Expansion of the Advanced Waste Treatment Facility, Kemps Creek Resource Recovery Precinct

Water Balance and Leachate Management Strategy

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Prepared for

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Executive Summary

SITA commissioned AECOM Australia to assess the potential impacts of the proposed Kemps Creek SAWT facility upgrade on the leachate management strategy at the site.

Leachate would be generated by a number of mechanisms at the site, including water entrained in waste arriving at the site, rainfall landing on compost windrows, odour scrubbing processes and facility cleaning.

To understand the behaviour of the proposed system, a continuous time-series water balance modelling approach was used. A water balance accounts for all water inputs and outputs into a defined system. By evaluating the difference over time between system inputs and outputs, the water balance model was used to estimate the volume of water generated at the site requiring management. The methodology used daily historic rainfall and evaporation records (123 years) together with system inputs provided by SITA of the proposed storage volumes for the leachate management ponds, catchment areas for each pond, and predicted potable water demands.

Outputs from the water balance are typically reported in a statistical manner. A key reporting metric adopted for this study is the average annual number of 25kL tanker trucks required to capture and transport excess leachate offsite for treatment. This metric has been used to compare the effectiveness of design options that mitigate leachate generation.

The SITA Kemps Creek site has an existing Environment Protection Licence (EPL) that allows discharge of stormwater subject to water both quality and quantity criteria. Where leachate does not meet the EPL criteria, it would be collected and tankered off-site for treatment prior to discharge. It is proposed the existing EPL quality and quantity criteria are maintained with the facility upgrade, and facility operations improved to reduce unnecessary tankering where possible.

For the purposes of this assessment, it has been assumed that all leachate would contain pollutant levels above the EPL criteria. This “worst case” assumption was adopted because it is not practical to quantitatively predict potential leachate quality, as pollutant generation will be highly variable depending on varying waste composition, rainfall, and dilution within pond storages. There will, however, be occasions where site discharge of excess leachate is in compliance with the existing EPL discharge criteria.

The proposed design was assessed as the Base Assessment Case. This assessment provides a quantitative understanding of the potential sources of leachate generation, and the base case number of tanker trucks per year required to prevent leachate overflow. Under the Base Assessment Case an average of 115 tanker trucks would be required per year, spread over an average of 11 days per year.

An additional leachate management method was also assessed. This assessment considered an increase to the working volume of the Source Separated Organics (SSO) Compost Leachate Pond. A range of volumes were assessed from 1,000kL to 10,000kL. For a working volume of 4,000k, an average of 68 tanker trucks would be required per year. For comparison, the Base Case Assessment assumed a pond working volume of 1,300kL.

It is recommended that tankering be adopted as the preferred leachate management measure, in accordance with the Base Assessment Case. To optimise site leachate management, expanding the volume of SSO Compost Leachate Pond could be adopted during the detailed design phase, subject to technical and financial feasibility.

As part of the Base Assessment Case, stormwater and leachate collected in pond and tank storages would be reused on-site where possible. Stormwater would be reused in the composting systems, biofilters, for some on-site amenities, and for cleaning and maintenance purposes. Leachate would be reused for irrigation of compost on storage pads and to supply the indoor composting processes. The reuse of stormwater and leachate on-site reduces the potable water demand from 88.7 ML/year to 5.0 ML/year on average, when compared to using potable water only.

1.0 Introduction

1.1 Overview

The upgrade of the Kemps Creek SAWT Facility would include modifications that alter the site's current leachate management processes.

This report assesses how the modified facility would manage leachate in order to prevent discharge to the environment.

For the purpose of this report, leachate is defined as any liquid that has come in contact with waste or compost, or their by-products, regardless of the quality of the water which might remain high.

In practice, there are four processes that would generate significant leachate quantities at the SAWT Facility.

- The process of converting waste to compost generates leachate from water entrained in the waste when it arrives on site, as well as water added to the waste during composting.
- Waste is processed in an enclosed building to contain odour. In order to treat this odorous air prior to discharge to the atmosphere, the air is passed through a biofiltration unit. This unit requires water to keep the filter media moist. During the process pollutants dissolve from the air into the water, producing leachate.
- When compost is stored outside it is both exposed to rainfall and irrigated to maintain moisture content and suppress dust. All runoff from compost would be collected in a leachate management system.
- Cleaning and maintenance of facilities.

As a result of these differing generation mechanisms, the water quality of leachate is highly variable. It is assumed that all leachate generated on site is not of a suitable quality to discharge to receiving waters untreated.

The volume of leachate generated can be highly variable. Volumes can be significantly influenced by rainfall rates, evaporation, waste composition, waste process volumes and a number of less significant factors, for example the shape of the stocked compost windrows and the duration finished compost is stored on site.

This report describes the use of time series modelling to assess the effects of variability in rainfall and evaporation on leachate generation. This historical analysis is used to assess the likely effectiveness of the proposed leachate management strategy.

1.2 Objectives

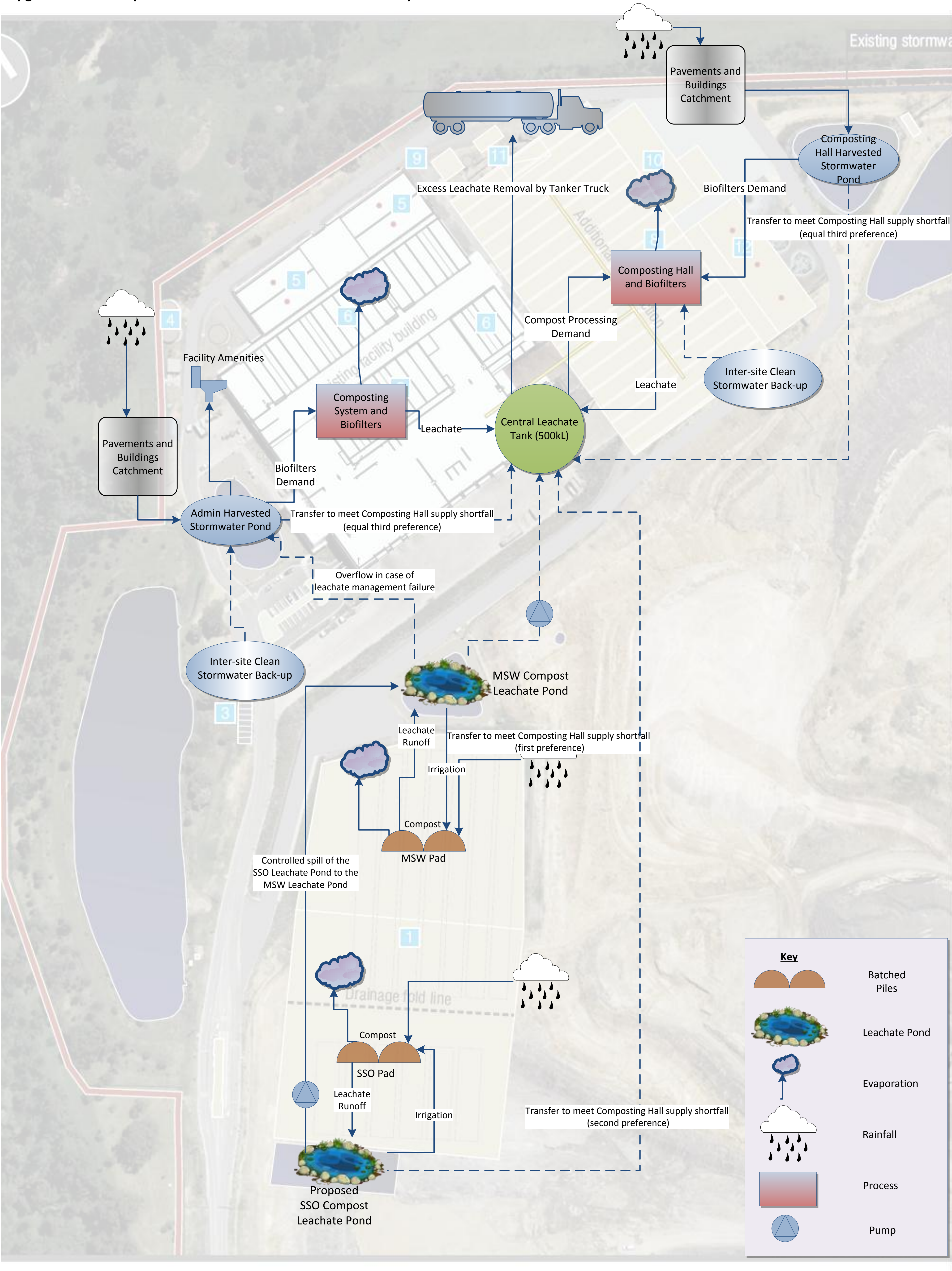
A water balance model was created of the site's water management system to simulate its operation. A 123-year historical rainfall record has been used as an input, in order that an understanding could be developed of the expected future system behaviour.

Specifically, the objectives of the site water balance model were to:

- Assess the likelihood of the proposed leachate collection ponds exceeding capacity.
- Identify leachate management options.
- Assess probable potable water savings through on-site re-use of collected stormwater.
- Assess the likely shortfall of collected stormwater with respect to on-site water demands.

Water Process Flow Diagram - Base Assessment Case

Upgrade of the Kemps Creek Advanced Waste Treatment Facility



2.0 Proposed Water Management System

2.1.1 Water System Process Flow Diagram

A process flow diagram showing an overview of the proposed management of water on site is attached as Figure 1. This figure should be referred to when reading the description of the water management system below.

2.1.2 Overview of Water Storages

The proposal would include two harvested stormwater collection ponds and two leachate collection ponds. Three of these four ponds already exist although they would be modified as part of the Development. These ponds would serve to collect rainfall and irrigation runoff from the site and store water for usage within the site. In addition to leachate collections ponds, the Development would also have a storage tank to balance the leachate production and feed rates to the Composting Hall.

Details for each of the water storages, as included in the water balance model, are shown in Table 1. Pond volumes are to be confirmed on site as part of the design process. Other pond assumptions are discussed in Section 2.1.3.

A description of the proposed operation of the storages is presented in Section 2.1.4.

Table 1: Characteristics of Water Storages used in Water Balance

Storage	Catchment	[m^2]	Storage Capacity[1] [kL]	Surface Area of Pond Storage at Capacity [m^2]
Harvested Stormwater Storages				
Admin Harvested Stormwater Pond	Building roof and pavement: Pond surface: Grass:	22,000 980 17,021	1,130	980
Composting Hall Harvested Stormwater Pond	Building roof and pavement: Pond surface: Grass:	16,500 1,210 3,990	1,570	1,210
Leachate Storages				
Central Leachate Tank	N/A	-	500	N/A
MSW Compost Leachate Pond	Earth pad pavement and road: Compost coverage at capacity: Pond surface: Grass:	12,200 6,000 1,080 2,223	1,400	1,080
SSO Compost Leachate Pond	Earth pad pavement: Compost coverage at capacity: Pond surface: Grass:	6,000 2,400 1,000 1,000	1,300	1,000

[1] Refer to Section 2.1.3 for discussion on assumed leachate storage pond capacities.

2.1.3 Leachate Pond Storage Capacity Assumptions

The ponds would comprise of the following four storage allowances (refer to Figure 2 below):

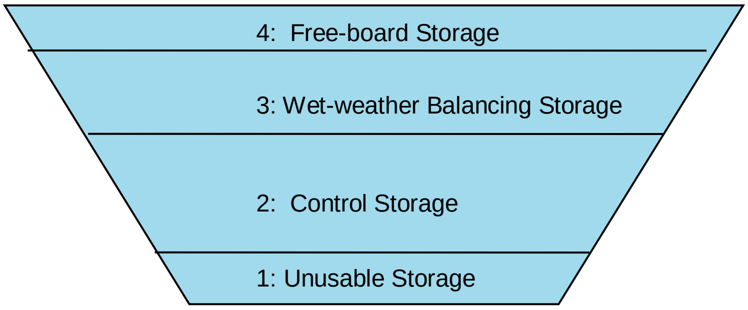
1) An *unusable storage* volume as the bottom layer of the pond which cannot be pumped-out. This depth is usually left to prevent sediments from being drawn out of the pond and to prevent the formation of vortexes and resultant air entrapment in the pump system.

2) A *control storage* volume, this being the largest storage component and the volume where leachate runoff is stored and from where water is supplied to satisfy withdrawal demands.

3) A *wet-weather balancing storage* which is required to balance the difference between pond inflows and pumped outflows once the control storage reaches full capacity and a trigger is set to start pumping leachate from the ponds.

4) *Free-board storage* this being the pond volume between the spillway level, and the *wet-weather balancing storage* volume.

Figure 2: Leachate Pond - Storage Components



The pond volumes discussed in this report represent the sum of the *unusable storage* and *control storage* components. That is, no allowance has been made for the *wet-weather balancing storage* (or the o*perational balancing storage* in the case of the harvested stormwater ponds) or the *free-board storage* volumes. These storages cannot be confidently sized until the detailed design phase when the specifics of pond operation are set.

In sizing the ponds the designer would also need to consider the decrease in pond capacity over-time as solids accumulate between pond clean-outs.

2.1.4 Description of Water Storages

Admin Harvested Stormwater Pond

The Admin Harvested Stormwater Pond, an existing stormwater dam, would be maintained in its existing size and position. The existing pond collects rainfall from the roof of the Resource Recovery Building, and from paved areas around the building. Water from this pond would be used by facility amenities (~8kL/day) and for irrigating the tunnel biofilters (~15 kL/day).

Composting Hall Harvested Stormwater Pond

The Composting Hall Harvested Stormwater Pond would be constructed by converting an existing leachate overflow pond that currently collects leachate runoff from the existing maturation pad (to be decommissioned). Stormwater runoff from the roof of the new building and its associated pavements would be directed to the pond and stored for use in the new biofilters and Composting Hall. To provide harvested stormwater to the Composting Hall there would be an average water demand on the pond of 100 kL/week.

Central Leachate Tank

The Central Leachate Tank would be an enclosed leachate balancing tank array which collects leachate generated from the indoor processing of compost. Collected leachate would subsequently be reused in the Composting Hall. The leachate production rate is expected to be relatively constant; however leachate demand would be variable following a demand pattern of five days on, two days off. As such, the Central Leachate Tank has been sized with a storage capacity of 500kL to store approximately three days of expected leachate generation.

The Central Leachate Tank would be the source from which water is drawn for waste processing. As such it would require regular supplementation with water from elsewhere on-site. The sources for make-up water (in order of preference) would be:

1) MSW Compost Leachate Pond.

2) SSO Compost Leachate Pond.

3) Transfer from harvested stormwater ponds within the Development.

4) Transfer from harvested stormwater ponds within the Landfill.

5) Potable water.

The MSW Compost Leachate Pond would be preferred over the SSO Compost Leachate Pond as it is expected that the quality of runoff from the MSW Compost Leachate Pond would be poorer than from the SSO Compost Leachate Pond. By preferentially transferring from this pond the risk of spilling the poorer quality leachate is reduced.

MSW Compost Leachate Pond

The MSW Compost Storage Pad is a demand balancing pad used to store finished MSW compost before it is provided to market. The MSW Compost Leachate Pond would collect leachate runoff from the MSW Compost Storage Pad. The pond is an existing leachate collection pond however its proposed catchment area would be increased to capture runoff from an extension to the pad area.

The volume of matured MSW compost stored on the pad would vary throughout the year depending on market demand. Demand for the finished compost is expected to vary seasonally, with peak product demand, and therefore minimal storage volumes, likely to occur in the summer months.

This pond would be the first preference for water make-up to the Central Leachate Tank, and would also supply water to irrigate finished MSW compost in storage at an estimated average rate of 10 kL/week. Water from the pond would be preferentially pumped to the Composting Hall before being used for irrigation. If there is insufficient water to irrigate the stockpiled MSW compost product then water would be transferred to the pond from elsewhere on-site.

SSO Compost Leachate Pond

The SSO Compost Leachate Pond is a proposed leachate collection pond which would collect leachate draining from the proposed SSO composting pad. This pond would be used to provide water to the Composting Hall if there is a demand at the facility which cannot be met by supply from the MSW Compost Leachate Pond. The pond also provides water to irrigate the batched piles of SSO compost at an estimated average rate of 20 kL/week. Water from this pond would be preferentially allocated to the Composting Hall before use for compost irrigation. If there is insufficient water available for compost irrigation then water would be transferred to the pond from elsewhere on site.

SITA considers the leachate from the SSO Compost Leachate Pond of acceptable quality for mixing with the MSW Compost Leachate Pond. It is therefore proposed that the SSO Compost Leachate Pond would be pumped to the MSW Compost Leachate Pond, as discussed below.

Overflow from SSO Compost Leachate Pond to the MSW Compost Leachate Pond

It is proposed that the SSO Compost Leachate Pond would be pumped to the MSW Compost Leachate Pond. This is complementary to the proposed operating rule that make-up water to the Composting Hall would preferentially be supplied from the MSW Compost Leachate Pond, before being supplied from the SSO Compost Leachate Pond. As a consequence, pond withdrawal rates are consistently higher from the MSW Compost Leachate Pond when compared to the SSO Compost Leachate Pond. As such the MSW Compost Leachate Pond would often have a greater available capacity to receive leachate than the SSO Compost Leachate Pond.

Pumping the SSO Compost Leachate Pond to the MSW Compost Leachate Pond would prevent the scenario of the SSO Compost Leachate Pond requiring leachate tankering whilst the MSW Compost Leachate Pond has spare capacity.

3.0 Water Balance Model

3.1 General

A model of the site water management system was created in GoldSim, a dynamic simulation software program. GoldSim was used to develop an understanding of the behaviour of the water management system by allowing its operation to be simulated over a period of 123 years using synthetic rainfall and evaporation data.

3.2 Key Modelling Assumptions

To build and run the water balance model, various assumptions regarding the management of on-site water have been made:

- An initial starting volume of 50% for all water storages.
- Compost storage on MSW Compost Storage Pad at 50% of full capacity (i.e. 3,000m^2 of 12,200 m^2 total pad area).
- Compost storage on SSO Pad at full capacity (i.e. 2,400m^2 of 6,000 m^2 total pad area).
- No allowance was made for inaccessible (dead) storage volumes in the harvested stormwater ponds.
- Assumptions regarding leachate pond volumes are summarised in Section 4.1.1.
- Assumed no pond water loss due to seepage.

3.3 Rainfall and Evaporation Data

A rainfall and evaporation data time series spanning from 01/01/1889 to 25/06/2012 was used in the water balance model. This data was sourced from the SILO database. Data was extracted from this database for the coordinates of the site at a Latitude/Longitude of 33 51'S 150 45'E.

The SILO database contains about 120 years of continuous weather records for Australia and is a useful source of input data for time-series climatic modelling. The records in the SILO database are mainly based on observed data, however the observed values have been adjusted to account for spatial averaging between gauges where required, and interpolated values inserted where there are gaps in recorded observations.

The average annual rainfall depth for the site from the SILO rainfall record was 755 mm. The average monthly rainfall and evaporation values are presented in Figure 3 and Figure 4 below.

Figure 3: Average Monthly Rainfall Depths from SILO Time Series Data

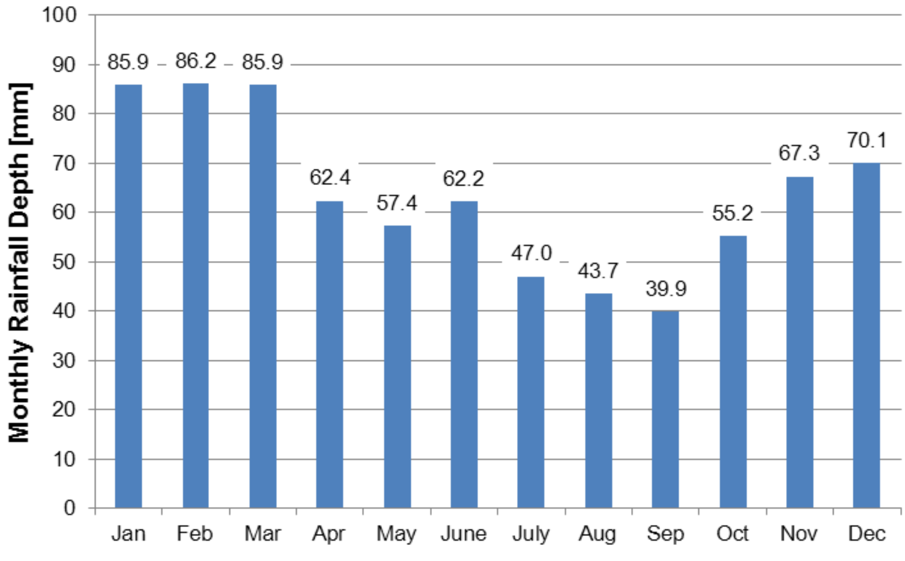
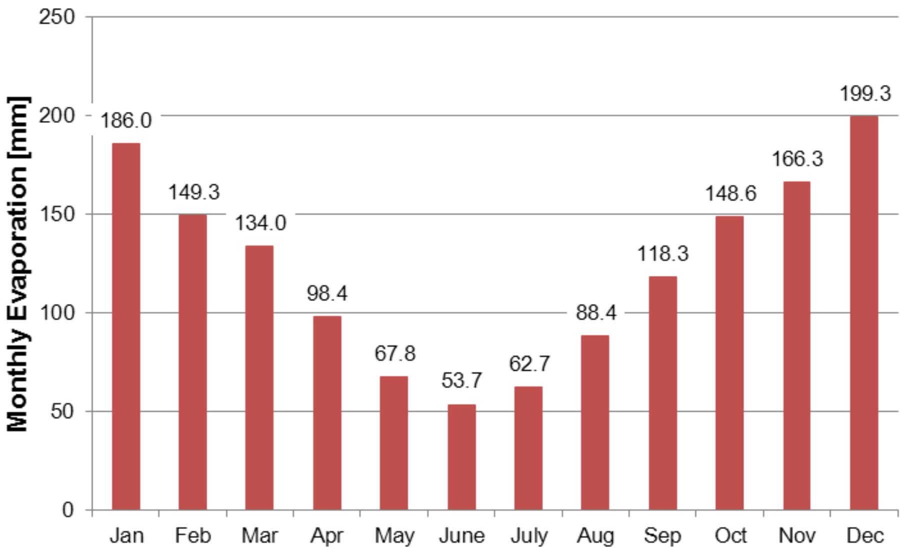


Figure 4: Average Monthly Evaporation from SILO Time Series Data



3.4 Runoff Coefficients

Not all the rainfall that lands on the site would be converted to runoff. Some rainfall is lost to evaporation, some infiltrates into the ground and some is stored on the surface (for example, rainfall is stored as moisture within compost). The ratio of rainfall to runoff is represented by a runoff coefficient.

The runoff coefficients used in the water balance model are presented in Table 2.

Table 2: Adopted Runoff Coefficients

Catchment	Runoff Coefficient	Source
Stored Compost	0.68	Wilson et al (2004). Refer Section 3.4.1
Exposed Pads and Pavements	0.80	Estimate
Roofs	0.80	Estimate
Ponds	1.00	Calculated
Grass	0.30	Estimate

The predicted leachate generation is strongly dependent on the runoff coefficient adopted for the 'Stored Compost' catchment type.

The rainfall/runoff relationship for compost and pads is complex and not easily quantifiable as it is dependent on many event-specific and site-specific variables including

- the moisture content of the stockpile at the start of the rainfall event,
- rainfall intensity and duration,
- evaporation rates,
- stockpile geotechnical properties,
- stockpile volume and surface area, and
- the distance of the stockpile from the runoff collection pond.

The water balance model has been developed with reasonable engineering judgement to account for these uncertainties where practicable. Where appropriate, the model has been established in a conservative manner for the purposes of predictive environmental assessment. As such care should be taken when using the results for any other purpose.

3.4.1 Runoff Coefficient for Stored Compost

Leachate runoff resulting from rainfall on the compost windrows consists of two components:

- Immediate runoff from rainfall which runs directly down the side of the windrow and does not infiltrate the windrow mass, and
- Rainfall absorbed by the compost which percolates down through the mass and is later leached from the toe of the windrow.

A technical paper by Wilson B. et al (2004) found that based on lab and field experiment results, approximately 68% of incident rainfall on a saturated compost windrow would eventually runoff. As this value assumes that the compost windrow is saturated at the start of the rainfall event this can be considered an upper-bound value given similar conditions. This value would therefore be an overestimate of runoff volumes generated during 1) rainfall after dry weather, and 2) relatively minor rainfall events. However, as the MSW and SSO compost leachate ponds would be sized to accommodate rainfall from relatively major rainfall events (either a singular event of successive days of high rainfall) it is likely that an over-estimate of runoff from minor rainfall events and rainfall following dry weather would not significantly affect the pond sizing.

As the incident rainfall during minor events is low, the resultant runoff volumes would be minor even with a relatively high runoff coefficient assumed. Furthermore, if a rainfall event is significant enough to result in the risk of pond overflow, then the compost is highly likely to be in a saturated state on which occasion assuming a 68% runoff value would be reasonable.

A Review of the Impact of Variable MSW Compost Storage Volumes on Leachate Generation

Compost material would not be permanently stocked on the MSW Compost Storage Pad, but would vary according to seasonal demand for the product. It is expected that during winter, stockpiles would increase, and that during summer there would be limited stockpiling of finished product. When there is no compost in storage on the pad, the quality of the produced leachate would be higher than when compost is in storage. However this runoff would still contain remnant contamination and has been adopted as leachate in this study.

Runoff from the MSW Compost Storage Pad under both full and empty conditions was reviewed so an understanding of the impact of compost storage on the volume of generated leachate could be developed. In the review it was assumed that the pad would be irrigated at the rate of 10kL/week if there was compost on the pad, and that there would be no irrigation when no compost was stored on the pad. As the runoff coefficient for an uncovered pad area is higher than for a composted pad area (*refer to* Table 2), there is a rainfall rate at which more leachate is produced from an empty pad area, than a compost covered pad area. This was found to occur at rainfall depths of greater than 1mm.

There was less than 6% difference in leachate volume generated when assuming an empty MSW Compost Storage Pad versus a full pad. This difference is not deemed significant when factoring in the other uncertainties associated with the compost runoff coefficient. Therefore it is considered a reasonable assumption that the MSW Compost Storage Pad contains a constant storage volume of 50% capacity.

As discussed in Section 3.2 it has been assumed for modelling that the SSO Compost Storage Pad will operate at 100% capacity.

4.0 Leachate Management Options

4.1 General

The water balance model was used to estimate the volume of leachate that would require management.

The current on-site operation uses tanker trucks to withdraw leachate from the ponds to prevent them from overflowing. These tanker trucks transfer excess leachate to an off-site treatment plant for processing prior to discharge. This existing management strategy would be adopted as the base-case mitigation method for dealing with excess leachate from the proposed upgraded facility.

In addition to leachate tankering, a number of additional options were considered for leachate management. The adopted management measure is to increase the storage volume of the SSO Compost Leachate Pond. Other mitigation methods considered and subsequently dismissed included coverage of the compost storage pads, and the installation of an on-site wastewater treatment plant.

The water balance model results for both the base operating case, and with the management option of increasing the SSO pond size, are presented below. In reviewing the results, the following statistics have been reported for both the SSO Compost Leachate Pond and the MSW Compost Leachate Pond:

- The average yearly overflow volume.
- The maximum recorded daily overflow volume over the 123 year simulation period.
- The average number of days per year an overflow occurs.
- The average number of tanker truck trips required per year to transfer excess leachate off-site.

A number of assumptions have been made regarding the tanker truck requirements and the overflow volumes and these are discussed in Section 4.1.1 below.

4.1.1 Leachate Tankering Assumptions

SITA have a fleet of tanker trucks which would be available when required to transfer excess leachate off-site. The following assumptions have been made regarding the tanker trucks and the receiving leachate treatment facility:

- The tanker trucks servicing the site would have a capacity of 25 kL.
- Tanker trucks would be available at the required rate to transfer excess leachate off-site.
- The receiving treatment facility would have sufficient capacity to accept leachate at the truck arrival rate.
- The numbers of tanker trucks reported in the water balance results are for transfer of leachate in excess of the sum of the *unusable storage* and *control storage* volumes (as discussed in Section 2.1.3).

  It should be noted that the applicant may tanker a volume of leachate in addition to the *wet-weather balancing storage* by also withdrawing leachate from the *control storage* volume. The level to which the *control storage* would be drawn-down would depend on the pre-determined risk management strategy adopted by the proponent. This would vary depending on factors such as forecast weather and leachate demand.

4.2 Base Assessment Case

Water balance results for the base operating case indicate that the average annual volume of leachate which could not be re-used onsite is in the order of 2,700 kL/year. If this excess leachate were to be managed by tanker truck transfer to an off-site treatment facility, then an average of 115 truck trips would be required on an annual basis. The model predicts the SSO Compost Leachate Pond would spill to the MSW Compost Leachate Pond 22 days per year on average. As the MSW Compost Leachate Pond would spill 11 days per year, approximately half the frequency of the SSO Compost Leachate Pond, this suggests the MSW Compost Leachate Pond would often be able to store excess leachate from the SSO Compost Leachate Pond.

Appendix A shows the modelled time history of the stored water volumes and modelled spills at the MSW Compost Leachate Pond.

Table 3: Modelled Capacity Exceedance of the Leachate Ponds - Base Case

Modelling Statistics		SSO Compost Leachate Pond[1]	MSW Compost Leachate Pond
Average Annual Overflow	[kL/year]	1,500	2,700
Maximum Daily Overflow	[kL]	900	3,100
Average Number of Overflow Days	[days/year]	22	11
Average Number of Tanker Truck Trips to Prevent Overflow	[truck trips/year]	N/A	115

[1] For the Base Case scenario the SSO Compost Leachate Pond overflows to the MSW Compost Leachate Pond.

4.3 Supplementary Mitigation Option – Increasing the Size of the SSO Compost Leachate Pond

This supplementary leachate management measure investigates the effect of increasing the size of the SSO Compost Leachate Pond. Increasing the size (relative to the base case) of the SSO Compost Leachate Pond rather than the MSW Compost Leachate Pond is preferred, as the SSO Compost Leachate Pond would be a proposed pond whereas the MSW Compost Leachate Pond already exists. It is considered preferable to expand the proposed pond, as expansion of an existing leachate pond could result in disturbance of contaminated sediment and may be constrained by space.

For the base case scenario, the SSO Compost Leachate Pond was modelled to spill to the MSW Product Pond. This arrangement was adopted to maximise the use of both pond storages thereby minimising leachate overflows. The optimal direction to spill between the two ponds (to minimise leachate overflows) switches as the SSO Compost Leachate Pond is increased in volume. From modelling results, this switch was found to occur at a volume of 2,000 kL. The results below assume the ponds have been designed with the optimal spill direction for the specific SSO Compost Leachate Pond volume modelled. That is, for a proposed SSO Compost Leachate Pond volume of greater than 2,000 kL, the MSW Compost Leachate Pond would spill to the SSO Compost Leachate Pond; and for volumes 2,000 kL or less, the reverse direction is adopted.

Figure 5 below shows the effect of increasing the volume of the SSO Compost Leachate Pond on the volume of leachate spilling from the MSW Compost Leachate Pond. The water balance results for this mitigation method are presented in Table 4 below.

The results show that increasing the pond size would significantly reduce the potential for leachate overflows.

Appendix A shows the modelled time history of the stored water volumes and modelled spills at the MSW Compost Leachate Pond.

Figure 5: Decrease in Leachate Overflow with an Increase in the Storage Volume of the SSO Compost Leachate Pond

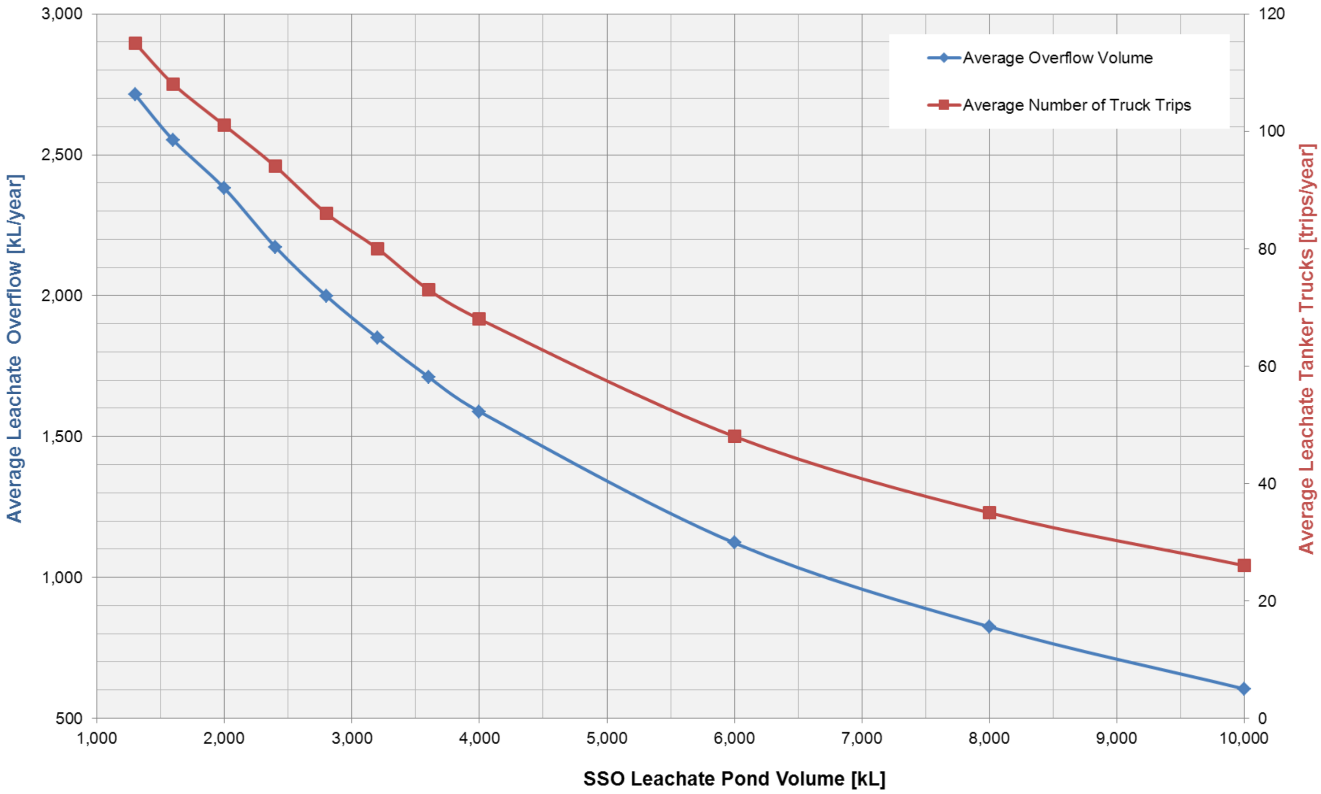


Table 4: Leachate Overflows from the MSW Compost Leachate Pond with increasing Volume of the proposed SSO Compost Leachate Pond

Scenario ID	Adopted Volume for SSO Compost Leachate Pond	Average Leachate Overflow from Site if no Tankering	Overflow Reduction on Base Case	Average Number of Tanker Truck Trips to Prevent Overflow
	[kL]	[kL/year]	[%]	[trips/year]
A (Base Case)	1300 (Base Case)	2,700	-	115
B	1,600	2,600	6%	108
C	2,000	2,400	12%	101
D	2,400	2,200	20%	94
E	2,800	2,000	26%	86
F	3,200	1,800	32%	80
G	3,600	1,700	37%	73
H	4,000	1,600	41%	68
I	6,000	1,100	59%	48
J	8,000	800	70%	35
K	10,000	600	78%	26

4.4 Comparison with existing SAWT Environment Protection Licence Conditions

The SITA Kemps Creek site has an existing Environment Protection Licence (EPL) that allows discharge of stormwater subject to water both quality and quantity criteria. Where leachate does not meet the EPL criteria, it would be collected and tankered off-site for treatment prior to discharge.

The existing SAWT Environment Protection Licence (EPL) (number 12889) states “Exceedance of the discharge [quality] limits … is permitted if the discharge occurs solely as a result of rainfall at the premises greater than 91 millimetres within any consecutive period of up to 5 days.” At other times discharge from site is only permitted if the concentration of pollutant discharged is within the limits specified in the EPL licence.

For the purposes of this assessment, it has been assumed that all leachate would contain pollutant levels above the EPL criteria. This “worst case” assumption was adopted because it is not practical to quantitatively predict potential leachate quality, as pollutant generation will be highly variable depending on varying waste composition, rainfall, and dilution within pond storages.

The development was therefore assessed against the quantity discharge criteria to provide an indication of the likelihood of compliant discharge relative to non-compliant discharge. In carrying out the assessment it was assumed that there would be no off-site trucking of excess leachate. Results are presented in Table 5 below.

Table 5: Assessment of Yearly Average Compliance of Overflows against EPL 12889 without Tankering of Excess Leachate

Scenario	Average Compliant Overflows per year	Average Non-compliant Overflows per year
Base Assessment Case	2.9	7.8
With Supplementary Mitigation Option (Increased SSO pond; results for 4,000 kL capacity)	1.5	6.0

5.0 Water Reuse and Potable Water Demand

5.1 General

Water collected in pond and tank storages would be reused on-site where possible. This approach minimises the site's demand for potable water and significantly reduces the volume of leachate which would otherwise require management through tankering.

5.2 Reuse of Stormwater

Table 6 below shows the water balance results for allocation of water from the Admin Harvested Stormwater Pond and Composting Hall Harvested Stormwater Pond. The table indicates that through the capture of on-site stormwater up to 15 ML of potable water is saved on average each year.

In the event that leachate from the MSW Compost Leachate Pond spills to the Admin Harvested Stormwater Pond, depending on the resultant pond water quality it may be necessary to pump all water stored in the Admin Harvested Stormwater Pond into tankers for treatment off-site. If a pump-out is necessary, reuse of water from the Admin Harvested Stormwater Pond will be temporarily suspended until this has occurred and storage levels have then recovered. This has not been accounted for in generation of the values in Table 6 however it is not expected that these discrete events will have a significant impact on the average annual volume of stormwater reused.

The modelled results below assume that there would be no transfer of water between the two on-site harvested stormwater ponds, however water can be sourced from either pond for use within the Composting Hall or Composting System biofilters. Development of a transfer scheme could help to reduce supply shortfalls and optimise pond operation by balancing differences in storage and demand between the two ponds.

Table 6: Stormwater Reuse from Harvested Stormwater Ponds

Pond	Average Water Demand from Pond (kL/day)	Average Stormwater Reused from Pond (kL/year)	Average Water Supply Shortfall[1] (kL/year)
Admin Harvested Stormwater Pond	Amenities - 8 Composting System and Biofilters - 15	7,600	900
Composting Hall Harvested Stormwater Pond	SCT Biofilters - 12 SCT Processing – 14	7,300	2,800

[1] This shortfall would be met by supplying harvested stormwater from the landfill. If this is not available potable water would be used.

5.3 Reuse of Leachate

Collected leachate would be reused onsite for

- Irrigation of compost on pads.
- Supplying the SCT composting Process.

As described in Section 2.1.2, all leachate collected from the indoor processing of compost would be reused. As the demand for leachate in the Composting Hall exceeds the leachate volume collected in the Composting Hall Leachate Storage Tank, make-up leachate would be sourced from the MSW Compost Leachate Pond and the SSO Compost Leachate Pond. If both of these ponds are empty, then the shortfall in demand would be supplied from the on-site harvested stormwater ponds, or from other harvested stormwater ponds in the landfill.

The average yearly volume of water captured from indoor compost processing that would be reused in the Composting Hall, along with the make-up water provided from the MSW and SSO compost leachate ponds, would be 67.6 ML. This value assumes the base case leachate management option as discussed in Section 4.2. On average 98% of the water demand at the Composting Hall can be met by reusing the leachate collected on site.

The compost stockpiled on the MSW Compost Storage Pad and the compost maturing on the SSO Pad is supplied with irrigation water from their respective leachate collection ponds. If there is insufficient leachate available in the leachate ponds, then water would be sourced from elsewhere in accordance with the priorities as described in Section 2.1.2. Leachate collected in the Leachate Ponds is first allocated to the Composting Hall (if required) before being made available for irrigation. The average yearly volume of leachate used for compost irrigation sourced directly from the MSW and SSO compost leachate ponds is 1.3 ML (with the base leachate management option).

5.4 Potable Water Demand

The reuse of stormwater and leachate on-site reduces the potable water demand from 88.7 ML/year to 5.0 ML/year on average, when compared to using potable water only.

6.0 Recommendations

It is recommended that:

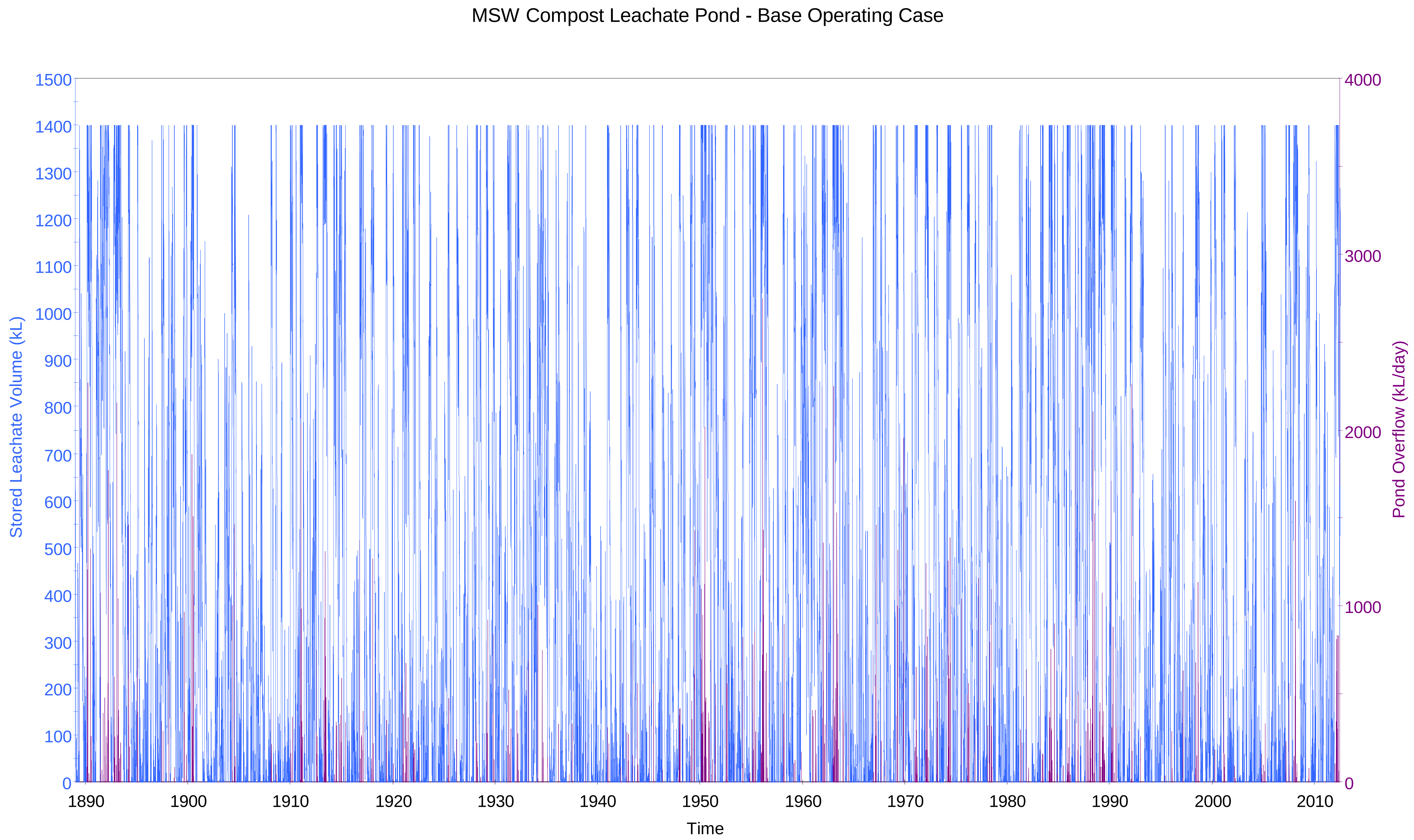
1. Tankering be adopted as the preferred leachate management measure, in accordance with the Base Assessment Case.
2. Subject to further investigation during the detail design phase of the project, the SSO Compost Leachate Pond could be expanded in size to assist with site leachate management. For this option consideration would need to be given to additional construction and operating costs, the time required for development of the mitigation method, site space and technical constraints, and impacts on operational flexibility.
3. The existing Environment Protection Licence (EPL 12889) discharge criteria are maintained.

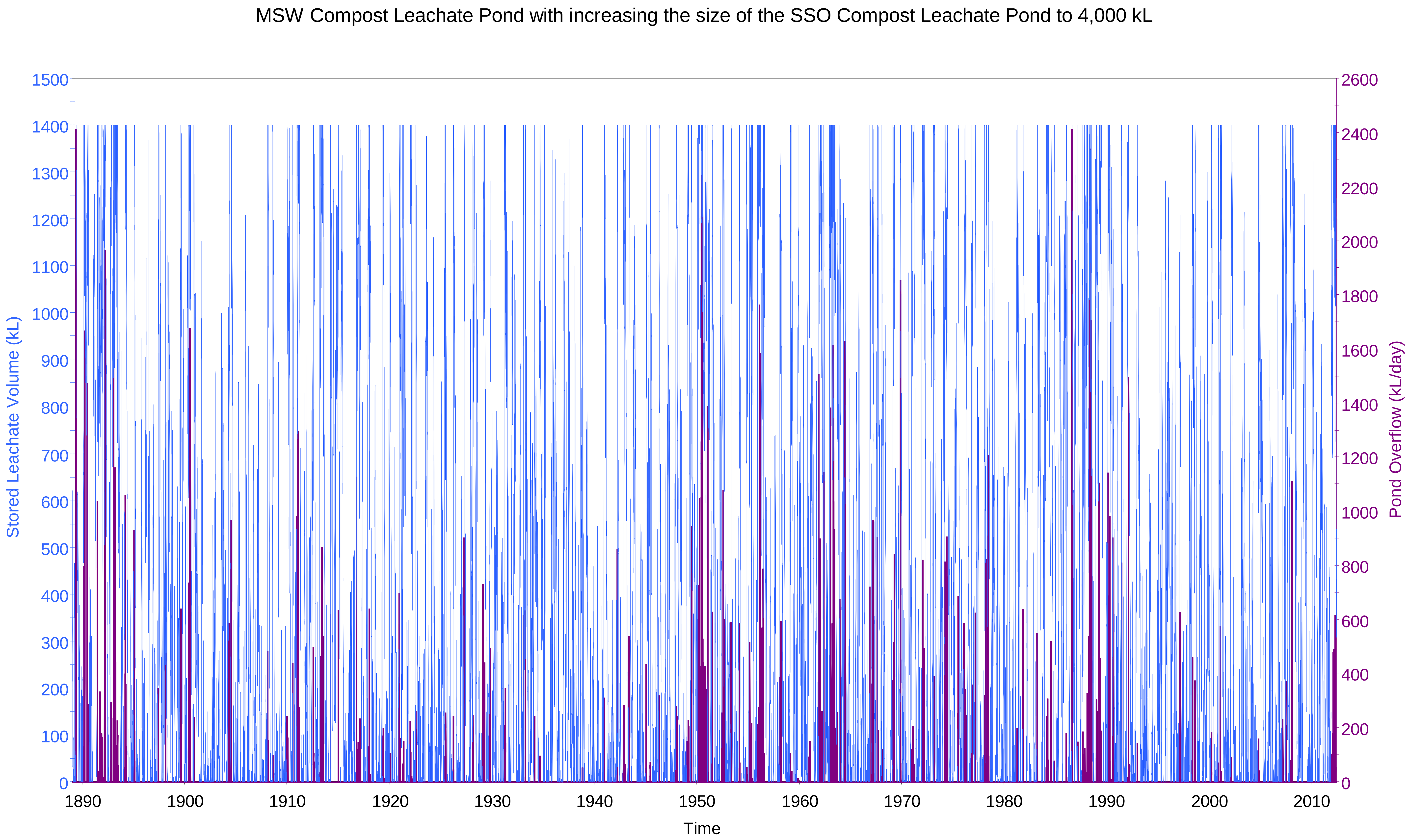
References

Wilson, B, Haralampides, K, Levesque, S 2004, ‘Stormwater runoff from open windrow composting facilities’, *Environ. Eng. Sci*, 3: pp. 537-540

Appendix A

Appendix A - Modelled Time History Graphs of MSW Compost Leachate Pond


MSW Compost Leachate Pond - Base Operating Case
Stored Leachate Volume (kL)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
Pond Overflow (kL/day)
0
1000
2000
3000
4000
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Time


MSW Compost Leachate Pond with increasing the size of the SSO Compost Leachate Pond to 4,000 kL
Stored Leachate Volume (kL)
Pond Overflow (kL/day)
Time
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010