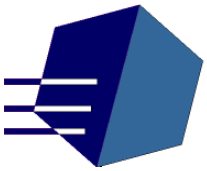
# Appendix E

## Water balance model report



# CONSULTING EARTH SCIENTISTS

**WATER BALANCE REPORT – MODIFICATION 6**

GENESIS LANDFILL AND RECYCLING FACILITY

PREPARED FOR DIAL-A-DUMP INDUSTRIES PTY LTD

CES DOCUMENT REFERENCE: CES170514-EMM-AB


**Written by:** Mark Challoner

**Reviewed by:** David Johnson

**Authorised by:** **Duncan Lowe**


**Client:** Dial-a-Dump Industries Pty Ltd
PO BOX 749
Mascot
NSW 1460

**Date:** 17 August 2017


**Telephone**: 02 8569 2200 • **Fax**: 02 9552 4399 • Level 1, Suite 3
55-65 Grandview Street • Pymble NSW 2073 • Australia • www.consultingearth.com.au

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# WATER BALANCE REPORT– MODIFICATION 6

GENESIS LANDFILL AND RECYCLING FACILITY

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## 1 INTRODUCTION

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Dial-A-Dump Industries Pty Ltd (DADI) (the client) to provide a Water Balance Report for the Genesis Landfill and Recycling Facility (the Site), for the proposed Modification 6 amendment to the Development Approval.

In accordance with the requirements of Clause 22 of Schedule 3 of Project Approval Application No. 06_0139 (as modified) in 2009 under the *Environmental Planning and Assessment Act 1979*:

The site water balance must:

a) include details of all water extracted, transferred, used and/or discharged by the development;

b) identify the source of all water collected or stored on the site, including rainfall, stormwater and groundwater; and

c) describe the measures that would be implemented to minimise water use on site.

This report refers to the previous water balance report prepared for the site:

- *Water Balance Report, Genesis Landfill And Recycling Facility*, Prepared For Dial-A-Dump Industries Pty Ltd, CES Document Referenced: CES161004-ECS-AD. November 2016.

## 2 OBJECTIVES

The objective of the Water Balance Report is to quantify the amount of leachate generated at the site and document the management of the leachate. To assess the amount of leachate generated at the site, CES has completed the following work:

- Reviewed available information pertaining to leachate management provided by DADI.
- Provided an assessment of leachate volumes produced at the site;
- Prepared this report assessing leachate volume balance and if necessary provided recommendations for future leachate monitoring.

# 3 BACKGROUND INFORMATION

## *3.1 SITE LOCATION AND DESCRIPTION*

The site is owned by Dial A Dump (EC) Pty Ltd and the site is legally defined as Lot 1 in Deposited Plan (DP) 1145808 and Lot 8 in DP 1200048. The site is located within the Eastern Creek suburb, which is in the Blacktown local government area. The site area of the two lots is 52.4Ha.

The Genesis Landfill and Recycling Facility is surrounded by a mix of commercial, open space, infrastructure (M4 Motorway) and industrial developments.

### 3.1.1 Environmental Protection Licences

Dial A Dump (EC) Pty Ltd operates under the following Environmental Protection Licences (EPL), EPL No. 20121 and EPL No. 13426. EPL No. 20121 specifically regulates the Materials Processing Centre (MPC) operations and recycling facility. EPL No. 13426 relates to the quarry void and is most relevant to the water balance assessment.

## *3.2 SITE OPERATIONS OVERVIEW*

The Genesis Landfill and Recycling Facility comprises the operation of a general solid waste (non-putrescible) landfill, a Materials Processing Centre (MPC), and Segregated Materials Area (SMA).

### 3.2.1 Approved Activities

The following activities have been approved under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act):

- Capacity to receive up to two million tonnes of waste per annum, including inert and solid wastes from construction and demolition (C&D), commercial and industrial (C&I) waste streams complying with acceptable waste for general solid waste (non-putrescible) facilities and green waste clean ups; on-site waste processing including sorting, screening, sieving, crushing, grinding, shredding and/or chipping, and composting of green waste;
- Recycling of an estimated 65-80% of incoming waste (1.3 to 1.6 million tonnes per annum (mtpa), based on maximum capacity intake) e.g. to produce road base, aggregate, landscaping soil, bedding sand, mulch, wood chip, green waste compost and asphalt derived products for land application;
- Testing and on-site storage/stockpiling of finished products prior to resale from stockpiles, predominantly to the building, civil construction and landscaping sectors and potentially the domestic market;

- Transport of an estimated 20-35% of incoming waste (0.4 to 0.7 mtpa, based on a maximum capacity intake) to the landfill proposed within the quarry void, comprising incoming materials which are unsuitable or uneconomical for recovery and recycling (for example contaminated soils, asbestos waste and loads that cannot physically be sorted);
- Quarantine and transfer of unacceptable wastes to an appropriate off-site facility for disposal; and
- Construction and operation of associated infrastructure, plant and equipment, including upgrade of the internal road network and reshaping of earthen amenity berms.

## *3.3 PROJECT APPROVAL*

The current Project Approval (06_0139) provides for:

- A waste recovery facility including a MPC and greenwaste area. It is noted that the facility is not currently operating greenwaste activities;
- Rehabilitation of the quarry void via a Class 2 (non-putrescible) landfill;
- Total throughput of up to 2 million tonnes of materials at the site per calendar year;
- Landfilling of up to 700,000 tonnes of non-putrescible waste (including asbestos);
- Stockpiling of up to 50 tonnes of tyres on site at any one time; and
- Stockpiling of up to 20,000 tonnes of greenwaste on site at any one time.

Although not all of the approved modifications are strictly relevant to the water balance modelling, the following modifications to the above original consent have been approved and included in this report for completeness:

### 3.3.1 Modification 1

Modification 1 (MOD 1 granted by the Minister on 30 September 2010) approved the following components:

- Electrically powered conveyor and chute;
- Postponed commencement of construction;
- Two way traffic on Fourth Avenue;
- Concrete bay walls within the greenwaste processing area; and
- Relocation of the wheelwash.

### 3.3.2 Modification 2

Modification 2 (MOD 2 granted by the Minister on 9 November 2010) comprised a correction to the land description details of the project Approval. The corrected reference to the land being Lots 1, 2, 3 and 4 in DP 1145808.

### 3.3.3 Modification 3

Modification 3 (MOD 3 granted by the Minister on 5 December 2011) approved the following components:

- Revised final landform level of the fill pad at Area D;
- Operational landform levels and site stormwater design;
- Internal office and external amenities to the Weighbridge;
- New amenities building;
- New amenities building associated with the spotter stations;
- New administrative/office building;
- New amenities at the tarp stand area;
- Approval for the use and relocation of the vehicle turning bay which works have already been carried out; and
- Voluntary planning agreement.

### 3.3.4 Modification 4

Modification 4 (MOD 4 granted by the Minister on 14 December 2013) approved the following components:

- Extended operating hours for the MPC allowing it to be operated during the hours of 6am to 10pm Monday to Friday, and 6am to 4pm Weekends and Public Holidays; and
- Modifications to the noise levels in Table 4, which provided that the Proponent would not exceed 36 LAeq (15 minute) dB(A) during the day and 35 LAeq (15 minute) dB(A) during the evening and Morning Shoulder period.

### 3.3.5 Modification 5

Modification 5 (MOD 5 granted by the Minister on 17 March 2016) approved the following components:

- Allow construction of a Pre-Sort Enclosure in accordance with the plans submitted with the modification application.

## *3.4 MODIFICATION 6*

### 3.4.1 Current Conditions

The Proponent currently operates as follows:

**Table 1 – Current Genesis Landfill and Recycling Facility Operation Hours (Table 5, Condition 39, Schedule 3, Project Approval (06_0139) as amended by MOD 4.**

| Activity | Day | Time |
|---|---|---|
| Construction | Monday – Friday | 07:00am to 18:00pm |
| | Saturday | 08:00am to 16:00pm |
| | Sunday and Public Holidays | Not Approved |
| Operation | Monday – Friday | 07:00am to 18:00pm |
| | Weekend and Public Holidays | 08:00am to 16:00pm |
| MPC | Monday – Friday | 06:00am to 22:00pm |
| | Weekend and Public Holiday | 06:00am to 16:00pm |

Clause 39a of the Project Approval states:

- *Operating hours of the conveyor and chute system are to be restricted to the facility's operational hours (and not times governing the Operation of the MPC as above) and as defined in condition 39 of Schedule 3.*

A landfilling limit of 700,000 tonnes per annum and a maximum mass of material received at the facility of 2Mtpa is currently approved.

### 3.4.2 Proposed Modification to Operating Hours

The proponent proposes to amend the Existing Table 5 of Condition 39 (as set out above and amended by Modification 4).

**Table 2 – Proposed Changes to Table 5, Condition 39**

| Activity | Sub-activity | Days | Hours |
|---|---|---|---|
| Construction | | Monday-Friday | 6am-6pm |
| | | Saturday | 8am-4pm |
| | | Sunday and public holidays | nil |
| MPC and PSE | Receive Materials | Monday to Sunday | 24 Hours |
| | Operations | Monday to Sunday | 24 Hours |
| SMA | Receive Materials | Monday to Sunday | 24 Hours |
| | Crushing and Screening | Monday to Sunday | 6:00am to 6:00pm |
| Landfill | Receive Materials by truck | Monday to Sunday | 5am-9pm |

| | | | |
|---|---|---|---|
| | Convey waste from MPC to landfill via chute | Monday to Sunday | 24 Hours |
| Maintenance | | | |
| MPC, PSE and landfill | Repair machinery | Monday to Sunday | 24 Hours |
| SMA | Cleaning and machinery repairs | Monday to Sunday | 24 Hours |
| Chute | Clearing of blockages and general repairs | Monday to Sunday | 24 Hours |

The landfilling limit of 700,000 tonnes per annum will be removed. The 2Mtpa limit of receival is not proposed to be changed.

### *3.5 LANDFILL HISTORY*

The predominant feature is breccia quarry, formerly known as the Pioneer Quarry, where it is understood that extractive operations started in the 1950s. The quarry reached the end of its economic life and all quarrying activities at the site ceased in September 2006, although the quarry void remained.

### *3.6 LANDFILL GEOMETRY*

The landfill geometry information was reported in the *Leachate Collection System, Concept Design* (ERM, August 2008) as:

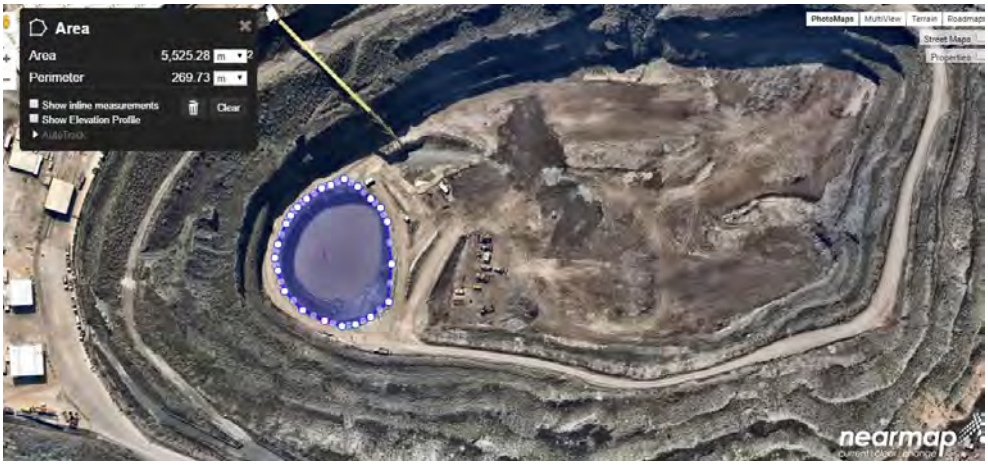
The open cut elliptical void is approximately 430 metres (m) x 700 m and up to 150 m in depth. The surface area is approximately 288,000 $m^2$ at ground surface and 12,000 $m^2$ at the base.

At the time of this reporting, the area dimensions of the landfill were measured using Nearmap tools based on the aerial photograph dated 9 September 2016. Areas measured were as follows:

Total Landfill Footprint Area = 472,000 $m^2$.


Total base of operating landfill footprint area = 73,000 $m^2$.


Total footprint area of 8 ML stormwater pond = 5,525 $m^2$.




### 3.6.1 Walls of Void

Benches of approximately 7 to 8 m in width descend down the sides of the void. The upper part of the quarry is excavated through unconsolidated sediments including clays and weathered shales and therefore has lower angled slopes. A spiral access road around 20 m in width around the edge of the void descends to the quarry base. Stormwater drains control run-off on the access road.

### 3.6.2 Base of Void

A rectangular level area (-57m Australian Height Datum (AHD) forms the base of the former void. A raised area (approximately 8m higher) is present to the east of the rectangular base. The base is fairly flat and drains to a sump from which groundwater ingress and run off is currently pumped. These areas have been entirely covered with landfill material.

The current base of void is at approximately -10 m AHD and is approximately 10m lower than the 8 ML stormwater dam located in the western portion. The active filling area is in the eastern portion of the pit.

## *3.7 GEOLOGY AND HYDROGEOLOGY*

A full review of the geology and hydrogeology of the site is set out in *Groundwater Assessment* (ERM, July 2008). The key features that relate to the collection of leachate are:

- The surficial geology comprises clay and weathered shales to a depth of approximately 32 m bgl. Intact (Bringelly) shales predominate below the weathered shales down to depths approximating 146 m bgl. The Hawkesbury Sandstone is likely to be located approximately 20 m below the base of the quarry;
- There is an intermittent shallow perched groundwater system located around the quarry within the fill, clay and weathered shale. Permeabilities of these deposits range from 1.46E$^{-}$

$^3$ m/day to 0.25 m/day. Based on the very isolated seepage observed from the clay and weathered shales exposed on the pit walls, this system is not in significant hydraulic contact with the quarry. This suggests that, provided leachate levels within the pit are kept below the base of the shallow aquifer system, leachate migration into this system is unlikely to occur. The water quality of this aquifer is considered to be poor and of limited human and environmental value; and

- There is a deeper regional groundwater system located within the shale deposits. The permeability of this shale has been calculated to be very low (1.75E-6 m/day to 8.7E-6 m/day). The elevation of this water table is likely to be in excess of 24 m AHD, which approximates 82 m above the pit base. This indicates a strong inward hydraulic gradient and suggests that the bulk formation hydraulic properties (including fracturing) of the surrounding geology are low. Given the low permeabilities of the geology surrounding the pit there is unlikely to be significant hydraulic contact between the quarry pit and the underlying Hawkesbury Sandstone. Overall, seepage from regional groundwater system into the quarry pit was estimated to approximate 2 $m^3$/day. The water quality of this aquifer is considered to be poor and of limited human and environmental value.

## 3.8 *INFILLING PROCEDURE AND LANDFILL LEACHATE GENERATION*

It is understood that the target infilling rate of the landfill under the current approval is approximately 500,000 tonnes/year (estimated to be 295,000 $m^3$/year). Under best case conditions it is anticipated that the pit cavity will be infilled within 65 years, this will shorten to approximately 26 years under worst case infilling conditions.

In 2007, DECC requested that a spreadsheet based model be developed to assess the required discharge rates for leachate; the likely leachate water elevations in the landfill; the required leachate surface storage; and the anticipated discharge rate to sewer.

The spreadsheet based model prepared by ERM in 2008 was developed as per DECC recommendations at the time and included the following parameters:

- Monthly time steps over a period of 100 years;
- The incorporation of 90th percentile wet years at year 1 and at 10 year intervals. Average rainfall conditions were used for the remaining years;
- Groundwater inflow to the pit of 2 $m^3$/day;
- A surface area of the landfill base of 12,000 $m^2$ and a maximum surface area of 265,000 $m^2$;

- In accordance with the Draft (at the time) Environmental Guidelines: Landfilling (DECC, 2008) there was an assumption that 50% of rain falling on the temporary capping at the surface of the landfill becomes leachate while the remaining rainfall runs off as surface water. Following this, it was assumed that 10% of rain falling on the landfill cap after closure becomes leachate; and
- The spreadsheet model is also designed to incorporate the infilling procedure outlined above.

The key data relevant to this document are summarised as follows:

- The design of the infilling system will allow separation of surface water run-off from the sides of the landfill from the rain falling directly onto the landfill waste and infiltrating to become leachate. This will significantly reduce the volume of leachate generated;

  However, it should be noted that the separated rainwater that is pumped/discharged to the pit stormwater dam and the surface dams (including the dam underneath the Materials Processing Centre (MPC) is used for irrigation/dust suppression of the waste area. As a result, this water may generate leachate.
- ERM conservatively estimated the volumes of surface water and leachate generated within the landfill. Based on this, leachate generated is anticipated to range between 45 and 872 $m^3$/day, with an average of 241 $m^3$/day;
- As a result, ERM estimated that in order to maintain groundwater elevations at acceptable levels within the landfill, pumping rates from the landfill will be required to range between 250 $m^3$/day and 500 $m^3$/day;
- ERM stated that provided that pumping rates do not fall below 241 $m^3$/day, the landfill will be able to be used as a storage facility during times of high rainfall. This pumping rate allowed a constant flow rate to be achieved from the leachate collection system and would negate the need for surface storage capacity for leachate pumped from the landfill;
- At the completion of the landfill and subsequent capping, leachate generation is likely to fall below 90 $m^3$/day. Due to the potentially poor ability of the regional groundwater system to absorb this volume of leachate there is potential for leachate elevations to eventually rise above the regional groundwater elevation and begin recharging the shallow perched groundwater system. Post landfill monitoring will help to quantify this process, however, there is potential for ongoing pumping to be required to prevent impact to receptors in potential hydraulic contact with the landfill.

# 4 WATER BALANCE

## *4.1 METHODOLOGY*

The water balance methodology takes inputs from measured precipitation, evapotranspiration and expected volumes of irrigation and infiltration to calculate the net water balance at the site. The relationship between the four input parameters is based upon the site area, which is divided between waste areas and non-waste areas. Water applied to waste areas is assumed to become leachate, while water applied to non-waste areas is converted to leachate at a lower rate. The net water balance represents the volume of leachate being required to be removed from the pit per year.

This water balance is for the current (2017) landfill geometry, and is the basis for the leachate generation model (CES documents reference CES170514-EMM-AC), which models the leachate generated over time, up until the filling of the pit void.

## *4.2 CLIMATE*

Climate data used in this report was collected from the Australian Bureau of Meteorology website. Weather records from the Prospect Reservoir observation station (number 067019) are used to represent weather for the site as this is the closest weather station with complete records of rainfall and evaporation for the relevant 12 months. The weather station is located at Lat: 33.82˚S, Long: 150.91˚E and at an elevation of 61m, approximately 5.5km to the south east of the site.

**Table 3 Climatic Data, All Years to 2016 for Prospect Reservoir**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean Rainfall (mm) (1)** | 96.2 | 95.9 | 96.2 | 76.7 | 70.4 | 77.1 | 56.2 | 50.5 | 46.4 | 58.7 | 73.6 | 75.9 | 874 |
| **Decile 9 monthly rainfall (mm) (1)** | 193.7 | 197.9 | 199.2 | 170.6 | 170.3 | 181.9 | 128.3 | 130 | 100.6 | 130.8 | 142.1 | 159.8 | 1178.2 |
| **Mean Monthly Evaporation (mm) (2)** | 167.4 | 131.6 | 120.9 | 87 | 62 | 48 | 52.7 | 77.5 | 105 | 136.4 | 147 | 173.6 | 1309.1 |
| **Mean number of days of rain >= 1 mm (3)** | 8.0 | 8.1 | 8.3 | 7.1 | 6.4 | 7.0 | 5.7 | 5.7 | 6.1 | 6.8 | 7.3 | 7.5 | 84.0 |

(1) BOM, Mean rainfall (mm) for years 1887 to 2016
(2) BOM, Mean monthly evaporation (mm) for years 1965 to 2016 (calculation)
(3) BOM, Mean number of days of rain > or = 1 mm

The annual mean total rainfall for all years at Prospect Reservoir is 874mm. This is below the 90th percentile wet year annual mean for all years of 1178.2mm. The total annual mean evaporation recorded for the Prospect Reservoir for all years is 1309.1mm. The total annual mean number of days of rain greater than or equal to 1 mm is 84 days.

## *4.3 WATER VOLUMES*

### 4.3.1 Water Generation

#### *4.3.1.1 Water Generated by Direct Rainfall ($V_1$)*

Potential leachate generated by direct rainfall in the landfill pit for the 90$^{th}$ percentile wet year annual mean as presented in Table 1, are calculated in Equation 1 below. The volume calculation considers the following assumptions:

- Total Landfill Catchment Area (site area within the perimeter amenity bund) = 472,000 m$^2$;
- Total base of operating landfill footprint area = 73,000 m$^2$;
- Total footprint area of 8 ML stormwater pond = 5,525 m$^2$;
- Area of direct rainfall onto waste areas = 67,475 m$^2$;
- Area of direct rainfall onto side slopes = 215,000 m$^2$;
- Assume 10% of rainfall on the catchment area including sidewalls (excluding direct rainfall onto waste area) interacts with landfill waste; 90% is collected by stormwater systems, adsorbed, or evaporated.

Equation 1:

$V_1 = A \times R$

*V1 = Direct rainfall to landfill base + 10% of rainfall from catchment area*

Where $V_1$ is the net volume input of water (m$^3$) generated by rainfall, over the catchment area and surface area of the landfill pit A (m$^2$), and R is rainfall expressed in metres.

$V_1 = [(73{,}000 - 5{,}525) \times 1.1782] + [(0.1 \times (472{,}000 - 73{,}000)) \times 1.1782] = 126{,}509\ m^3/yr$

#### *4.3.1.2 Water Generated by Irrigation ($V_2$)*

Irrigation and dust mitigation at the site (landfill area, Materials Processing Centre, and surrounding lands) will continue to be supplied via water carts, water cannons, and sprinklers. Irrigation will generally operate 7 days per week, for a total operating week calculated as 168 hours (based on the information in Table 2 – that the Segregated Materials Area (SMA) will receive materials 24 hours a day, 7 days per week). It is also assumed that water irrigation is not

done on the mean number of annual days from Monday to Friday with rainfall greater than 1 mm (95 days per year for a seven day week). Thus, the operating days with irrigation are assumed to be approximately 281 days per year. It is assumed that water is sourced from the stormwater detention ponds and this water used to irrigate. Irrigation is assumed to be carried out as per the following:

- It is assumed that 14% of the site wide irrigation water interacts with waste in the landfill pit base area, based upon reconciliation of the existing site water balance (CES161001-ECS-AD);
- It is assumed that 178,000 $m^2$ of the site are irrigated (i.e. areas where dust control is likely to be required);
- One 9, 000 L (9 $m^3$) water truck is emptied within the landfill pit approximately 5 times per day, 281 days per year;
- Twelve water cannons are used intermittently on the site in 3 minute bursts, once per hour per average 10.5 hour day, 7 days per week, 281 days per year, at an approximate rate of 11 L/s (0.011 $m^3$/s, 3.3 $m^3$/3 minute burst); and,
- Eighteen sprinklers are used intermittently on the site in 3 minute bursts, once per hour, on average 10.5 hour day, 7 days per week, 281 days per year, at an approximate rate of 2 L/s (0.002 $m^3$/s, 0.36 $m^3$/3 minute burst).

The scenario for irrigation at the site are modelled as follows:

- Water Truck Water Volume = 9 $m^3$ x 5 volumes per day = 45 $m^3$/day = 12,645 $m^3$/yr
- Water Cannon Volume = 499 $m^3$/day x 281 days/yr = 140,208 $m^3$/yr
- Water Sprinkler Volume = 136 $m^3$/day x 281 days/yr = 38,238$m^3$/yr

*Total Irrigation at the site = 12,645 $m^3$/yr + 140,208 $m^3$/yr + 38,238 $m^3$/yr = 191,091 $m^3$/yr*
*Assume 14% irrigation water interacts with waste in the landfill pit = 26,753 $m^3$/yr*

*$V_2$ = Total irrigation water available for leachate = 26,753 $m^3$/yr*

#### *4.3.1.3 Leachate Generated by Groundwater Migration from Aquifer ($V_3$)*

The estimated flow rate of groundwater into the landfill is reported by ERM as 2 $m^3$/day (730 $m^3$/yr).

### 4.3.2 Water Reduction and Disposal

#### *4.3.2.1 Evaporation from Landfill Pit ($V_4$)*

Evaporation from the landfill pit is assumed to occur at the surface of waste only with no penetration into the waste.

The annual volume of water lost from the pit assuming waste levels at or about -10 mAHD due to evaporation is calculated in Equation 2 below:

Equation 2:

$V_4 = A \times E$

Where $V_2$ is the volume of water lost from the landfill pit due to evaporation (E). Evaporation is given a negative value and expressed in metres.

$V_4 = 67{,}475\ m^2 \times -1.3091 m/yr$

$V_4 = -88{,}332\ m^3/yr$

#### *4.3.2.2 Leachate Artificially Removed from Landfill Pit*

The leachate will continue to be passed through a sequenced batch reactor (SBR) and following treatment discharged to Sydney Water sewer via a Trade Waste Agreement. It is understood that the SBR system is in the order of 219,000 $m^3$/year; as such, the predicted volumes of water indicated below are well within the current capabilities of the treatment system.

### 4.3.3 Water Balance Summary

Based on the information above, a Water Balance Summary has been estimated and is presented in Table 2.

**Table 2: Leachate Volume Summary**

| Source | | Leachate Volume ($m^3$/yr) |
|---|---|---|
| $V_1$ | Net Rainfall on waste in landfill pit | +126,509 |
| $V_2$ | Net Irrigation on waste in landfill pit | +26,753 |
| $V_3$ | Seepage from groundwater | +730 |
| | Total Estimated Water Inputs | +153,992 |
| $V_4$ | Evaporation from Landfill pit with current waste deposit at -10 mAHD | -88,332 |
| | **Net Water Balance ($m^3$/yr)** | **+65,660** |
| $V_5$ | Leachate pumped out from landfill pit (2016) | -61,485 |

# 5 CONCLUSIONS

## *5.1 WATER BALANCE ASSESSMENT*

Based on the information available to CES, an approximate water balance has been estimated. This balance indicates that the modelled irrigation scenario indicates a net positive volume of water (or maximum available water to derive leachate) within the landfill pit. It is noted that although the net water balance exceeds the leachate pumped from the landfill pit in 2016, the SBR leachate treatment system has a capacity in the order of 219,000$m^3$/year. As a result, the SBR system has sufficient capacity to manage the predicted net water balance. The calculated irrigation and net leachate volume will be utilised in a leachate model, to assess the volume of leachate likely to be generated under the Modification 6 operating conditions over the filling period of the pit (CES Document Reference CES170514-EMM-AC).

## *5.2 WATER STORAGE*

It is noted that this water storage assessment does not consider the pumping of leachate from the base of the landfill pit, treatment and off-site disposal, since this is not considered to be water storage and is regulated by the NSW EPA under the Environmental Protection Licences (Nos. 13426 and 20121).

This water storage assessment comprises the following:

1. Compilation and preparation of a table of all known water storage units (tanks and dams) and the identification of the licensing status of each storage unit;
2. Quantification of the volume of water taken by passive means (since it is understood that there is no active take (pumping) by the project) from each water storage unit, where possible, and comparison with the previous predictions, where available.

CES has carried out a review of all existing water storage units (water tanks and dams) on-site and compiled the information and data (where available) into Table 1 which is presented in Appendix A – Water Storage Assessment. Water storage, in the event of MOD 6 approval, will not be different to the current management of water storage across the site.

The tables in Appendix A provide a list of all water storage units on the site, capacity of each unit in ML, the location (including map identification) of each unit, the source of the water (stormwater zone or roof), whether the water is obtained passively or actively, where the water is collected from, the volume of water taken as water supply on an annual basis and the licensing status of each unit.

The volume of each water storage unit was not able to be identified since records (other than subjective assessment) of the daily or weekly volume retained in each basin is not maintained.

The table below provides an explanation of the parameters presented in the Water Storage Assessment tables (Table 1 and 2) and information on the source of the data used in the tables.

Water Storage locations are presented as Figure 1.

| **Parameter** | **Explanation/Source** |
|---|---|
| Capacity | The capacity of each water storage unit was obtained with reference to drawings (for example Drawing C01 and C02, (AT&L, *Northern and Southern OSD Basin Layout Plan*, dated 01/12/2011) or from estimates provided by Environ Consulting Services (ECS). This does not represent the volume actually stored in the water storage unit, simply the maximum capacity. |

| | |
|---|---|
| Water Source | The source (catchment) of water collected within each water storage unit was provided by ECS and supported by a site visit undertaken by CES on 5 April 2017. |
| Passive or Active Take | It is understood that no stormwater or groundwater is pumped (that is to say actively taken from any source). This does not include the pumping to transfer water from one water storage unit to another – such as the pumping from the Northern OSDB to the "wet down bay" Water Storage Tanks [These tanks are used to supply water to wet down the loads contained in trucks before they proceed to the landfill pit]. It is noted that this assessment does not consider the treatment and disposal of leachate which is fully licensed and regulated by the NSW EPA under the Environmental Protection Licences No. 13426 and 20121. |
| Annual Water Supply Use | In the absence of any specific (quantitative) records of water use, CES has referred to the estimates (minimum and maximum) provided within this report (Water Balance Report, CES document reference: CES170514-EMM-AB). This report estimated the volumes of water used by the water sprinklers, the water cannons and the water carts. This annual volume does not include the volume of water used by the wet down bay. |
| Licensing Status | DIPW states in their letter (Letter reference: V15/416#53 OUT17/11948) that "the collection of dirty water in dams or sediment ponds for a water supply is exempt from requiring a licence under the Water Management (General) Regulation 2011. As such, since the majority of the water storage units source water from the working area of the landfill and recycling facility (including access roads) – noting that the treatment of leachate is entirely separate – the water stored in most of the dams is exempt from being licenced. In addition, the dams are licenced under the Environmental Protection Licences issued by the NSW EPA. In particular conditions A1.3, P1.2 and L1.2.<br><br>Where water is not collected from the working area – such as the roof stormwater dam and tanks underneath the Materials Processing Centre (MPC) and the Spotters Station (Crushing Yard), the capacity of the tank/dam is below the Maximum Harvestable Right (MHR) Dam Capacity as calculated using the maximum harvestable right calculator provided on the DIPW website (http://www.water.nsw.gov.au/water-licensing/basic-water-rights/harvesting-runoff/calculator). A site area of 77.84ha has been used as the site area (based on the site boundaries and Six Maps (https://maps.six.nsw.gov.au/). The calculator indicates that the MHR= 6.23ML. The storage capacity of the MPC dam and the Spotters Station tank is less than 1.01ML. As such the storage of water in these tanks is within the limits. |

### *5.3 WATER MINIMISATION*

In general terms, it is in the landfill operator's best interest to minimise water use, since surplus water used in the vicinity of the landfill may increase leachate generation, either through direct infiltration through the landfill materials – when water is used for dust suppressant during daily landfilling operations, or through infiltration to groundwater – and thereby increasing groundwater inputs to the leachate. In addition, surplus water will create additional operational issues on roadways, by causing slippery and muddy conditions, which are unfavourable for truck movements and landfill operations efficiency.

The site currently uses (and will continue to use after the approval of MOD 6) a fleet of water cannons, water carts and water sprinklers to minimise dust generation in the landfill pit, the segregated materials area (SMA) and the Materials Processing Centre (MPC). These water supply devices are operated in a strategic manner, i.e. they are not used when rainfall minimises the requirement for dust suppressant measures and are used on an increased basis during dry and windy conditions. Water for dust control is supplied from stormwater that has been harvested from the site area. This stormwater, as noted in Section 5.2, is currently pumped from the landfill pit stormwater basin into the northern and southern OSD basins.

Stormwater is also harvested from the roofs of structures, such as the MPC, which stores rainwater in the emergency dam underlying the MPC shed.

# 6 REFERENCES

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DADI Group Pty Ltd, Environmental Management Strategy; Leachate Collection Conveyance and Management System, Revised 16 March 2017


CONSULTING EARTH SCIENTISTS
Suite 2, Level 1
55 Grandview Street, Pymble NSW, 2073
ph 9569 2200 fax 9983 0582

Title

**Figure 1: Water Storage Unit Locations**

| CES Project ID: | Date: |
|---|---|
| CES161004-ECS-AL | 07/04/2017 |
| Prepared By: E.Millar | Checked By: M. Challoner |

# APPENDIX A
# WATER STORAGE ASSESSMENT TABLE

Genesis Landfill and Recycling Facility
Water Storage Assessment

CONSULTING EARTH SCIENTISTS

| Water Storage Unit (WSU) ID. | Location Map ID. | Name | Capacity (ML) | Water Source | Passive or Active Take | Catchment Assessment | Annual Volume of Water Taken as Water Supply [F] | Licensing Status [G] | Use | Water Supply Use |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Northern OSDB | 3.9[A] | Pit and Working Area | Passive | Working Area | 144-346 ML | Exempt[D] | Routine | Dust Suppression |
| 2 | 2 | Southern OSDB | 3.6[A] | Site Access Road and TNG Area | Passive | Working Area | 144-346 ML | Exempt[D] | Routine | Dust Suppression |
| 3 | 3 | Pit Dam | 8[B] | Pit and Pit Access Road | Passive | Working Area | 144-346 ML | Exempt[D] | Routine | Dust Suppression |
| 4 | 4 | MPC OSDB | 1[B] | MPC Roof | Passive | Rainwater | 144-346 ML | Harvestable[E] | Routine | Dust Suppression |
| 5 | 5 | NE OSDB | 1[B] | Overflow from Pit Dam | Passive (Pump)[C] | Working Area | 144-346 ML | Exempt[D] | Rarely Used | Dust Suppression |
| 6 | 6 | Wet Down Poly Tanks | 0.0225 | From Northern OSDB | Passive (Pump)[C] | Working Area | NA | Exempt[D] | Routine | Vehicle Wash |
| 7 | 7 | Wet Down Poly Tanks | 0.0225 | From Northern OSDB | Passive (Pump)[C] | Working Area | NA | Exempt[D] | Routine | Vehicle Wash |
| 8 | 8 | Wet Down Poly Tanks | 0.0225 | From Northern OSDB | Passive (Pump)[C] | Working Area | NA | Exempt[D] | Routine | Vehicle Wash |
| 9 | 9 | Wet Down Poly Tanks | 0.0225 | From Northern OSDB | Passive (Pump)[C] | Working Area | NA | Exempt[D] | Routine | Vehicle Wash |
| 10 | 10 | Wet Down Poly Tanks | 0.0225 | From Northern OSDB | Passive (Pump)[C] | Working Area | NA | Exempt[D] | Routine | Vehicle Wash |
| 11 | 11 | Spotter Station OSD Tank | 0.01 | Spotters Station Roof Crushing Yard | Passive | Rainwater | 144-346 ML | Harvestable[E] | Routine | Dust Suppression |

Notes:

[A] - Capacity of Northern OSD and Southern OSD from Drawings C01 and C02, AT&L, 01/12/2011

[B] - Estimated Volume provided by ECS

[C] - Pumped from an existing OSDB (On-Site Detention Basin)

[D] - The surface water run-off is collected passively from working areas of the landfill and recycling site and therefore is considered to be exempt under the Water Management (General) Regulation 2011

[E] - Maximum Harvestable Rights Order (as defined in NSW Government Gazette 40 - 31 March 2006),

based on site area of 77.84 ha. (see attached plan). 6.23 ML (http://www.water.nsw.gov.au/water-licensing/basic-water-rights/harvesting-runoff/calculator)

[F] - Total water estimated (annual) for dust suppression from water carts, water cannons and water sprinklers (CES, Water Balance Report, Document Ref: Section 4.2.1.2 CES161004-ECS-AD)

[G] - It should be noted that WSU IDs. 1, 2 and 3 (and therefore 6-10) are licensed under the Environmental Protection Licence 13426, in particular Conditions A1.3, P1.2 and L1.2.

WSU ID 1 is monitored under Monitoring Points 2 and 5 (EPL 13426) and WSU ID 2 is monitored under Monitoring Points 3 and 6 (EPL 13426)

WSU ID 1 is monitored under Monitoring Points 5 and 7 (EPL 20121) and WSU ID 2 is monitored under Monitoring Points 6 and 8 (EPL 20121)