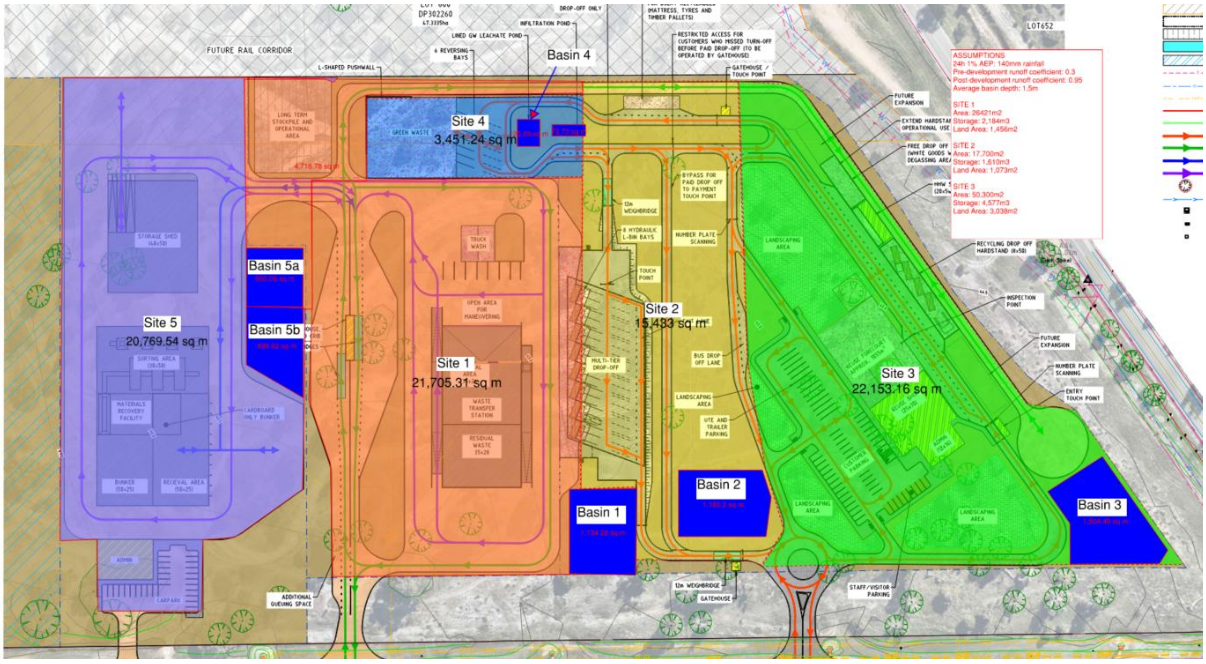

Figure 4-1: General Catchment Areas and Preliminary Basin Locations

4.2.1.1 *Runoff Coefficient*

Two main surface types were considered in the preliminary sizing modelling, with corresponding runoff coefficients as follows:

- Grassed/vegetated areas over sandy soils – runoff coefficient of 0.3; and
- Roofs, concrete and asphalt – runoff coefficient of 0.95.

The proportional area of each surface type was considered to determine a composite runoff coefficient for each catchment. Though some of the hardstands are proposed to be gravel initially, all hardstands have been modelled as asphalt/concrete to align with long-term development aims for the Site and to provide a level of conservatism for the Site's surface water management design.

For preliminary sizing of required on site stormwater detention basins, predevelopment and post-development runoff coefficient of 0.3 and 0.95, respectively, has been adopted across the site.

4.2.1.2 *Catchment Design Summary*

Table 4-2 summarises the design details of the catchment areas considered for the Site's SWMS.

Table 4-2: Summary of Catchment Areas

Catchment	Area (ha)	Assumed Runoff Coefficient Pre Development	Assumed Runoff Coefficient Post Development
1	2.64	0.3	0.95
2	1.54	0.3	0.95
3	2.21	0.3	0.95
4	0.35	0.3	0.95

Catchment	Area (ha)	Assumed Runoff Coefficient Pre Development	Assumed Runoff Coefficient Post Development
5	2.28	0.3	0.95

The catchment areas identified in Table 4-2 are utilised to calculate the required capacity of the surface water ponds and the necessary geometry across the Site to transfer surface water run-off to these ponds.

4.2.1.3 *Surface Water Movements*

Surface water runoff from the catchments will be conveyed through a pit and pipe network to the Site's proposed detention basins. With the exception of Basin 4, individual basins will be connected via a piped network allowing equalisation of basins throughout the site and conveyance of overflow in a West to East direction. Catchment areas corresponding to various stages of anticipated construction are identified in Figure 4-1.

The function of Basin 4 is detailed in Section 5.1.4.

4.3 Surface Water Infrastructure Design

The following sections describe the modelling results and the preliminary design characteristics of the key infrastructure proposed for the Site's surface water management system.

4.3.1 Pit and Pipe Network

Drainage pipework and pits will be utilised throughout the site to effectively transport surface water runoff into the proposed onsite detention basins.

A software program called *Drains* by Watercom will be utilised for the design of all proposed surface water management infrastructure. *Drains* is a stormwater drainage system design and analysis software commonly used in civil engineering applications across Australia. An Initial Loss – Continuing Loss (IL-CL) hydrological model will be used with input data sourced from the Australian Rainfall and Runoff (ARR) Datahub (pervious area initial loss of 20.4mm and pervious area continuing loss of 4.3mm/hr). Stormwater pits in sag locations have been assumed to be 50% blocked during a storm event. A climate change rainfall multiplier of 1.203 is to be applied, which effectively increases the rainfall intensities by 20.3%. A one-dimensional unsteady hydraulic model is to be used in the flow calculations.

4.3.2 Surface Water Detention Basins

Onsite detention basins will be sized to ensure that post-development flows off-site does not exceed the pre-development flow.

Table 4-3 outlines the key design criteria for the proposed surface water detention system.

Table 4-3: Summary of Surface Water Pond System Design Criteria

Pond	Approx. Dimensions [LxWxh] (m)	Basin Surface Area (m^2)	Operational Capacity* (m^3)	Required Capacity (m^3) 1:20, 24hr
Basin 1	38x30*2.5	1200	1800	1975.155
Basin 2	37x30*2.5	1200	1800	1404.312
Basin 3	45x30x2.5	1504	2256	2015.923
Basin 4	14x16*2.5	240	360	314.041
Basin 5a	25x25x2.5	660	990	**
Basin 5b	25x32x2.5	838	1257	2071.979
Total		5522	8283	8210.566

*Operational Capacity is set by the invert level of the proposed passive overflow.
** Required Capacity for Basin 5a is determined by additional eventual detailed design of the material recovery facility.

Required Capacity of individual basins are shown in Table 4-3 for reference. As the basins are interconnected via a piped overflow network, assessment of capacity has been made of the overall on-site stormwater basin network. Consideration will be given to construction staging of the proposed site to ensure basins are progressively provided to cater for development stages as they are constructed.

The proposed on-site detention system has been designed to handle a 1-in-100-year, 24-hour storm event, and to safely overtop during larger storm events via overflow routes. Additional storage capacity is also available in the landscaped area West of Basin 3. While this has not been considered in the operational capacity of preliminary sizing shown in Table 4-3, there is opportunity to utilise this landscaped are to further incorporate WSUD initiatives and increase on-site storage capacity should the need for this be identified during detailed design.

An additional level of conservatism has been reflected in the required capacity shown in Table 4-3, which does not consider infiltration within each basin. As the existing ground conditions are a permeable sandy soil it is anticipated that considerable on-site infiltration will occur within the site. Infiltration capacity of each basin will be included in hydraulic modelling undertaken during detailed design. Each basin will be earth-lined and will feature an uncompacted base to promote infiltration.

4.4 Management and Monitoring Strategy

Regular monitoring and maintenance of the SWMS will continue to be undertaken on a regular basis to ensure the system is operating effectively. Table 4-4 shows the recommended monitoring and maintenance schedule to preserve the integrity of the SWMS following the Site's redevelopment.

Table 4-4: Monitoring and Maintenance Schedule for the SWMS

Activity	Frequency
Integrity of all surface water drains and bunding	Monthly or daily during heavy rainfall events
Integrity of all overflow points and outlets	Monthly or daily during heavy rainfall events

Activity	Frequency
Integrity of the washdown bay containment infrastructure and refuel station oil separator	Periodic

Surface water sampling and monitoring at the Site is not considered necessary following the Site development works given the low-risk nature of the run-off, separation to groundwater and minimal potential environmental and social impacts.

5 Leachate Management Strategy

Leachate at the Site has the potential to be generated from a number of sources, including from the decomposition of waste material, from stormwater interacting with waste materials, from spills, and from fire wash waters. Leachates have the potential to contain nutrients, metals, salts, hydrocarbons, pesticides and other soluble or suspended components and decomposition products of the wastes.

Several areas of the Site have been identified as being able to generate leachate, including:

- WTS;
- MRF;
- Household Hazardous Waste (HHW) Facility;
- Mixed Waste Multi-Tiered Drop-off Facility (Multi-Tiered Drop-off);
- Recycling Drop-off;
- Greenwaste bunker; and
- Long-Term Stockpiling Area.

The design of these areas has been developed to minimise or eliminate leachate generation wherever possible. The following sections discuss the key infrastructure that will manage the anticipated small volumes of leachate generated at the Site.

5.1 Key Infrastructure

5.1.1 Covered Infrastructure

To eliminate leachate production from precipitation events where possible, the majority of the Proposed Infrastructure at the Site will be covered/roofed. This includes the following areas identified in Section 5:

- HHW Facility;
- Multi-Tiered Drop-off;
- Recycling Drop-off;
- WTS; and
- MRF.

Each roof will be constructed to prevent rainwater ingress, and all rainfall that falls onto the roofs will be transferred to the Site's surface water management system.

The WTS and MRF will be fully enclosed buildings, while the HHW Facility will be enclosed on three sides to prevent or minimise rainfall ingress during storm events. The Multi-Tiered Drop-off and the Recycling Drop-off and will feature a canopy to protect waste and recycling bins from generating leachates.

5.1.2 Hardstands, Surfacing & Bunding

As discussed in Section 4.1.2, all of the Site's operational areas will consist of either hardstands constructed from gravel (initially), asphalt or concrete. Where the designs have not specified the use of these materials, hardstands will be formed from compacted material to provide the lowest-achievable permeability. These hardstands provide a lower permeability surface to mitigate rainfall percolation in the Site's operational areas.

Additionally, surface grading, kerbs and bunding will be used to maintain clear separation between high-risk leachate generating areas from clean surface water run-off on these hardstand areas or the roads around Site. Hardstands in the vicinity of buildings will be graded to fall away from doors to ensure that stormwater does not enter these potentially leachate generating areas.

Internal to the WTS buildings, the greenwaste bunker and the HHW shed the floors will be constructed from a 200mm minimum reinforced concrete. The WTS floors are graded towards leachate collection points to ensure any generated leachate does not exit the building or the hardstand area. The greenwaste bunker floors are graded towards the adjacent evaporation pond.

In the event of a fire, any wash water escaping the MRF building will be captured and diverted towards the lined evaporation pond (Basin 5b) for containment and evaporation. Due to the nature of materials stored in the HHW shed, specialised foam will be used for fire suppression. This foam is significantly lower in volume than standard fire wash water and will be collected in sumps located within the HHW shed before being removed by a qualified contractor.

Where wastes are placed in bins, the condition of the bins will be monitored and maintained to ensure that leakages are minimised.

5.1.3 Leachate Tank System

While steps have been taken to eliminate leachate generation wherever possible, some undercover Site operations, in particular the WTS and greenwaste bunker will still produce some leachate, which must be managed appropriately.

All sealed surfaces within the WTS will direct any leachate generated to a leachate collection point. Leachate from the WTS will then be diverted via a pipe network to an adjacent designated below-ground tank system. The tank will be self-bunded and will include a float level sensor connected to a monitored alarm system. Once the alarm is triggered, the tank will be emptied by a qualified contractor.

Fire wash water from the WTS will be diverted into the drive through loadout lane, which will function as sump and will be pumped out by a qualified contractor. The drive through load out lane has a capacity of approximately 450m^3.

5.1.4 Leachate Evaporation Ponds

Leachate from the greenwaste bunker will be diverted to a HDPE-lined evaporation pond (Basin 4).

In the event of a fire, fire wash water from the MRF will be diverted into an adjacent lined evaporation pond (Basin 5b).

Both ponds' estimated characteristics are shown in Table 5-1.

Table 5-1: LWF Evaporation Pond Characteristics

Dimensions (m) [Length x Width x Depth]	Side Slope [V:H]	Catchment Area (m^2)	Maximum Evaporation Area note 1 (m^2)	Operational Capacity note 2 (m^3)	Full Capacity note 3 (m^3)
Greenwaste Pond (Basin 4)					
10 x 12 x 2	1:3	3451	180	360	400
MRF Pond (Basin 5b)					
25*32*2.5	1:3	Note 4	480	1257	1400

Notes: [1]The Maximum Evaporation Area is based on a depth of 1.1m from the pond crest
[2]The Operational Volume is based on design top water level
[3]The Full Capacity Volume is based on spillway design level of 0.2m below top of pond crest
[4] Required Capacity for Firewater collection is determined by flow rate of fire suppressant water. A rate of 20L per second has been adopted over a period of 4 hours. The resultant required storage for firewater is 288m^3.

Based on the evaporation ponds catchment areas, maximum evaporation areas, an evaporation coefficient of 0.7, and the average climate data presented in Section 3, the ponds have a net evaporative loss of approximately 357m^3 and 952m^3 per annum, significantly higher than anticipated leachate generation at the Site.

5.1.5 Surface Water Management System

Low risk, potentially contaminated stormwater generated from the uncovered areas of the Long-Term Stockpiling Area will be captured by the surface water management system at the Site and conveyed by pit and pipe network to the surface water infiltration basin (Basin 5a) to be diluted. Runoff generated from the Long-term stockpiling area has been considered as part of Site 1 Catchment discussed in Section 4.

5.2 Management and Monitoring Strategy

The leachate management system (LMS) will be regularly inspected, maintained, and repaired when necessary. Leachate monitoring will be undertaken on a regular basis to ensure the leachate management system (i.e., pond, drain, pipes, etc.) is operating effectively. Table 5-2 shows the recommended monitoring and maintenance schedule to preserve the integrity of the LMS.

Table 5-2: Monitoring and Maintenance Schedule for the LMS

Activity	Frequency
Integrity of all drains, sumps and pipes	Monthly or following hardstand cleaning
Leachate tank leachate level	Continuously
Leachate tank integrity	Annually
Leachate evaporation pond leachate level	Weekly or daily during heavy rainfall events

To ensure environmental impacts are mitigated and the Site meets licence requirements, regular environmental monitoring, including leachate, will be undertaken.

APPENDIX A
Figures and Drawings

Figures

Figure 1: Locality

Figure 4: Topography

Figure 7: Geology

Figure 9: Groundwater Contours

Figure 10: Hydrology

Drawings

Drawing C-500: WTS, MRF and CRC Concept Layout

Drawing C-121: WTS Drainage Layout

Drawing C-121: Green Waste Drainage Layout

Drawing C-301: Typical Details (WTS Drainage)

Drawing S-100: HHW Layout

Drawing S-103: WTS Floor plan and Sections

Drawing S-105: MRF Floor plan and Sections

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