OPAL VALE SALT VALLEY ROAD CLASS II LANDFILL

LOT 11 CHITTY ROAD, TOODYAY

WORKS APPROVAL APPLICATION SUPPORTING DOCUMENTATION

View of Clay Pit Entrance

Prepared for

OPAL VALE PTY LTD

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1. Introduction

Opal Vale Pty Ltd (Proponent) proposes to development of a Class II landfill site within an existing clay pit at Lot 11 Chitty Road, Toodyay.

To achieve this, it is necessary that a Works Approval application be submitted to the Department of Environment Regulation (DER).

This document provides the supporting information for the Works Approval application.

2. Facility Development Guidelines

The facility development considerations and design has been based on the DER landfill development guidelines (*Siting, Design, Operation and Rehabilitation of Landfills, September 2010 – EPA Victoria*). In October 2014, the Victorian EPA released an amendment to this document (*Siting, Design, Operation and Rehabilitation of Landfills, October 2014 – EPA Victoria*), which contained minor changes to the previous document. These recent changes have also been considered in the proposed development.

The proposed development substantially complies with the requirements of the latest Victorian landfill development guidelines (*Siting, Design, Operation and Rehabilitation of Landfills, October 2014 – EPA Victoria*) and where there are minor deviations from these guidelines, they are clearly explained.

3. The Proponent

The Proponent for this proposed development is Opal Vale Pty Ltd.

The Proponent is a well-regarded company operating in the WA waste industry.

Opal Vale is also closely affiliated with the following other waste industry related companies:

- Instant Waste - the largest waste collection company in WA;
- Resource Recovery Solutions – the largest construction & demolition (C&D) and commercial & industrial (C&I) waste recycling company in WA; and,
- New Energy – waste to energy company developing waste to energy solutions in Port Hedland and Rockingham.

The Proponent currently operates the Class I Landfill on Lot 1 Salt Valley Road and has a demonstrated track record in the waste management field.

The Proponent's postal address is:

Opal Vale Pty Ltd
PO Box 419
MORLEY BC
WA 6943.

4. Premises Location and Details

Property Location:

Lot 11 Chitty Road
TOODYAY

The site is the Williamson's Clay Pit which is situated on the south eastern portion of Lot 11. The clay pit is approximately 1.25 km to the east of Chitty Road and 3 km to the south east of Salt Valley Road (the site entrance).

The clay pit is currently operated by Austral Bricks. Agreements are in place between Austral Bricks, the landholder and the Proponent for the utilisation of the existing and future clay pit for the development of a Class II landfill.

Site Area:

Overall Lot 11 area is 619 ha.

Proposed Prescribed boundary is approximately 50 ha, which includes:

- Stage 1 landfill area of approximately 10 ha;
- Associated operational areas (access roads, leachate and gas management areas) is approximately 10 ha; and,
- Internal buffer zones.

Land Use

The land use is an “A” use within the Rural Zone. An “A” use means that the use is not permitted unless the local government has exercised its discretion by granting planning approval.

Planning Approval has been granted through the State Administrative Tribunal process.

Appendix No. 1 – Location – Land Uses and Buffers provides detail of the site location.

5. Project History

The development of a landfill within the existing clay pit has been considered for many years. In mid-2009, the Proponent submitted a Works Approval Application to the DER (then DEC) and a Development Application to the Shire of Toodyay for a Class II landfill within an existing clay pit on site. These applications were assessed and progressed to varying degrees. Ultimately, there was a requirement for additional technical landfill design information before the application could be progressed further.

In mid-2011, a new, amended application was lodged with both the DER and the Shire. The amended documentation contained significantly more technical information relating to the proposed development.

Subsequently, the Shire refused the application and the Proponent took the matter to the State Administrative Tribunal (SAT). Due to the Shire refusal, the DER ceased assessing the Works Approval Application until the Shire Planning matters were resolved through SAT.

In early 2013, the SAT process unfolded with the outcome being in June 2013, the proposed development was given conditional Planning Approval. Some of the SAT conditions related to technical landfill development matters, which required additional environmental investigations and consequently amendments to the originally proposed landfill base design.

As a result of the drawn out process of obtaining (conditional) Planning Approval, the number of related Works Approval Application documents and revisions as well as the subsequent SAT conditions, it was agreed between the DER and the Proponent that the most efficient way forward was for the Proponent to withdraw the previous Works Approval Application and commence with a new application consisting of the latest, most up-to-date documentation. In July 2013, this new application was submitted to the DER.

In September 2013, the DER requested and received some additional information on the proposed development.

In December 2013, the DER was provided with the site groundwater monitoring data up to December 2013, which was a condition of the SAT approval.

On 20 October 2014, the DER wrote to the Proponent with a detailed commentary on the proposed development, providing 35 days for the Proponent to respond to the matters raised. In addition, the DER stated that any significant amendment to the proposal should be provided as a new application.

Following a review of the issues raised by the DER, it was apparent that the Department of Water (DoW) would not accept an underdrainage system below the landfill that may intercept groundwater. Even though the DER landfill development guidelines allowed for this situation, it was deemed not acceptable by the DoW. The simple solution was to raise a portion of the base of the landfill by approximately 2 m; hence, enabling the underdrainage blanket to be removed. This relatively simple change to the design was however seen as a significant amendment to the proposal and hence, on 18 November 2014 the Works Approval application was withdrawn.

This new application incorporates the change to the landfill base level and provides significantly more technical information to support the application.

6. Local Government Authority

The proposed development is within the Shire of Toodyay.

The proposed land use is an “A” use within the Rural Zone. An “A” use is not a permitted use unless the Local Government has exercised its discretion by granting Planning Approval.

Planning Issues – In mid-2009, the Proponent submitted a Planning Application for the development of a Class II landfill in the Williamson’s Pit. At its Council Meeting of 19 August 2010, the Shire resolved accordingly:

“*That Council defer consideration of the planning application until such time as the Environmental Protection Authority and/or Department of Environment and Conservation has issued works approval and a licence for the facility and they have agreed to receive and manage a financial assurance from the Applicant in accordance with the provisions of the Environmental Protection Act 1986*.”

As can be seen from the above resolution, there was a procedural conflict as a licence could not be issued by the DER without the facility being constructed and the facility could not be constructed without Planning Approval being received by the Proponent.

Following the August 2010 Council resolution, the Proponent progressed with the technical design of the proposed landfill facility, which culminated in the submission of a further Planning Approval application in March 2012.

At its Council Meeting of 17 July 2012, the Shire resolved accordingly:

“*That the planning application for a Class II landfill be refused for the following reasons:*

1. *There is insufficient information contained in the hydrology report (Council would require an independent hydrology report commissioned by the Shire of Toodyay at the proponents cost).*
2. *There is insufficient information to demonstrate that the facility is adequately designed to meet the seismic conditions of the area, to determine whether the integrity of the landfill could be maintained during or following a seismic event.*

3. *There is no agreement from the Department of Environment and Conservation to receive and manage a financial assurance from the applicant.*
4. *The Development application report refers to the application as being for a Class III landfill.*
5. *The Development application report is insufficient in relation to rehabilitation outcomes.*
6. *The application does not address the measures that would be implemented to address the mosquito management issues raised by the Department of Health.*
7. *The proposal would establish an undesirable precedent for the use of other extractive industry sites in the area as landfill sites for waste disposal:*
8. *The proposal is inconsistent with the content and intent of the Shire of Toodyay's Local Planning Scheme No 4.*
9. *The proposed use is inconsistent with the content and intent of the Shire of Toodyay's Local Planning Strategy.*
10. *The proposed use is inconsistent with the approved rehabilitation plan for the extractive industry licence granted for the site.*
11. *The proposal fails to meet specific objectives of the Avon Arc Sub-Regional Strategy.*
12. *The proposal fails to meet the objects and principles of the Environmental Protection Act 1986.*
13. *The proposal would have an adverse impact on the amenity of the area.*
14. *The proposal would have an adverse impact on the tourism industry within the district.*
15. *The proposal does not address the concerns raised by Main Roads WA in relation to truck movements associated with the operation of the landfill.*"

Following the refusal of the Development Application by the Shire, the Proponent took the Shire to the State Administrative Tribunal (SAT).

On 13 June 2013, SAT issued its Reasons, Decisions and Orders and determined that "*the application for review is allowed, with effect from 27 February 2013*". The SAT decision contained 28 orders, of which 15 are impacted by the Works Approval process.

Consequently, there is currently conditional Planning Approval for the proposed development. The majority of the SAT conditions (Orders) will be complied with when a Works Approval has been issued by the DER. There are a number of orders that are unrelated to the Works Approval process and will be complied with by the Proponent independently of the Works Approval process.

7. State Administrative Tribunal

Following the refusal of the Development Application by the Shire of Toodyay, the Proponent took the Shire to the State Administrative Tribunal (SAT).

On 13 June 2013, SAT issued its Reasons, Decisions and Orders. The SAT decision contained 28 orders as well as extensive Reasons and Decisions associated with the orders. Order number 4 has 7 sub-orders; hence, there are effectively 34 orders and sub-orders that need to be complied with. 15 orders and sub-orders have a consequence to the Works Approval process.

The full SAT judgement can be sourced from the SAT website at "*http://decisions.justice.wa.gov.au/SAT/SATdcsn.nsf/PDFJudgments-WebVw/2013WASAT0088/$FILE/2013WASAT0088.pdf*"

The SAT orders (in *italics)* and Works Approval related impacts are as follows (numbering is as per the SAT order numbering):

1. *The application for review is allowed, with effect from 27 February 2013.*
   This order has no consequence to the Works Approval process.
2. *The refusal of the Shire of Toodyay is set aside and planning approval personal to the applicant is granted under the Shire of Toodyay Local Planning Scheme No 4 for the proposed landfill development as generally described in the document 'Management and Rehabilitation Program of Clay Pit, Class II Landfill, Lot 11 Chitty Road, Toodyay' by Landform Research dated January 2012 (Application Document) and shown in Attachments 1 to 4 of the document 'Opal Vale Clay Pit - Landfill Design and Closure' by IW Projects dated January 2012 which is Appendix 2 to the Application Document (facility), subject to the conditions set out in paragraphs 3 to 28 of these orders.*

   This order has no consequence to the Works Approval process. It is noted that this Works Approval Supporting document supersedes the referenced documents in this order; however, is effectively the updated version of the referenced documentation covering the aspects ordered by SAT.

Deferred commencement

3. *This approval, while otherwise current and effective as a planning approval from the date of these orders, commences and can only be acted upon from the date that the Department of Environment and Conservation issues a works approval under the Environmental Protection Act 1986 (WA) in respect of Stage 1 of the facility (works approval).*

   This order has no consequence to the Works Approval process; however, the issue of a Works Approval is required to enable the Planning Approval to be acted upon.

4. *The applicant is to:*

   a. *install an additional five bores located around the perimeter of the landfill area, drilled to the water bearing horizon, in approximately the locations shown on the plan attached to the orders of 27 February 2013 as Annexure A (perimeter bores);*

      This order has a consequence to the Works Approval process. The bores referred to in this order were installed in accordance with the agreed locations.

   b. *install five bores within the landfill area for each stage of the facility, the approximate locations of which for Stage 1 are shown on Annexure A, drilled to a depth of 5 metres below the proposed design base level of the landfill area at the location of each bore as shown on the Landfill Earthworks Layout Plan Drg No OV-WA-02 prepared by IW Projects dated May 2012 (pit bores);*

      This order has a consequence to the Works Approval process. The bores referred to in this order were installed in accordance with the agreed locations.

   c. *arrange for a suitably qualified independent person to measure the water levels at a minimum of once per month from 1 June (and as far as is practicable with respect to June 2013) to December 2013 in the perimeter bores and the pit bores to better define the winter static water levels;*

      This order has a consequence to the Works Approval process. Following the installation of the required additional bores, they were monitored on a monthly basis by Stass Environmental since March 2013 through to December 2013. The results of this monitoring were provided to the DER in January 2014 as well as being included within this latest Works Approval application.

d. *further investigate the material in the existing pit and walls and undertake further calculation of seismic risk by reference to both AS4678-2002 and AS1170.4-2007;*

   This order has a consequence to the Works Approval process. These further calculations were undertaken by CMW Geosciences. In addition, Golder Associates has also undertaken an assessment of the seismic stability of the proposed development and confirmed the stable nature of the design.

e. *utilise the information referred to in 4(c) and 4(d) above to confirm or inform the final engineering design of the facility, including the batter slopes, shape and base level of each landfill stage, for the purposes of seeking the works approval;*

   This order has a consequence to the Works Approval process. The landfill base design has been amended to cater for the possible presence of groundwater below the landfill by raising the base of the liner at least 3 m above the highest recorded groundwater level. The DER landfill development guidelines only require a 2 m attenuation zone between the highest groundwater level and the underside of the landfill liner.

f. *provide the information referred to in 4(c) and 4(d) above to the Department of Environment and Conservation at the time of seeking the works approval; and*

   This order has a consequence to the Works Approval process. The most up-to-date information is provided in this supporting documentation.

g. *provide a copy of the information referred to in 4(c) and 4(d) above, together with a copy of the application for the works approval, to the Shire of Toodyay at the time of seeking the works approval.*

   This order has no consequence to the Works Approval process. This information was provided to the Shire as required and the Shire has been provided a copy of this latest Works Approval application.

5. *If the works approval has not been issued by the Department of Environmental and Conservation within two years from the date of this approval, then this approval shall lapse and be of no further effect.*

   This order has a consequence to the Works Approval process. The SAT approval will lapse on 26 February 2015. Due to the time that it has taken to progress the Works Approval application(s), the two-year timeframe has substantially been consumed. The Proponent is currently going through the process of applying to extend the validity of the SAT approval.

Substantial commencement

6. *If development of the facility is not substantially commenced within a period of one year from date of issue of the works approval, then this approval shall lapse and be of no further effect.*

   This order has no consequence to the Works Approval process.

General development and construction

7. *The final engineering design of the facility, including the batter slopes and shape and base level of each landfill stage, shall be implemented in accordance with the works approval issued by the Department of Environment and Conservation.*

   This order has no consequence to the Works Approval process.

8. *The facility is to be confined to that part of Lot 11 Chitty Road, Toodyay that has been used for an extractive industry and such adjacent land as is required for its operations, as identified in the application document.*

   This order has no consequence to the Works Approval process as the development is totally within the allowable Lot 11 and hence compliant with this order.

9. *No existing vegetation is to be removed for the operation of the facility (not including vegetation required to be removed for the initial or staged construction of the facility as set out in the application document).*

   This order has a consequence to the Works Approval process as the supporting documentation covers the issue of native vegetation clearing. There is however no clearing of native vegetation beyond that required to be removed for the initial or staged construction of the facility as allowable within the order.

10. *Approval for any effluent disposal systems to be located at the facility shall be sought from the Shire of Toodyay through the lodgment of an 'Application to Construct or Install an Apparatus for the Treatment of Sewage'.*

    This order has no consequence to the Works Approval process. There is no current proposal to construct or install an apparatus for the treatment of sewage. If in future a sewage treatment facility is required, the approval thereof will be sought from the Shire through the lodgement of the necessary application.

11. *All groundwater/stormwater management and watercourse protection measures detailed in the Water Management Plan (contained in the application document) shall be implemented prior to the commencement of operations at the facility.*

    This order has a consequence to the Works Approval process. groundwater and stormwater management is addressed within this supporting documentation.

Fire Management Plan

12. *Prior to the commencement of operation of the facility, the applicant must prepare and implement a Fire Management Plan, such plan being submitted to the Shire of Toodyay for approval.*

    This order has no direct consequence to the Works Approval process. A Fire Management Plan will be presented to the Shire and once approved, implemented prior to the commencement of operations on site.

    The supporting documentation does however cover the management of fires on the landfill. Hence, some aspects of on-site fire management will be assessed as part of the Works Approval process.

13. *Prior to the commencement of operation of the facility, the applicant must prepare and implement a Mosquito Management Plan, such plan being submitted to the Shire of Toodyay for approval.*

    This order has no consequence to the Works Approval process. A Mosquito Management Plan will be presented to the Shire and once approved, implemented prior to the commencement of operations on site.

Confirmation that clay resource no longer a viable basic raw material

14. *Prior to the commencement of construction of each landfill cell at the facility, the applicant must provide the Shire of Toodyay with confirmation from the clay extraction operator that the clay resource is no longer considered to be a viable basic raw material.*

    This order has no consequence to the Works Approval process.

Gates and fencing

15. *Lockable gates are to be installed at all entries to the facility and are to be locked at all times when the facility is not manned.*

    This order has a consequence to the Works Approval process as site access and fencing is addressed in this supporting documentation.

16. *All boundary fencing around Lot 11 Chitty Road, Toodyay shall be a sufficient rural fence, as defined by the respondent's local law relating to fencing, and must be installed prior to the commencement of operations.*

    This order has no consequence to the Works Approval process as this covers fencing on the perimeter of the greater Lot 11. Due to the size of the Lot and the fact that there is stock grazing within the Lot (but not within the landfill operational area), this supporting documentation covers the appropriate fencing of the landfill operational area and not the overall Lot perimeter.

17. *Prior to the commencement of operation of each landfill cell at the facility, a 2 metre high temporary mesh fence must be erected as shown on the site layout plan detailed in the application document, or otherwise located so as to act as a litter trap for waste items being disposed of in the landfill cell in question. All such fencing must be removed at the completion of the landfill.*

    This order has a consequence to the Works Approval process as site fencing of the operational landfill area is addressed in this supporting documentation.

Operation on the facility

18. *Only waste in conformity with the requirements of Class II, Category 64 Landfill, as defined under the Department of Environment and Conservation's Landfill Waste Classification and Waste Definitions 1996 (as amended), shall be disposed at the facility.*

    This order has a consequence to the Works Approval process as waste acceptance criteria are addressed in this supporting documentation.

19. *The hours of operation for entry to the facility for the purposes of disposing waste or any other activity related to the waste disposal operation shall be Monday to Saturday (excluding public holidays) 7 am to 6 pm.*

    This order has a consequence to the Works Approval process as facility operating hours is addressed in this supporting documentation.

20. *Measures shall be taken to minimise the amount of dust pollution associated with the waste disposal site and trucks transporting materials to the facility, as detailed in the Off Site Impacts Management Plan (contained in the application document). This includes the covering of all truck loads entering or leaving the Shire of Toodyay.*

    This order has a consequence to the Works Approval process as dust emissions are addressed in this supporting documentation.

21. *The facility must be maintained in a tidy condition at all times and any landfill and waste disposal items must be contained within the 2 metre temporary mesh fence referred to in condition 17. If any materials leave the approved landfill area, they must be collected and disposed of by the applicant.*

    This order has a consequence to the Works Approval process as litter management is addressed in this supporting documentation.

22. *All trucks entering the Shire of Toodyay in connection with the facility shall comply with the respondent's Policy A.8 - Oversize Vehicles.*

    This order has no consequence to the Works Approval process.

23. *At no time can Chitty Road be used by trucks accessing the facility.*

    This order has no consequence to the Works Approval process.

24. *The facility is not to be used by the general public for the disposal of domestic waste.*

    This order has no consequence to the Works Approval process.

Information to be provided to the Shire of Toodyay

25. *The applicant is required to provide the Shire of Toodyay with a copy of the information and report required to be submitted quarterly by the applicant to the Department of Environment and Conservation, or such other information as may reasonably be required to identify the quantity of waste that has been disposed of to landfill in the facility.*

    This order has no consequence to the Works Approval process.

26. *The facility must be rehabilitated in accordance with the Rehabilitation Management Plan detailed in the application document, or any alternative rehabilitation plan approved by the Department of Environment and Conservation and the Shire of Toodyay. The rehabilitation works must be completed within the first winter months following the re-establishment of the final contour ground levels and maintained for a period of three years thereafter.*

    This order has a consequence to the Works Approval process as landfill closure and rehabilitation is addressed in this supporting documentation.

Cash bond

27. *Prior to the commencement of operation of the facility, the applicant shall provide a cash bond of $120,000 to the Shire of Toodyay as a performance guarantee against the satisfactory completion of the rehabilitation of the site, such funds to be held in an interest bearing account, with the interest forming part of the bond. The performance guarantee will be refunded at a rate of 50% following completion of the final stage of rehabilitation works and 50% at the conclusion of the three year monitoring period. Any such bond is to be accompanied by a bonding agreement and written authorisation from the owner of the land that the respondent may enter the site to complete or rectify any outstanding work. The respondent will recover the bond, or part thereof as appropriate, for any costs to the respondent in completing and/or rectifying the outstanding works.*

    This order has no consequence to the Works Approval process.

Road maintenance

28. *The applicant shall be responsible for the cost of maintaining and repairing damage to the roads controlled by the Shire of Toodyay which are used by heavy haulage traffic to deliver Class II waste for disposal at the facility, to the extent that such traffic contributes to the need for such maintenance and repair. Prior to the commencement of operation of the facility, a Road Maintenance Plan based on this principle and including:*
    a. *an audit of the condition of relevant roads prior the commencement of operation of the facility;*
    b. *appropriate maintenance standards and associated requirements and responsibilities;*
    c. *the estimated average annual cost of road maintenance and repairs for the duration of operation of the facility; and*
    d. *the amount of the contribution to such cost to be paid by the applicant,*

    shall be lodged with the Shire of Toodyay for approval and the Road Maintenance Plan shall then be implemented throughout the duration of operation of the facility.

    This order has no consequence to the Works Approval process.

8. Ministerial Requirements

Environmental Protection Act Part IV – The Proponent did not refer the proposed development to the EPA; however, the application was referred to the EPA by an unknown third party.

On 15 July 2013, the EPA wrote to the Proponent indicating that the proposed development had been referred to the EPA and requested that the Proponent provide sufficient information on the proposed development to enable the EPA to make a decision on whether or not to assess the proposal. A copy of the application documentation was provided to the EPA.

On 7 October 2013, the EPA wrote to the Proponent advising of its decision not to assess the proposal.

The EPA's decision not to assess the proposal was appealed against by the members of the community and following a length appeals process, on 5 February 2014, the Minister for Environment rejected the appeal.

9. Site Selection

The Proponent has over many years considered numerous sites surrounding the Perth metropolitan area as potential landfill development sites. As part of this consideration, the Salt Valley site has been determined as being the preferred development site.

The proposed landfill is to be located in an existing clay extraction pit. The clay pit is located in a topographical saddle on the crest between two surface water catchments and as such does not have any upstream catchment. Based on the requirements of the DER landfill development guidelines (*Siting, Design, Operation and Rehabilitation of Landfills, October 2014 – EPA Victoria*), the preferred landfill location is in an existing extractive industries site. This proposal complies with this preferred position.

The site development preference is based on the following:

- Located with a reasonable travel distance from the Perth Metropolitan area (economically viable);
- No surrounding, lined Class II landfills (provides an improved local landfill solution);
- Adequate transport access to the site (economically viable);
- Adequate buffer distances surrounding the proposed facility (manageable landfill impacts on surrounding community);
- Agreeable landowner and clay extraction contractor (land availability);
- Appropriate environmental conditions (minimal environmental impact);
- Within an existing extractive industries excavation (DER preferred landfill siting and pre-existing void);
- Preferred geological conditions (significant depth of natural clayey material);
- Stable geological conditions (long-term sustainable solution);
- No need to clear native vegetation (minimal environmental impact);
- No upstream surface water considerations (long-term sustainable solution); and,
- Rehabilitation of an existing clay pit (landscape rehabilitation).

10. Existing Site

The landfill site is proposed to be developed on the south eastern portion of Lot 11 Chitty Road, within an existing clay extraction pit.

Lot 11 has an area of 619 ha and forms a part of a larger farming property known as “Longford Grazing”. The property has large areas of existing remnant vegetation with some areas of cleared agricultural land. Also located on the property are two existing clay extraction areas; one is operated by BGC and the other by Austral Bricks (Williamson’s Pit). The proposed landfill Prescribed boundary will occupy approximately 50 ha, which is less than 8% of the overall site area; however, the operational landfill area will be less than half that at about 2%.

The clay pit (Williamson’s Pit) is currently operated by Austral Bricks. Agreements are in place between Austral Bricks, the landholder and the Proponent for the utilisation of the existing and future clay pit for the development of a Class II landfill.

Williamson's Pit has ideal geological, topographical and hydrogeological features for the development of a Class II landfill site.

To date approximately 1,000,000 m^3 of clay and soil have been excavated from the pit. The proposed landfill design incorporates a combination of additional excavation and filling within the clay pit to achieve the proposed landfill design.

11. Existing Physical Environment

11.1. Physical Setting

Williamson's Pit is located in a topographical saddle on the crest of a hill, at a maximum elevation of approximately 295 m. To the west and south west of the pit the land is gently undulating before sloping relatively uniformly down to the Jimperding Brook approximately 900 m away. To the north and north east of the existing pit the land slopes gently down to a small drainage line (draining from south to north).

Stass Environmental has undertaken a detailed hyrdogeological investigation of the site, which includes a description of the region surrounding the site, the site hydrogeology, groundwater conditions below the site and commentary on the potential impact of the proposed development on the environment.

Appendix No. 2 – Stass Ground Water Assessment, Dec 14 provides detail of the physical setting of the site.

11.2. Geotechnical Attributes

Clayey materials, which are suitable for brick and tile making, are being excavated to an average depth of about 15 m below natural ground level. The clayey materials continue to a depth of at least a further 15 m to 20 m below the base of the existing pit. Whilst these clays may not be ideal for brick making (due to elevated salt content), its relatively low permeability renders the site ideal for the development of a landfill.

The naturally occurring clayey material has a relatively high salt content, which increases with depth from 200 ppm at depths of up to 6 metres, rising to 1,500 ppm and in some cases up to 4,000 ppm at depths of 15 metres below natural ground level. The increase in salinity with depth is the primary factor that determines how deep Austral Bricks excavate down to; as the elevated salt content negatively impacts the usefulness of the material.

Prior to excavation, as part of the initial site investigation, the site was extensively drilled by Austral Bricks and found to have a pH range of between pH 4 to 7. Some material has a lower pH, down below 3, but this is not common.

Martinick McNulty conducted a drilling program on 24 March 1998 when ten holes were drilled by Wallis Drilling with a Mantis drilling rig mounted on a Toyota Landcruiser to assess the local geology and groundwater.

Further drill holes have recently been sunk by Stass Environmental to confirm the geology and provide data on the hydrogeology. The Stass Environmental Ground Water Assessment Report contains details of the hydrogeology and the geotechnical investigations undertaken.

Appendix No. 2 – Stass Ground Water Assessment, Dec 14 provides additional detail of the geotechnical attributes on site.

11.3. Seismic Stability

The seismic stability of the site, proposed landfill design and landfill waste placement filling program have been assessed by both CMW Geoscience and Golder Associates.

In August 2012, CMW Geoscience undertook an initial stability assessment of the site and proposed landfill development and concluded that:

"*In the short term, the existing 70 degree slope during static conditions has an adequate factor of safety. However, the lowest factors of safety were obtained in the long term for the existing steep slopes when the phreatic surface is highly elevated. Unfortunately we are unable to determine what time period long term could be. Once the slopes are recontoured to 18 degrees, then they are stable even under seismic loading with the parameters used.*"

Appendix No. 3 – CMW Earthquake Stability Assessment Report Aug 12 provides detail of the initial seismic assessment.

Earthquake stability was one of the issues that were discussed in detail during the SAT process and as a result thereof CMW Geoscience undertook a further assessment of the site seismic stability and in February 2013 concluded:

"B*ased on our site inspection, defects and schistosity was identified at two exposures and further analysis was therefore completed to assess the effect of these discontinuities have on slope instability. It was concluded that it is kinematically possible for toppling type failures at Exposure 1 and for wedge type failures at Exposure 2.*

However, once the slopes are re-contoured to 18 degrees then we maintain they should be stable against general slip failures through the insitu material, (even under seismic loading with the parameters used) and against rock slope type failures along existing discontinuities.

As mentioned in our previous report, site specific geotechnical investigations should be undertaken to confirm our findings with consideration given to relevant laboratory testing. As discussed previously, there are a number of variables that influence shear strength parameters and our research into these correlations must be validated."

Appendix No. 4 – CMW Earthquake Stability Assessment Report Feb 13 provides additional details of the seismic assessment.

In November 2014 Golder Associates undertook a further assessment of the seismic stability of the site, proposed landfill design and landfill filling program. This investigation also included site specific geotechnical investigations and relevant laboratory testing; and in December 2014 concluded that the proposed facility design was adequately stable.

Appendix No. 5 – Golder Opal Vale Technical Studies to Support Design Dec 14 provides further details of the seismic assessment.

The extensive seismic investigations that have been undertaken of the site, proposed landfill design and landfill filling program have all concluded that the proposed development is stable and should not be negatively impacted by a seismic event.

11.4. Climate

The climate of the area is Mediterranean with warm to hot dry summers and cool wet winters.

The closest recording weather station is Toodyay, which only records rainfall. Other data is recorded at Northam.

The highest temperatures are from December to February with between 31^{o} and 33^{o} C maxima, and the lowest temperatures in July with maxima of just over 16^{o} C and minima near 8^{o} C.

Annual rainfall for the area averages 427 mm of which the majority falls in the months April to October inclusive.

The prevailing winds are from the south east in the morning and more westerly in the afternoon.

Wind roses and additional climate data are provided in the environmental report prepared by Stass Environmental.

Appendix No. 2 – Stass Ground Water Assessment Dec 14 provides detail of the local climate.

11.5. Geotechnical Investigations

The local hydrogeology and associated soils have been characterised from an interpretation of the following data:

- Exploration drilling undertaken by Austral Bricks;
- Hydrogeological studies completed by Martinick McNulty in 1998;
- Material analysis by Landform Research in December 2010; and,
- Drilling and the installation of monitoring bores by Stass Environmental between June 2011 and March 2013.

Appendix No. 2 – Stass Ground Water Assessment Dec 14 provides additional detail of the site investigations undertaken.

11.6. Soil Permeability

Numerous investigations of the in-situ soil permeability have been undertaken, these include:

- Martinick/McNulty in early 1998:
  - 3.12×10^{-9} m/s; and,
  - 1.49×10^{-8} m/s.
- Landform Research in December 2010;
  - 7.2×10^{-9} m/s;
  - 3.9×10^{-9} m/s;
  - 5.8×10^{-9} m/s;
  - 6.8×10^{-8} m/s;
  - 2.2×10^{-8} m/s; and,
  - 9.1×10^{-9} m/s.

Stass Environmental found from recent drilling that there was an aquiclude under the clay resource within the area of the proposed landfill, with depths of clays and weathered schist of 20 m to the aquifer.

Stass Environmental also stated:

"*A number of hydrothermal quartz veins intersect the exposed geological sequences, presumably intruded along fracture lines. The quartz veins are either massive white quartz veins or a reddish coloured quart which has been fractured, presumably due to earlier metamorphic events, These older quartz veins tend to have the fractures infilled with a clay/silt matrix*". This is a demonstration of the heterogeneous nature of the natural soils on site.

Although the base of the existing clay pit consists of low permeability clayey material, the heterogeneous nature of the soil (presence of quartz veins) exposes the possibility of preferential flow pathways through the soil matrix. Consequently, the landfill liner design has not relied on the low permeability of the natural soils in order to achieve the appropriate design leakage rate.

The modelling of the liner design undertaken by Golder Associates has ignored the presence of the naturally occurring clayey materials and has simply modelled the leakage rate through the geosynthetic lining system, which has clearly demonstrated the adequacy of the proposed design.

Consequently, although there is naturally occurring low permeability soil below the proposed landfill, this is not essential in order to achieve the required landfill design standards.

Appendix No. 2 – Stass Ground Water Assessment Dec 14 provides additional detail of the geological setting on site.

11.7. Surface Water Hydrology

Williamson's Pit is located in a topographical saddle on the crest of a hill, at a maximum elevation of approximately 295 m. To the west and south west of the pit the land is gently undulating before sloping relatively uniformly down to the Jimperding Brook approximately 900 m away. To the north and north east of the existing pit the land slopes gently down to a small drainage line (draining from south to north), which ends up in the Jimperding Brook. The Jimperding Brook flows in a general northerly direction and ultimately ends up in the Avon River.

Fresh water typically flows in the Jimperding Brook during the winter months following the opening rainfall events of the autumn and winter seasons. The first rains typically result in a run-off of fresh water, but the water in Jimperding Brook becomes progressively brackish during the spring months when subsoil drainage contributes to the flow into the brook.

Williamson's Pit, being located on the crest of a hill does not intersect any drainage lines and receives no upstream run-off water. Immediately to the north east of the clay pit is the beginning of a small drainage line flowing to the north, away from the proposed landfill site.

There are no natural surface water bodies present within 500 m of the proposed landfill site. There is a small disused, dry farm dam immediately to the north of the existing clay excavation pit. The catchment for this dam has previously been removed by the development of the clay pit. This dam has been included in the overall footprint of the landfill and will be removed as part of the progressive, future landfill development.

Currently Austral Bricks has diverted some surrounding surface water into the pit, which is stored for subsequent use for dust suppression in the clay extraction operation and for stock watering by the local farmer.

As part of the proposed landfill development, all surface waters will be diverted away from the active landfill areas.

Appendix No. 2 – Stass Ground Water Assessment Dec 14 provides additional detail on the surface water hydrology across the site.

11.8. Groundwater Hydrology

Stass Environmental has undertaken extensive investigations into the groundwater hydrology in the local area of the proposed development. This investigation has included drilling nine deep monitoring bores around the perimeter of the proposed landfill footprint and five, 10 m deep monitoring bores within the landfill base. Monitoring of the groundwater depth and quality has been ongoing since July 2011 and continues to date.

The outcome of the groundwater investigation is that the groundwater to the north, north east of the site is a good quality, while the groundwater to the south, south west is of poor quality. The groundwater flow typically follows the site topography with part flowing to the north, north east and part flowing to the south, south west.

The investigation of the groundwater level over the period of monitoring since July 2011 has indicated that the highest seasonal potentiometric head stabilises within 10 m to 20 m from the natural ground surface, but is also below the level of excavation within the existing clay pit.

Stass Environment concluded:

"*On the basis of this study, the following conclusions are reached:*

- *The site is underlain by a confined aquifer/aquitard of limited extent which is confined by thick beds (up to 30 m thick) of clays and weathered schist/quartzite.*
- *Based on the water yield and aquifer physical characteristics, the water body can be defined as a confined aquitard.*
- *The water quality in south and south west downgradient bores is poor, indicating impacts from salinity and geological weathering of in situ mineralisation (presence of heavy metals). Ground water quality to the north and east of the site is good.*
- *While the yield from the aquifer has not been tested, the geological materials recovered from the drilling suggest that this aquifer is potentially low yielding with poor aquifer transmissivity (low hydraulic conductivity).*
- *The recently installed bores are adequately located to define the local aquifers and are suitably positioned for monitoring of the groundwater below the site.*
- *The highest possible groundwater potentiometric surface (measured between July 2011 and September 2014) is below the current floor of the pit.*
- *The groundwater conditions at the site are favourable for the development of a waste management facility as the aquifer below and adjacent to the site cannot be considered a beneficial water resource due to likely low yielding water characteristics and in some locations poor water quality. This observation is related to the significant clay content in the matrix of the geologic materials recorded during installation of the site groundwater monitoring bores.*
- *Modelling of the most sensitive receptor pathways shows that it will take in excess of 90 years for water leaking from the landfill to reach the most sensitive and closest receptor - the Jimperding Brook. The Bioscreen model suggests that it may take as little as 17 years for a contaminant "breakthrough" to be observed at the Brook (first recorded concentration) if a preferential groundwater flow path exists in a direct line between the landfill and Jimperding Brook.*

- *The beneficial groundwater use in the area is considered to be sufficient for "stock watering". Groundwater to ten east and north of the site is suitable for domestic use.*
- *Water yields from bores adjacent to the site are likely to be poor due to the low permeability of the aquifer/aquitard.*"

This groundwater investigation has provided significant information to guide the design of the base level of the proposed landfill.

Appendix No. 2 – Stass Ground Water Assessment Dec 14 provides additional detail of the groundwater hydrology across the site.

12. Existing Biological Environment

12.1. Vegetation and Flora

The site has previously been cleared for agriculture and subsequently extractive industry purposes.

The original native forests in these areas were cleared progressively from the 1960's onwards for pasture and cropping purposes. The uncleared part of the property supports a forest of predominantly Jarrah *(Eucalyptus marginata),* Marri *(Eucalyptus calophylla),* Wandoo *(Eucalyptus wandoo)* and Powderbark Wandoo *(Eucalyptus accedens)* trees with an understorey of a range of native shrubs, herbs and grasses.

These forests are well represented throughout the Shires of Toodyay and Northam, including Clackline Reserve (Moore, *et al* 1985) and will not be impacted on by the proposed development.

Williamson's Pit is located on the crest of a rise, which supports pasture and cropping land with very occasional Marri trees. No extensive clearing of native vegetation is required for the construction of the landfill or associated infrastructure, as these will be constructed within the existing clay pit or on previously cleared land. The exception being the water storage day, which will be constructed in the valley of the creek line running to the north of the proposed landfill site.

The construction activities will require the following native vegetation to be cleared:

- Landfill – an isolated cluster of 3 trees within the landfill footprint;
- Access road – one tree;
- Leachate ponds – three isolated trees; and,
- Surface water storage dam – three trees and a number of dead saplings killed by excessive salt in the watercourse.

Prior to any native vegetation clearing, the appropriate Clearing Permit will be obtained from the Department of Parks and Wildlife (previously DEC).

As a consequence of the construction of the proposed facility, there will be planting of native tree and shrub species along an existing earth embankment to provide an improved visual screen between the neighbouring property and landfill. This area of new planting will be many times larger than the area required to be cleared.

12.2. Fauna

A definitive fauna report has not been conducted because the proposed development is contained within previously cleared lands and within an existing clay pit. The minimal native vegetation (approximately 10 trees) that is likely to be impacted is either isolated single trees or an isolated clump of trees within the overall cleared pasture. There is no significant fauna habitat that will be negatively impacted by the proposed development.

The landfill will be developed in a currently active clay pit and on being filled will be rehabilitated back to native bush land and pasture, which will in time improve the fauna habitat on site.

13. Proposal Description and Throughput

13.1. Proposal Description

It is proposed to develop a lined Class II landfill in the existing clay extractive industries site within Lot 11 Chitty Road, Toodyay.

The site offers a highly suitable environment for the proposed landfill development and in addition, the extractive industry's activities have created and will continue to create available void space for the proposed landfill development.

As the landfill develops, it will be progressively closed, capped and rehabilitated to return the site back to a similar landform as existed prior to the extractive industries activities.

13.2. Service Provision

The proposed facility is anticipated to provide a convenient waste disposal location for the Perth metropolitan commercial waste collection companies as well as potentially neighbouring Shires.

13.3. Facility Operating Hours

The facility will operate during the following hours:

- Monday to Saturday – 7.00 am to 6.00 pm.
- Sunday and Public Holidays – Closed.

13.4. Proposal Throughput

The landfill is to be a Class II facility, with the incoming waste type being determined in accordance with the DER *Landfill Waste Classification and Waste Definitions 1996 (as amended)*. It is anticipated that the landfill will be able to receive up to approximately 150,000 tonnes of waste per year (based on the anticipated economic climate). It is however anticipated that it will take a number of years for the waste quantity to build up to this level. The majority of the incoming waste will come from the Resource Recovery Solutions recycling and transfer station located in Bayswater (an affiliated company). The large portion of this waste will be residual waste from the facilities recycling operations.

It is also anticipated that the surrounding local governments may utilise the facility for the disposal of municipal waste as well as local commercial waste generators and collectors. It may be that commercial waste companies from the Perth metropolitan area will also utilise the facility.

14. Facility Categories

Based on the intended activities on-site, the following facility Category is relevant:

Associated with the proposed Works Approval:

- Category 64 – Class II Putrescible Landfill.

15. Material Type and Quantity

15.1. Material Type

Material types will consist of Class I and Class II material including the following:

- C&I waste;
- C&D waste; and,
- Municipal waste.

Typically the material will be originating from a wide range of construction, commercial, industrial and residential activities from within the Perth metropolitan area and potentially the surrounding shires; these include building & construction waste, light manufacturing, transport and freight services, mechanical workshops, offices, showrooms, shops, agriculture and residential properties.

The majority of the material being delivered to the landfill site will be coming from the Resource Recovery Solutions waste sorting and transfer station in Bayswater. This facility is partly owned by the Director of Opal Vale Pty Ltd. The Bayswater facility sorts and recycles a significant percentage of the waste it receives, the Class II residue from this facility will be sent to the landfill.

The remainder of the incoming waste will be delivered by a range of other commercial waste collection companies or directly by the waste generators and will generally arrive at the landfill in a mixed form. Occasionally there will be dedicated loads of a single material type.

The following waste types will not be acceptable on site:

- Liquid waste;
- Hazardous, intractable and problematic waste;
- High hazard flammable; and,
- Class III and IV waste.

There will also be a quality control process at the weighbridge and at the landfill tipping area to identify any unacceptable waste types that may inadvertently be delivered to site. If unacceptable materials are identified, it will be immediately loaded back into the customers' bin or vehicle and removed off site. If the source is unknown, the Proponent will separate the particular non-compliant waste material and appropriately store it in preparation for immediate off-site removal.

Only waste that complies with the DER *Landfill Waste Classification and Waste Definitions 1996 (as amended)* as applicable to Class II landfill site will be accepted on site.

15.2. Material Quantity

The quantity of material being disposed of to landfill will not be restricted by the landfill design capacity, but will be limited by the quantity of waste material being delivered. The commercial environment will effectively determine the quantity of material being landfilled.

It is anticipated that initially the facility will receive approximately 50,000 tonnes per year, increasing to approximately 150,000 tonnes per year; however, this will be dependent on the commercial environment.

The facility design capacity will be limited by available airspace within the active landfill area. So long as future landfill cells are developed well ahead of when the landfill airspace is required, the facility would easily be able to receive up to 400,000 tonnes of waste per year. As mentioned above, the commercial reality is that this level of utilisation is most unlikely to occur.

16. Landfill Development

16.1. Site Layout

The shape of the landfill is largely determined by the shape of the existing and future proposed clay excavation. The clay pit shape will be modified slightly to accommodate the new landfill development.

These modifications will include:

- Straightening out some of the existing excavation perimeter to achieve a more uniform landfill edge;
- Battering back of the excavation walls to facilitate liner installation;
- Shaping (cut and fill) the excavation base to remove one of the existing water storage dams and provide the necessary slope to accommodate leachate flow into predetermined extraction sumps;
- Footprint modification to accommodate surface water run-off and ensure that all stormwater is diverted away from the landfill and into the surrounding creek lines

The development will also include the following landfill related infrastructure:

- Site access roads;
- Weighbridge located at the entrance to the landfill;
- Site office and staff amenities will be co-located within the weighbridge;
- Leachate ponds;
- Groundwater monitoring bores;
- Stormwater control;
- Construction of a surface water storage dam in the downstream creek line;
- Site fencing and gates; and,
- Provision for future landfill gas power generation facility.

Appendix No. 7 – Drawing 22 Overall Layout Plan provides details of the proposed site layout.

16.2. Site Infrastructure

The local infrastructure is able to sustain the operation of the landfill. Currently the site is used for clay extraction. This incorporates the movement of heavy road vehicles to and from the site. These vehicles currently have adequate access to site in order to remove clay. The waste delivery vehicles would use the same traffic routes as these existing clay removal vehicles.

In order to ensure all-round accessibility to the waste delivery vehicles there would be minor modifications to the internal road network in the immediate vicinity of the landfill. The location of the access roads directly into the landfill will be determined based on where the landfill tipping face is located. The internal access roads will be located and constructed to ensure easy access and egress from the landfill tipping area. Due to the clayey nature of the natural ground it is likely that during winter there will be a need to sheet the roads with crushed rock or similar material to improve the vehicle traction on the surface to prevent the vehicles from getting bogged down in the roads.

In addition, in consideration of the internal site roads, in January 2012, Shawmac Traffic Engineers undertook a traffic study of the local road network and concluded:

"*The assessment indicates that traffic generated by the landfill site is estimated at about 40 vpd initially and 160 vpd at ultimate operating levels. Depending on whether clay carting is occurring in conjunction with landfill operations, traffic flows could increase from existing flows during concurrent lay carting of 417 vehicles per day to 505 vehicles per day with concurrent clay carting and landfill operations.*

This should not result in unacceptable adverse impacts on the road environment. The expected additional trips are of a small magnitude and will not impact measurably on the existing road network or affected intersections."

Further afield, Shawmac identified that the intersection of Fernie Road and Toodyay Road was currently over capacity and that in the near future this intersection would need to be upgraded. Main Roads and the Shire of Toodyay are aware of the state of the intersection and have considered this in their future planning.

Appendix No. 29 – Shawmac Traffic Study Jan 12 provides details of the traffic study.

16.3. Surface Water Management

The site is located on the crest of a hill and does not intersect any drainage lines and receives no upstream run-off water; consequently, there is no major work associated with the diversion of surface water away from the landfill development.

The design of the landfill facility includes a 1 m high perimeter bund all the way around the active landfill area this is to ensure that there is no surface water flow into the landfill. Outside the landfill perimeter bund is an access road and beyond that is a 1 m deep stormwater drain to divert any surface water flow away from the landfill footprint and into adjacent natural watercourses. This “nominal” stormwater diversion infrastructure is adequate to ensure that there will be no surface water entering the landfill footprint.

There have been no hydraulic calculations undertaken to determine the design capacity of the stormwater drains, as there is no upstream catchment. The only surface water that will require management is the limited amount of runoff that will be generated within the immediate surrounds of the landfill footprint (typically within 20 m of the landfill). The stormwater drains have been designed to be a nominal 1 m deep. This is primarily to provide a long-term sustainable drain that will not need any maintenance for many years.

Beyond the landfill perimeter, there is an existing drainage line running down the valley in a northerly direction. This is the headwater of a small ephemeral stream that only flows after heavy rainfall events. The existing clay excavation catches and stores the surface run-off from the uppermost portions of the watercourse.

On the southern side of the landfill the natural ground falls gradually away to the south, southwest. Austral Bricks has previously diverted some of the surface water runoff, via a cut-off drain, into the clay pit in order to increase the surface water collection capacity within the pit. The collected water is used by Austral Bricks for dust suppression and by the local farmer for stock watering. As part of the landfill development, this cut-off drain will be in-filled and the surface water will return back to its natural watercourse.

As further demonstration of the surface water flow characteristics around the existing clay pit, Austral Bricks has never construct any perimeter bunding to limit surface water inflow into the pit, but has actively diverted water into the pit from an adjacent catchment. This confirms that the site is located at the crest of a hill.

Further afield, there are no natural surface water bodies present within 500 m downhill of the proposed landfill site. There is a disused, dry farm dam immediately to the north of the existing clay excavation pit. This dam has however been included in the overall footprint of the landfill and will be removed as part of the progressive landfill development.

As part of the development, it is proposed to construct a water storage dam approximately 350 m to the north, downstream from the landfill. This water storage dam has a dual purpose that being the storage of operational water supplies as well as providing a surface water monitoring location.

The intention is to retain all surface water collected within the pit, in storage pond(s) excavated within the clay pit (as is the current situation). The availability of surface water remains a critical aspect on site. Historically, the clay extraction and farming activities have consumed all available surface water collected within the pit and peripheral diversion drains. With the inclusion of the landfill activities, conservation of surface water will become even more critical; hence, highly unlikely that any water will be pumped out of the pit.

If in the absolute extreme case, where for operation reasons there is insufficient space for the water to be stored within the pit, some of the water may be pumped out of the pit and discharged into the water storage dam. Prior to discharge, the water quality will be monitored to ensure that no excessively saline, turbid or otherwise contaminated water is discharged out of the pit.

The standards to be applied to the quality of the discharge water will be as follows:

- Salinity (TDS) < 5,000 ppm;
- Turbidity Limits:
    - Dry Weather – Max. 50 NTU, Medium 25 NTU;
    - Stormwater Flow – Max. 100 NTU, Medium 50 NTU.
- *DER Stock Watering Guidelines 2010* (based on the accepted beneficial downstream water use).

No water will be discharged from the excavation if the water quality is in excess of the above values.

Based on past experience, water is a sought after commodity and is managed carefully; consequently, it is highly unlikely that there will be any discharge of water from the excavation into the water storage dam.

Any surface water runoff from around the landfill site that enters the water storage dam will also be monitored for turbidity and contamination, but not salinity (as the landfill has no impact of salinity). The above water quality standards will again be applicable.

Should the water quality in the dam be determined as substandard, depending on the water quality, it will be retained in the dam, used as dust suppression water or treated as leachate.

The Shire of Toodyay in its letter of 30 November 2011, requested that additional considerations and comments be provided detailing how the application addresses the Department of Water's *Water Quality Protection Note (WQPN 111) – Landfills for Disposal of Putrescible Materials*, as the plans show that the application would not comply with the recommended setback of 100m to a water course.

The Water Quality Protection Note (WQPN 111), in the section "Purpose", states that "*Regulatory agencies should not use this note's recommendations without a site-specific assessment of any project's environmental risks. Any conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. The note shall not be used as this department's policy position on a specific matter, unless confirmed in writing.*"

Although the WQPN specifically recommends that there be a 100 m setback from a landfill to a watercourse, it does allow for discretion based upon individual site circumstances. On this particular site the landfill is located at the top of the valley with no water catchment above the proposed landfill sites. The watercourse being referred to, in the vicinity of the proposed landfill site, is a minor watercourse and has been impacted by the existing clay quarrying operations. Consequently, there is minimal, if any flow in the ephemeral watercourse in the immediate area of the existing quarry. With the development of the proposed landfill this situation will continue. The development of the landfill site will not negatively impact on the quantity of water entering the watercourse.

In its June 2012 comments on the proposed development, the Department of Water (DoW) concluded: "*The DoW's database has this waterway mapped as a minor, non-perennial waterway. The DoW does not consider the proposal to have the potential for significant impact on this waterway and the issue of water quality management can be addressed through the licensing and works approvals requirements of the Department of Environment and Conservation. The DoW is confident that some form of setback can be achieved to the closest waterway and it appears that the 100m setback can be achieved for all other waterways on site.*"

With regards to the potential for surface water contamination, there are a number of site-specific features/safeguards that will be implemented to minimise the potential for any contamination of the watercourse. These include the following:

- No upstream water catchment (no potential for flooding);
- Minimum 1 m high perimeter bund surrounding the landfill to separate it from any surface water;
- Perimeter stormwater drains to divert any localised runoff away from the landfill area;
- Lined landfill to contain leachate;
- Naturally occurring clayey soil to further improve the leachate containment;
- Large portion of the landfill is belowground; hence, improved control of surface water runoff;
- Active leachate collection system on top of the landfill liner;
- Leachate evaporation ponds to receive and evaporate excess leachate;
- 500 mm freeboard to all leachate evaporation ponds;
- Water storage dam immediately downstream of the landfill to collect any possible contaminated surface water runoff and allow an opportunity to monitor the quality of the surface water; and,
- In excess of 2.5 km of watercourse downstream of the landfill before the watercourse exits the site (significant opportunity to remediate any surface water contamination if it should occur).

Based on the above, the development of the landfill within 100 m of the minor watercourse is not seen as an environmental concern, as ratified by the DoW.

The final elevation of the landfill has been designed to shed surface water and keep it separate from water that could potentially contain leachate.

Appendix No. 26 – Drawing 41 Stormwater Drainage Layout Plan provides details of the proposed site layout.

16.4. Site Fencing

There is currently stock fencing around the clay pit. During the construction of the landfill development, the site fencing will be improved to establish a sound perimeter fence around the landfill operational area that will prevent stock wandering into the site and uncontrolled vehicle access. The site entrance gate will be securely locked when the site is unmanned.

Immediately surrounding the active landfill area and the leachate ponds there will be a 2 m chain link mesh and barb wire fence to act as a litter collector and access prevention. Depending on the prevailing wind direction and location of landfilling there will be a 4 m high temporary/mobile litter fence immediately adjacent to the landfill tipping area to improve litter management.

16.5. Landfill Available Airspace

Based on the proposed landfill design the Stage 1 landfill available airspace is approximately 1.5 million m³. The future Stage 2 landfill is anticipated to have similar available landfill airspace; however, the ultimate volume will be dependent on the extent of continued clay excavation.

Available landfill airspace is a combination of the clay void and aboveground airspace; consequently, there is more available landfill airspace than there is clay extraction void.

16.6. Landfill Life Expectancy

At an annual landfill incoming waste tonnage of approximately 150,000 tonnes, with an anticipated landfill waste density of 0.85 tonnes per cubic metre, the waste will consume approximately 175,000 m³ of airspace annually. Based on the available landfill airspace in Stage 1, the landfill is anticipated to have a life expectancy of approximately 8.5 years. With the anticipated gradual increase in annual waste quantities up to the maximum anticipated 150,000 tonnes per year, it is likely that the Stage 1 landfill will have a life expectancy of approximately 10 to 12 years. The ultimate landfill duration will be dependent on the annual waste tonnage received and the actual waste density achieved.

The Stage 1 development has been broken down into six individual landfill cells that will be progressively developed. **Table 16.6.1 – Landfill Cell Capacity** provides information on the size and anticipated life expectancy of each landfill cell.

Table 16.6.1 – Landfill Cell Capacity

Landfill Cell	Available Airspace	Annual Tonnage	Life Expectancy
Cell 1	110,000 m^3	50,000 t	1.8 years
Cell 2	270,000 m^3	100,000 t	2.2 years
Cell 3	120,000 m^3	100,000 t	1.0 years
Cell 4	330,000 m^3	150,000 t	1.9 years
Cell 5	240,000 m^3	150,000 t	1.3 years
Cell 6	430,000 m^3	150,000 t	2.5 years
Total	**1,500,000 m^3**		**10.7 years**

The above life expectancy is highly dependent on the annual tonnage received at the landfill facility.

As per the DER landfill development guidelines, the ideal is to have an individual landfill cell completed within two years of commencing waste placement. Based on the above estimated annual waste quantities, this is achievable for all but two landfill cells. Cell 2 has a life expectancy of 2.2 years, and Cell 6, 2.5 years. Although these are outside the landfill development guidelines, they are not too far out.

Depending on the quantity of waste being received at the site, if the quantity is significantly different (lower or higher) than anticipated above, the size of the future individual landfill cells may be amended to achieve nearer the two-year duration of each cell.

Over the life of the landfill it is anticipated that there will be a fluctuation in the quantity of waste delivered to site. This will be impacted by the availability of other Class II landfill site within the Perth metropolitan and surrounding areas as well as the rate of future recycling in the waste industry.

16.7. Clay Extraction and Landfill Interaction

To date, clay extraction has created a void of approximately 1 million m^3, with a further 0.5 million m^3 of landfill airspace being created aboveground. The clay extraction commenced at the top of the valley and is progressing in a north westerly direction down the side of the valley. There is currently sufficient airspace available to allow a landfill to be developed without adversely impacting the clay extraction operation.

In a typical year, there will be approximately 25,000 m^3 of clay removed. Including an additional 50% airspace being created aboveground, in a typical year, there will be about 37,500 m^3 of landfill airspace created on site. Initially there is anticipated to be approximately 70,000 m^3 of landfill airspace being consumed annually. This could eventually increase to 175,000 m^3 within approximately five years (based on an annual waste intake of 150,000 tonnes). With approximately 1,500,000 m^3 of airspace currently available in Stage 1, within 10 to 12 years, the landfill activities will have consumed all current available airspace; however, during the 10 to 12 years, the clay extraction would have progressed down the valley and generated a further 400,000 m^3 of void, which, allowing for aboveground landfilling equates to an additional 600,000 m^3 of landfill airspace. While this volume is being filled with landfill, the clay extraction progresses even further. Consequently, it is likely that the clay extraction could stay ahead of the landfill activities.

The Proponent has an agreement with Austral Bricks that if the landfill catches up with the clay extraction activities, the Proponent will excavate the clay in advance of the waste placement to ensure that the landfill operation is not negatively impacted. The Proponent with stockpiled the excavated clay in dedicated areas for future removal by Austral Bricks; however, this is a Stage 2 landfill consideration and hence, not an issues for this current application.

As part of the clay extraction activity, all the substandard clay material (from a brick and tile making point of view) will be used for site screening, landfill daily cover and selected materials used as final landfill capping.

16.8. Cell Development and Staging

The landfill will be developed in a series of cells, with each cell being sized to accommodate approximately one to two years' landfill airspace requirements. However, as mentioned above, the actual life expectancy of each landfill cell will be highly dependent on the quantity of waste being delivered to site.

Due to the existing shape of the clay pit and the fact that the future clay extraction will be occurring downhill of the landfill (in the direction in which the leachate will flow), the landfill will be developed in two stages. Stage 1 (this application) will be developed within the existing void, while Stage 2 (a future application) will be developed in the future clay excavation void.

Appendix No. 7 – Drawing 22 Overall Layout Plan provides details of the proposed landfill staging; **Appendix No. 8 – Drawing 23 General Arrangement Layout Plan** provides specific details on the proposed landfill cell layout within Stage 1 development.

16.9. Landfill Design Standard

The landfill design has been developed to substantially comply with the DER landfill development guidelines (*Siting, Design, Operation and Rehabilitation of Landfills October 2014 – EPA Victoria*).

It is noted that these guidelines were developed by the EPA in Victorian and hence, not all aspects of the guidelines are directly applicable or relevant to the Western Australian landfill industry.

A comprehensive review of the landfill development guidelines has been undertaken, documenting compliance with the guidelines and providing comment on any variance from these guidelines.

Appendix No. 30 – IWP Landfill Development Guideline Comparison Dec 14 provides a comprehensive comparison of the proposed development against the DER landfill development guidelines.

16.10. Separation to Groundwater

The DER landfill design guidelines (*Siting, Design, Operation and Rehabilitation of Landfill October 2014, EPA Victoria)* stipulate a minimum separation distance between the groundwater and the landfill liner of 2 m.

Site monitoring of the potentiometric level of the groundwater below the proposed landfill since July 2011 has provided substantial data on the groundwater level. The highest groundwater level registered in each of the nine site monitoring bores has been used to develop a contour plan of the highest groundwater level across the site.

The base of the landfill has been designed to be a minimum of 3 m above the highest groundwater contour plan. This is a conservative position, in comparison to the 2 m requirement in the landfill development guidelines, but on this critical aspect of the facility design, the conservative position is preferred.

16.11. Landfill Liner System

The landfill design guidelines set a minimum allowable leakage rate through the landfill liner of 10 L/ha/day. This was used as the basis for the landfill liner design.

The proposed landfill lining system incorporates a composite liner consisting of a geosynthetic clay liner (GCL), a 2 mm thick HDPE liner, a geotextile cushion layer, a leachate collection layer and finally a geotextile separation layer. This liner configuration is highly typical of standard putrescible landfill design standards within WA.

Appendix No. 11 – Drawing 26 Landfill Liner Details – Sheet 1 of 2 provides details of the proposed landfill lining system.

Golders Associates has modelled the leakage rate through the liner and has confirmed that the proposed liner configuration meets the design criteria of <10 L/ha/day.

The Golders Associates modelling determined that the anticipated leakage through the liner will be in the order of 1.02 L/ha/day (372 L/ha/yr) with good contact between the GCL and the HDPE and 5.88 L/ha/day (2,035 L/ha/yr) with poor contact. These leakage rates are substantially lower than the maximum allowable leakage rate.

Appendix No. 5 – Golders Opal Vale Technical Study to Support Design Dec 14 provides detail on the liner leakage rate assessment undertaken by Golder Associates.

With the base of the landfill being at least 3 m above the highest recorded groundwater level, there will be no groundwater pressure on the base or side slope lining system.

The technical assessment of the potential for any lateral groundwater flow to impact on the side slope lining system has determined that there will be no impact and that there is no need for the installation of any drainage system behind the liner to relieve groundwater pressure. This conclusion is based on the following parameters:

- The landfill being positioned on the crest of a hill; hence, no upstream water pressure;
- The low permeability of the natural soils;
- The landfill side walls are at a slope of 1 V in 3 H and there is approximately 20 m from the edge of the liner to the stormwater drain around the landfill perimeter and the drain invert is a minimum of 2 m below the top of the liner; consequently, for any surface water to percolate down through the natural soils and impact on the lining system, it would need to travel a significant horizontal distance. To achieve this, there would need to be lateral pressure applied to the seepage, which does not exist. As an example, at 2 m below the invert of the perimeter stormwater drain, the landfill liner is approximately 32 m horizontally away and at 8 m below the drain, the liner is 50 m away.

16.12. Landfill Capping System

The landfill design guidelines set a minimum allowable leakage rate through the landfill cap of 75% of the leakage through the landfill base lining system.

Based on the Golder Associates modelling of the landfill base, the maximum allowable leakage through the landfill capping system is 0.77 L/ha/day (279 L/ha/yr) with good contact and 4.22 L/ha/day (1,527 L/ha/yr) with poor contact, this represents 75% of the anticipated base leakage rate.

The proposed landfill capping system incorporates a composite liner consisting of a geosynthetic clay liner (GCL), a 2 mm thick LLDPE liner, a geotextile cushion layer, a sand drainage layer and finally a growing medium.

Appendix No. 12 – Drawing 27 Landfill Liner Details – Sheet 2 of 2 provides details of the proposed landfill lining system.

Golders Associates again modelled the leakage rate through the cap and has confirmed that the proposed capping system meets the design criteria and concluded:

"*The results indicate that the annual flux through the cap remains below the limits of 279 and 1,527 L/ha/yr, 75% of the basal leakage for "good contact" and "poor contact" conditions, respectively. The modelling and the calculations using the Giroud et al. (1989) approach indicate that a drain above the cap liner is required, and that it must be capable of conveying the water that percolates through the vegetative cover off the cap while maintaining a head of less than 30 mm. The permeability of the sand should therefore be greater than* 10^{-6} *m/s.*"

Appendix No. 5 – Golders Opal Vale Technical Study to Support Design Dec 14 provides detail on the liner leakage rate assessment undertaken by Golder Associates.

16.13. Leachate Management

16.13.1. Leachate Collection System

The base of the landfill will be sloped at a minimum 3% across the lined surface to the leachate collection pipes, with the pipes being at a minimum of 1% slope to the leachate sump. This configuration of gradient will ensure adequate flow of leachate from the lined surface into the leachate sump.

The landfill lining system will also incorporate a 300 mm leachate drainage layer and leachate collection pipes across the complete landfill base. Leachate collecting in this drainage layer will be directed, under gravity to a dedicated leachate sump. The sump will have leachate extraction points to allow the leachate to be pumped from the base of the landfill.

The critical aspect of the leachate collection system is the high permeability drainage layer to allow the leachate to flow unimpeded across the liner and into the sumps. To ensure that the drainage layer retains its high permeability a separation geotextile will be placed on top of the coarse aggregate drainage layer to prevent fine material passing into the drainage layer.

Appendix No. 13 – Drawing 28 Leachate Extraction Layout Plan, **Appendix No. 14 – Drawing 29 Leachate Extraction Details - Sheet 1 of 2** and **Appendix No. 15 – Drawing 30 Leachate Extraction Details - Sheet 2 of 2** provide details of the leachate collection and management system.

16.13.2. Leachate Generation

The quantity of leachate to be generated during the operating life of the landfill is highly dependent on a range of factors including:

- Timing of when new landfill cells are commissioned (summer or winter);
- Size of the landfill;
- Area of exposed landfill liner;
- Quantity of landfill waste within the landfill;
- Shape of the waste mass (slope angle);
- Operation of the landfill;
- Type of waste; and,
- Type of cover material.

All of the above variables can have a significant influence on the quantity of leachate being generated on-site.

Golder Associates has undertaken the modelling of the anticipated volume of leachate to be generated during the development and operation of the Stage 1 landfill.

This modelling has determined that two evaporation ponds are adequate for the management of anticipated leachate volumes for the first four years and in the fifth year a third leachate pond will be required. This assessment is based on 25% of the generated leachate being recirculated onto or within the landfill waste mass. This is a conservative assumption and should easily be able to be achieved.

16.13.3. Leachate Management Options

Leachate management is a critical activity for all putrescible landfill sites. There are however numerous leachate management options available for the on-site handling of leachate. In summer time, when there is only occasional rainfall, this is when the landfill operators will be significantly reducing the volume of leachate stored on site, ideally getting to a stage where the leachate ponds are empty by the end of summer. During winter, when the site receives the majority of its rainfall, this is when most of the leachate generated on site is accumulated within the leachate ponds. Fortunately, with the site being located in a relatively low rainfall zone (mean annual rainfall of 427.6 mm), there is still a significant portion of the winter period where leachate management solutions other that simple storage in the leachate ponds will be viable.

Leachate management options to be utilised on site, in the order of priority, include the following:

- Evaporation from the surface of the leachate ponds – ongoing without any operator effort;
- Leachate recirculation onto the waste surface using drip irrigation and/or low pressure sprays (large nozzle diameters to prevent them blocking up) – active landfill areas and temporary capped areas draining into the landfill footprint;
- Leachate recirculation into the waste mass – via injection wells and drains installed into the waste mass. The landfill gas wells can also be used for this purpose;
- Use of a water cart to spray leachate onto the internal landfill roads (only over the lined landfill area);
- Micro-sprays over the leachate pond surface or on the landfill surface (nozzle blockage is a concern with this method) – wind direction is also important, as the spray drift needs to remain on the lined surface;
- Accumulation in the leachate ponds (typically over winter);
- If needed, large volumes of leachate can be pumped directly onto the incoming waste as it is being placed and compacted in the landfill. The dry incoming waste (even in winter) absorbs a significant volume of leachate and the waste placement activities mix the moisture evenly through the waste.
- In the case of an emergency, leachate can be trucked off site to the water Corporation or to a composting facility.

The evaporation and recirculation activities are far more efficient during summer; however, during winter, with a concerted effort during favourable weather conditions, reasonable leachate volumes can be “consumed” by these methods.

16.13.4. Leachate Ponds

A space allocation has been made for up to six leachate ponds to cater for possible future leachate quantities, including Stage 2 landfill development. Initially only two leachate ponds will be constructed, with the other leachate ponds being constructed as and when required. Each pond has a maximum evaporation area of 2,304 m^2 (48 m x 48 m) and retains a volume of 5,024 m^3 whilst still maintaining a 500 mm freeboard.

The leachate ponds have been designed with a maximum average operating depth of 2.5 m and an additional 500 mm freeboard, resulting in a total maximum average depth of 3.0 m (excluding the 0.5 m leachate sump).

The DER landfill design guidelines require a 500 mm freeboard and the Department of Water requirements for freeboard (*Water Quality Protection Note WQPN 27 – Liners for Contaminating Pollutants, using Engineering Soils*) is to cater for a 1 in 20 year storm event, without specifying a specific minimum freeboard.

Appendix No. 16 – Drawing 31 Leachate Evaporation Ponds Layout Plan, **Appendix No. 17 – Drawing 32 Leachate Evaporation Ponds Details** and **Appendix No. 18 – Drawing 33 Leachate Evaporation Ponds Safety System** provides details of the proposed leachate pond design.

16.13.5. Leachate Evaporation

Based on the size of the leachate ponds, the effective annual evaporation from a single pond has been calculated as follows:

- Pond maximum evaporation area = 2,304 m^2;
- Median annual evaporation = 427.6 mm;
- Median annual rainfall = 2,054.8 mm;

Evaporation Volume = Area (0.8 * Evaporation – Rainfall) = 2,802 m^3/year/pond.

16.13.6. Leachate Extraction From Landfill

The landfill design incorporates an automated pumping system from the leachate sump, which is operated by a set of float switches that control when the leachate pump is switched on and off. This automated system will only be functional during facility operating hours, while there are staff on site to monitor its performance. After hours, the system will be automatically isolated to prevent it pumping leachate.

The automated pumping system has been designed to maintain the head on the landfill liner to less that the prescribed maximum of 300 mm. The leachate pump (144 mm diameter, submersible Davey SS60/03 or similar) will switch on when the leachate level is 800 mm above the base of the leachate sump (300 mm above the landfill liner) and then switch off once the leachate level has dropped to 300 mm above the base of the leachate sump (200 mm below the level of the liner). The pumped volume will be approximately 60 m^3 and will take approximately one hour to pump. The actual performance of the pump will be determined on site by the delivery head, the volume of leachate within the 500 mm float switch zone and the rate of leachate generation within the landfill.

The submersible pump will be installed within the main 355 mm diameter leachate extraction pipe. There are however two spare leachate extraction pipes of which, either could be used for leachate extraction in the event that the main extraction pipe was damaged.

The leachate extraction pump and associated pipework delivers leachate directly to the leachate ponds, where by adjusting valves, the leachate is pumped into any pond. The leachate extraction point has a blanked-off flange isolation valve that can be used to connect an additional pipe for recirculation of leachate directly from the sump onto the landfill. A separate, mobile delivery pump will be used to pump leachate from the leachate ponds back to the landfill.

16.13.7. Leachate Monitoring

The Golder Associates leachate volume modelling is a hypothetical assessment of the possible leachate quantities that could be generated within the landfill and are used for the purposes of facility design. It is however, the actual leachate volumes that are important to monitor to gain an understanding of the quantity of leachate being generated on site as well as being treated.

The efficiency of the automated leachate extraction system to maintain the head of leachate on the liner to a maximum of 300 mm can easily be monitored by measuring the depth of leachate in the leachate sump. Measuring is achieved utilising an electronic measuring device inserted through one of the two spare leachate extraction pipes. Ideally this measurement is taken at the beginning of the day, before the automated system is switched on and then again during the day while the pump is working. These various measurements will indicate how much leachate is generated over night and then to what levels the pump maintains the leachate at during the day whilst operating on automatic. Due to the extremely high permeability of the leachate drainage aggregate, it is unlikely that there will be a drawdown curve around the pump while operating; however, that can easily be confirmed by measuring the leachate depth while the pump is operating and then switch the pump off and remeasure a short time thereafter. If there is the impact of a drawdown curve, then leachate measurements will only occur while the pump is not operating.

After a short time of facility operations (provided that there is leachate to be pumped and measured), it is likely that the pump cycling capacity and the impact on the depth of leachate in the sump will become known and hence there will be no need to regularly monitor the leachate depth in the leachate sump. In these circumstances, the sump will be measured and recorded on a monthly basis.

The leachate sump headworks also includes a flow meter, which will be used to monitor the quantity and flow rate of leachate being pumped from the sump. This gives the facility operators data on the annual leachate quantity being generated within the landfill.

The leachate ponds are of known size and holding capacity. The design drawings include pond volumes at 1 m deep, at maximum operating depth (with a 500 mm freeboard) and at the absolute maximum holding capacity of the pond (overflow volume). By measuring the depth of leachate in each pond the facility operators can obtain an accurate volume of stored leachate.

As a minimum, on a monthly bases, the facility operators will measure the depth of liquid in the leachate sump, the depth of each pond and the total volume of leachate pumped out of the landfill. This data will provide sufficient information to gain an understanding of how the leachate generation is comparing with the leachate disposal activities and hence guide further leachate management activities if need be.

16.13.8. Leachate Contingency Planning

Being a critical aspect of landfill management, should the ongoing monitoring of leachate on site indicate that there is a net accumulation of leachate over time, the following contingency actions can be implemented:

- Employ an additional staff member to concentrate solely on leachate management activities (increased treatment effort);
- Apply thicker intermediate cover over temporary closed areas to increase the retention of rainwater within the soil and hence, reduce leachate generation;
- Bring forward the timing of subsequent leachate pond construction;
- Last resort, tanker excess leachate off-site.

From a day-to-day operational consideration, spare pumps, pipe lines and fittings will be kept on site so that in the event of a system breakdown, there are readily available items of equipment to ensure continuity of leachate management.

16.14. Landfill Gas Management

Due to the size of the facility and the type of waste received, the landfill will generate landfill gas at quantities that need to be managed appropriately. This will include the extraction of gas from within the landfill waste mass, coordination of these activities with landfill operations and closure as well as awareness of any potential off-site impacts from the landfill gas.

16.14.1. Landfill Gas Quantity and Treatment

To determine the potential landfill gas management requirements and the likelihood of any off-site impacts, it is necessary to estimate the quantity of landfill gas that may be generated within the landfill.

The quantity of landfill gas has been calculated using the *Intergovernmental Panel on Climate Change 2006 IPCC Guidelines for National Greenhouse Gas Inventories* model. The inputs into the model include:

- Landfill capacity – 1.5 M m^3;
- Annual waste input quantity – 150,000 tonnes. It is noted that the model is not able to manage a "ramp up" of annual waste quantity; hence, the worst case scenario has been adopted;
- Landfill closure year – 2025;
- Gas capture percentage – 75%. This is the accepted industry norm;
- Methane oxidation factor through the landfill cap – 0.025. Based on 10% oxidation of the 25% landfill gas that is not extracted by the active extraction system (refer to the 75% gas capture percentage above); and,
- Waste composition – MSW= 30%, C&I = 60% and C&D = 10%.

Table 16.14.1.1 – Landfill Gas Quantities provide the IPCC model outputs based on the above inputs. The quantities of gas generated is for methane (CH_4).

Table 16.14.1.1 – Landfill Gas Quantities

Year	CH4 Tonnes	CH_4 Volume (m^3)	m^3/hr	Generation Potential (MW)
Landfill commences operation in late 2015				
2015				
2016				
2017				
2018	458	681691	77.8	
2019	895	1331263	152.0	
2020	1311	1950267	222.6	
2021	1707	2540173	290.0	
2022	2085	3102383	354.2	1
2023	2445	3638228	415.3	1
2024	2788	4148978	473.6	1
2025	3115	4635835	529.2	1
Landfill ceases operation sometime in 2025				
2026	3427	5099948	582.2	1
2027	3724	5542408	632.7	1
2028	3550	5282561	603.0	1
2029	3384	5035203	574.8	1
2030	3225	4799725	547.9	1
2031	3075	4575548	522.3	1
2032	2931	4362121	498.0	1
2033	2795	4158922	474.8	1
2034	2665	3965453	452.7	1
2035	2541	3781239	431.6	1
2036	2423	3605833	411.6	1

2037	2311	3438805	392.6	1
2038	2204	3279749	374.4	1
2039	2102	3128277	357.1	1
2040	2005	2984023	340.6	1
2041	1913	2846637	325.0	1
2042	1825	2715784	310.0	
2043	1741	2591150	295.8	
2044	1661	2472433	282.2	
2045	1585	2359348	269.3	
2046	1513	2251621	257.0	
2047	1444	2148994	245.3	
2048	1378	2051221	234.2	
2049	1316	1958068	223.5	
2050	1256	1869311	213.4	
2051	1199	1784739	203.7	
2052	1145	1704151	194.5	
2053	1094	1627355	185.8	
2054	1044	1554168	177.4	
2055	998	1484417	169.5	
2056	953	1417937	161.9	
2057	910	1354570	154.6	
2058	870	1294168	147.7	
2059	831	1236589	141.2	
2060	794	1181697	134.9	

As can be seen from the above table, predicted methane gas generation peaks at 632.7 m^3/hr 12 years after commencement, which is two years after Stage 1 operations have ceased. Maximum potential power generation is 1 MW, for approximately 20 years (2022 to 2041).

The DER landfill development guidelines (Table 6.5) indicate that for landfill gas generation rates of between 250 m^3/hr and 1,000 m^3/hr (presumably all gas, not just methane), the following gas treatment options are available:

- Power generation;
- Intermittent use and off-time flaring;
- High-temperature flaring; and,
- Low-calorific flaring.

Above 1,000 m^3/hr, the additional treatment options include:

- Substitute fuel; and,
- Combined heat and power generation.

630 m^3/hr of methane would equate to approximately 1,250 m^3/hr of landfill gas (based on 50% methane).

With the site being located in a relatively remote rural setting (distance to power distribution networks) and there only being the potential for a 1 MW of power generation, it is unlikely that there this will be a viable option. The most likely option will be a high-temperature flare; however, the landfill gas contractor will assess the options available as the gas volume increases.

In anticipation of the need for an active landfill gas extraction systems and associated infrastructure, an area on site has been allocated for this activity. The area has been selected as being high-ground to allow landfill gas condensate to drain back to the landfill (a critical aspect of landfill gas extraction management).

16.14.2. Landfill Gas Extraction

The intention of the landfill gas extraction system is to maximise the extraction of landfill gas, while minimising the quantity of oxygen sucked into the waste mass. There needs to be a carefully measured balance between applying too much or too little suction to the waste mass.

The landfill gas installation will incorporate the following:

- Lateral and vertical wells will be progressively installed in the waste mass as the height increases. These will start being installed in Cell 2 once the waste height has reached a minimum of 10 m above the base liner. These wells will continue to be installed at minimum 10 m height intervals. There will be insufficient gas generation in Cell 1 to justify installing an extraction system.
- The leachate drainage aggregate installation will stop at 5 m from the top of the landfill. This is to prevent a preferred flow part for gas to escape the landfill. A landfill gas extraction pipe will be installed on the top of this drainage aggregate layer, in direct contact with the aggregate, to collect the gas from this aggregate layer.

- As the final waste profile is progressively achieved, deep vertical wells (20 m) will be installed on the surface. These wells will be installed at a maximum spacing of 50 m to ensure that there is a comprehensive coverage of the waste mass. In some areas this spacing is likely to be reduced to improve extraction ability. The gas extraction wells will be piped to the gas management system (likely a flare) in the allocated landfill gas infrastructure location. There will be a condensate return pipe from the gas management infrastructure back into the landfill and connected into the leachate collection aggregate layer. The gas extraction wells, connecting pipes and condensate return pipes will all be installed before the lined capping layer is constructed so that there will be minimal penetrations through the capping layer. Penetrations will all be located as close to the edge of the landfill as is reasonably possible.
- There will be a landfill gas collection layer installed on top of the waste mass, just under the lined capping layer. This sand collection layer has a duel purpose. It provides a “corridor” for the gas extraction pipes to run under the lined cap surface without having to dig up the waste cover material and also to enable the collection of gas that collects under the lined cap surface.
- A perimeter landfill gas manifold will be installed around the edge of the landfill to act as the main collection of gas running to the flare. All of the extraction wells will be connected to this manifold.
- To prevent oxygen intake, there will be no gas extraction (drilled pipes) within 5 m of the sides of the waste mass or final waste profile. There will also be no drilling closer than 5 m from the base and side slopes.

Appendix No. 27 – Drawing 42 Landfill Gas Installation Layout Plan and **Appendix No. 28 – Drawing 43 Landfill Gas Installation Detail** provide information on the typical proposed landfill gas infrastructure. It is noted that landfill gas management is normally undertaken by specialist landfill gas contractor that will install its own systems for gas extraction. Hence, there is likely to be some minor variation in the actual infrastructure installed; however, the overall concepts will remain valid.

16.14.3. Landfill Gas Risk Assessment

Due to there being reasonable quantities of landfill gas generated within the landfill, a Landfill Gas Risk Assessment (LGRA) has been undertaken to assess the potential off-site impact of the gas. The *Landfill Licensing Guidelines (Victorian EPA publication 1323)* provides guidance on the issues to be investigated as part of the LGRA. The basic risk assessment approach involves:

- Development of a conceptual model of the landfill and its surroundings;
- Hazard identification and risk screening; and,
- Quantitative risk assessment.

The Stass Environment report covers the physical nature of the site and the local surrounds, which in summary consists of a rural setting of rolling hill and open pasture. The natural soils are predominantly a low permeability clayey material with occasional quartz veins. The Stass Environment comment on the quartz veins includes "*A number of hydrothermal quartz veins intersect the exposed geological sequences, presumably intruded along fracture lines. The quartz veins are either massive white quartz veins or a reddish coloured quart which has been fractured, presumably due to earlier metamorphic events. These older quartz veins tend to have the fractures infilled with a clay/silt matrix.*"

The nearest neighbouring building is 1.35 km to the north east, across a relatively steep valley. This structure is a substantial distance from the landfill and will not be impacted by any fugitive subterranean or surface gas emissions.

The landowner's farmhouse 400 m to the south west of the landfill is not considered as a neighbouring receptor (as agreed with the landowner); however, from a landfill gas point of view, this structure needs to be considered. This building is located in an adjacent valley line and cannot be seen from the proposed landfill site. The soil profile between the landfill and the structure is as described above. This low permeability soil is not conducive to lateral gas movement. In addition, the landfill lining and capping system and active landfill gas extraction system will significantly reduce the likelihood of fugitive gas emissions from the landfill. Consequently, it is highly unlikely that any subterranean landfill gas will get close to this structure. As a further safety factor, this farmhouse is an aboveground, timber building with no belowground services. The power supply is above ground (on poles). Hence, even if there was any subterranean landfill gas, it is most unlikely that there would be any negative impact thereof.

With this farmhouse being located 400 m from the landfill, it is possible that there may be some aboveground fugitive landfill gas impact at this property. Due to the distance from the landfill, the concentration of the gas will be highly diluted and significantly below the Lower Explosive Limit (LEL) of the gas; hence, will not be a safety risk. The only possible impact to the occupants of the farmhouse may be the occasional odour from the hydrogen sulphide (and other odourous components) in the landfill gas.

With regards to air toxins, landfill gas has the potential to contain toxins; however, for Class II landfills, any toxins that may be present in the gas will be at extremely low quantities. Landfill gas extraction and control systems have the greatest impact on gas migration and exposure and in combination with buffer distances, provide adequate protection to the community. The EPA recommend a 150 m buffer distance to the nearest residential property, this buffer distance having been developed based on protection of receptors from such aspects as landfill gas impact, air toxins being one of these considerations. The farmhouse is 400 m away, which is in excess of 2.5 times of the EPA recommended buffer distance.

There will be no health impact of the low level of landfill gas exposure. The farmhouse will only be impacted by odour if the wind is blowing from the north east and at low speed (typically 4 to 5 km/hr). As identified in the Stass Environment report, this is not a predominant wind direction; hence, this is an unlikely scenario.

Based on the potential landfill gas quantities likely to be generated, the comprehensive lining and capping system and the landfill gas extraction and flaring system, there is not likely to be significant quantities of landfill fugitive gas from the landfill.

To quantify the level of fugitive gas potentially being emitted from the landfill, as per the above IPCC modelling:

- The peak landfill gas generation will be 632.7 m^3/hr.
- The capture rate will be 75%; hence, the non-captured quantity is 158.2 m^3/hr.
- There is 10% oxidation of the fugitive gas through the landfill cap; the quantity of gas emitted through the cap is 142.3 m^3/hr.
- The Stage 1 landfill area is 89,377 m^2; hence, the emission rate is 0.0014 $m^3/hr/m^2$, which equates to 1.4 $L/hr/m^2$.
- At 50% methane, there would be 0.7 $L/hr/m^2$.
- Methane has a LEL of 4.4%, which equates to 44 L/m^3.

- The hourly emission of methane (presuming extremely low wind speed and that it accumulated within a 1 m layer above the landfill) would be 63 times lower than the methane LEL at the landfill surface.
- By the time the gas has travelled 400 m to the farmhouse, the gas would have been diluted many more times and is unlikely to be detectable. With higher wind speed, the influence of dilution would be proportionally increased.

Based on the above conceptual scenario, event with the broad assumptions made, it is clear demonstration that there will be no negative impact of the landfill gas on the nearest structure.

16.14.4. Landfill Gas Monitoring

The DER landfill development guidelines cover the need for monitoring landfill gas emissions, primarily via belowground monitoring bores. Monitoring bores in uniform low permeability soils with no development within 150 m have a minimum gas bore spacing of 10 m and a maximum of 50 m. With no development within 250 m the spacing has changes to a minimum spacing of 50 m and a maximum of 150 m. Hence, for a 100 m change in the position of the development (from 150 m to 250 m), the maximum bore spacing have been pushed out by 300%. Consequently, with a single, aboveground farmhouse 400 m from the landfill, it is not deemed necessary to install gas monitoring bores (the guideline does not deal with development beyond 250 m from the landfill).

16.15. Landfill Closure and Rehabilitation

The concept for landfill closure has been developed. This incorporates a final landfill cap with a pre-settlement waste profile at a maximum slope of 1 in 5 (20%). This provides a gradient that achieves a stable, easily manageable slope for capping, rehabilitation and future maintenance.

The landfill will be progressively closed. As individual landfill cells or portions of the landfill reached the ultimate design profile these areas will be capped, rehabilitated and closed off.

The landfill cap will consist of a geosynthetic lining system overlaid with a 1 m to 2 m layer of clayey material sourced from onsite available materials. This will typically consist of overburdened clay from the existing and future clay excavation. There may be a requirement to import selected cover material from off-site sources if there is insufficient suitable capping material on site. The capping layer will be a minimum of 1 m thick, up to a maximum of 2 m, the thicker zones will enable clusters of deeper-rooted species to thrive on the capped surface.

Appendix No. 19 – Drawing 34 Landfill Cell 1 Filling layout Plan through to **Appendix No. 24 – Drawing 39 Landfill Cell 6 Filling layout Plan** provide detail on the proposed filling sequence for progressive closure, while **Appendix No. 25 – Drawing 40 Final Presettlement Waste Profile layout Plan** provides the final Stage 1 waste pre-settlement profile.

Landfill closure and rehabilitation will be carried out in accordance with the concepts described in the Rehabilitation Management Plan.

Appendix No. 31 – IWP Rehabilitation Management Plan Dec 14 provides details of the proposed landfill rehabilitation.

16.16. Post Closure Use

Following the closure and final rehabilitation of the landfill site, the affected land area will be returned back to native bush and pasture. The native bush component will comprise of the areas of previous waste placement (landfill capped area), with other areas of the site either returned to native bush or pasture.

The important aspect is to prevent stock from accessing the landfill capped area to enable it to completely rehabilitate over time back to a native bush environment.

17. Construction

17.1. Property Modifications

There will be a need to modify the shape of the existing clay pit to accommodate the landfill base design. This will entail the removal and control of the existing surface water as well as filling and/or excavation to achieve the desired ground profile for the landfill liner subbase.

The remaining activities such as the water storage dam, evaporation ponds, weighbridge and amenities will be constructed externally to the existing clay pit.

17.2. Construction Activities

The proposed landfill development consists of the following construction components:

- Water storage dam;
- Removal and control of existing surface water;
- Filling in of groundwater monitoring bores within the clay pit;
- Surface water diversion drains;
- Earthworks to form the landfill cell base;
- Cell perimeter bunds;
- Leachate extraction sump;
- Lining of the landfill floor, side slopes and perimeter bunds;
- Protection/cushion geotextile;
- Leachate collection pipework;
- Leachate drainage layer;
- Separation geotextile;
- Leachate extraction/transfer infrastructure;
- Leachate ponds;
- Internal access roads;
- Weighbridge and amenities; and,
- Perimeter fencing.

Appendix No. 6 – Drawing 21 Cover Sheet, DRG. Schedule and Locality Plan through to **Appendix No. 18 – Drawing 33 Leachate Evaporation Pond Safety System** and **Appendix No. 26 – Drawing 41 Stormwater Drainage Layout Plan** provide information on the proposed landfill design and associated construction activities.

In addition to the construction Drawings, comprehensive construction Specifications have been developed.

Appendix No. 32 – IWP Construction Specifications Dec 14 provides significant detail method and quality of the proposed landfill construction activities.

17.3. Construction Quality Assurance Plan

A Construction Quality Assurance (CQA) plan will be implemented as part of construction phase. The Plan provides a means of demonstrating to stakeholders that the landfill has been constructed in accordance with the approved design and specification.

The main purpose of this Plan is to demonstrate that the construction is appropriate and complies with the Works Approval.

The CQA Plan is based on the design contained within this proposal. It contains the material/construction specifications, testing methods, testing frequency, corrective action and provide for appropriate documentation procedures in addition to the responsible parties and timeframes.

Appendix No. 33 – IWP CQA Plan Dec 14 provides detail of the Construction Quality Assurance Plan.

18. Operating Methodology

18.1. Waste Acceptance

The acceptance of waste to the site will be governed by the DER *Landfill Waste Classification and Waste Definitions 1996 (As Amended)*. No waste will be landfilled that does not comply with the necessary waste acceptance criteria. The applicable waste acceptance criteria will be strictly adhered to by the Proponent.

On arrival at the site, the following activities will be undertaken in dealing with each waste load:

- On arrival at the weighbridge, customers will be required to provide information on the source and type of waste material being delivered. Due to vehicles either being covered (transfer trailers and bins vehicles) or sealed (compactor vehicles), it is not practical/possible to visually inspect the waste material at the weighbridge; however, an elevated camera will be mounted on the weighbridge gatehouse to enable the weighbridge operator to, where possible, monitor the contents of the incoming vehicles.
- The incoming load will be weighed over the weighbridge and as a minimum, the following information recorded:
    - Customer name;
    - Waste type, including the identification of asbestos;
    - Waste load weight (either by deducting the vehicle's stored tare weight from the gross weight or reweigh of empty vehicle on exiting the facility);
    - Date and time of entry; and,
    - Vehicle registration.
- If there is likelihood that the incoming load may contain non-acceptable waste, the load will be inspected as best possible prior to discharge at the active tipping face. If this is not possible, the load will be tipped under supervision on the side of the active landfill area to enable the load to be adequately inspected while being unloaded. If the load is then deemed unacceptable, it will be placed back into the delivery vehicle and removed from site. If the load is deemed acceptable, it will be pushed up into the landfill and compacted.

- When a waste load is discharged at the active landfill tipping area, the load will be inspected by landfill operations personnel for conformance with the site waste acceptance criteria. Waste deemed acceptable will be incorporated into the landfill and waste deemed unacceptable will be rejected, reloaded into the customer's vehicle and removed from site.

Due to the active tipping area being permanently manned, all loads will be inspected on arrival and hence there is a reasonable likelihood that if unacceptable waste is identified, that the customer will still be on site and able to remove the non-conforming waste. If the customer has departed the site and is subsequently unidentifiable, the Proponent will separate the waste and quarantine it to one side while making the necessary arrangements to remove the waste from site to the appropriate disposal location.

18.2. Asbestos Management

The landfill site will accept asbestos containing material.

The control of materials containing asbestos products is a critical management aspect within the facility.

It is deemed advantageous to the greater community to allow asbestos materials to be accepted on site. This ensures the appropriate handling and disposal of asbestos material.

Asbestos material will only be accepted on site if it is appropriately wrapped and sealed in plastic. The delivered material will be immediately taken to landfill where the asbestos will be appropriately buried within the landfill, in a specially allocated area within the landfill that is appropriately coordinated and recorded.

Prior to the commencement of operations the Proponent will develop an appropriate asbestos handling procedure. The procedure will cover the following aspects:

<u>Prevention/Inspection</u>

- All customers will be advised that asbestos will only be accepted if it is handled in accordance with the asbestos handling procedure;
- Inspection of incoming loads by facility operations personnel; and,
- Confirmation that asbestos is appropriately wrapped.

Disposal (identified loads)

- Asbestos laid on the landfill and not tipped from height;
- All asbestos will be landflled within a dedicated area of the landfill;
- Unloaded and covered immediately; and,
- Disposal details recorded in the asbestos disposal register.

Handling of Asbestos (unidentified loads)

- Wearing of appropriate PPE when handling asbestos;
- Separation of asbestos material from general loads;
- Wrapping asbestos in a manner to prevent asbestos fibres entering the atmosphere;
- Applicable labelling of wrapped materials;
- Methodology for unloading wrapped materials at the tipping face;
- Methodology for landfilling asbestos material; and,
- Maintenance of an asbestos disposal register.

18.3. Waste Pre-treatment

There will be no pre-treatment of waste on site as the facility is fundamentally a landfill site. All waste pre-treatment occurs prior to the waste arriving on site.

The majority of the incoming waste will come from the Resource Recovery Solutions recycling and transfer station located in Bayswater (an affiliated company). The large portion of this waste will be residual waste from the facilities recycling operations.

There will be a minor amount of recyclable extraction on the tipping face, but this will primarily be to remove problematic materials from the waste stream such as mattresses, wire and large pieces of metal.

18.4. Waste Placement

On arrival at the active tipping area, the waste delivery vehicle will stop on a hardstand area located close to the final waste disposal location and discharge its load. 4 m high mobile litter screens will be used in close proximity to the tipping area to improve litter collection and prevent excessive litter blowing away from the landfill site.

The deposited waste will be pushed into place by a dozer or waste compactor in layers not exceeding 0.5 m in depth. Once in the area of final disposal, the waste will be broken up and compacted by the waste compactor. This is typically achieved by a minimum of five passed of the compaction vehicle. Subsequent loads of waste will be placed on top of this waste and similarly broken up and compacted.

The waste tipping area will be kept as small as possible, but to a maximum width of 30 m and a maximum height of 2 m.

This process is continued until the area of waste placement has reached its desired height or waste deliveries have ceased for the day. Thereafter, the compacted waste will be covered with adequate daily cover material to cover all waste.

A 300 mm layer of intermediate cover will be placed over all waste that will not have subsequent waste placed over it within three months. This will provide an improved cover to the waste mass over an extended period.

The formation of the waste mass within each landfill cell will be typically in accordance with the individual landfill cell filling plans. The maximum slope of the waste batters will be 1 V in 2.5 H. These batter slopes have been assessed by Golder Associates and confirmed to be adequately stable in accordance with the proposed landfill development.

Appendix No. 19 – Drawing 34 Landfill Cell 1 Filling Layout Plan through to **Appendix No. 24 – Drawing 39 Landfill Cell 6 Filling Layout Plan** provide detail on the proposed landfill gas filling program.

18.5. Leachate Management

Details on the leachate generation quantity and management strategies have been covered above.

As part of the regular landfill operations, leachate level in the leachate sumps and ponds will be monitored and recorded on a minimum monthly bases. Over time these records to enable year-on-year comparison of monitoring results to determine the effectiveness of the leachate management systems and treatment options. Where necessary, changes can be made to improve leachate management systems.

18.5.1. Landfill Gas Management

Details on the landfill gas generation quantity and management strategies have been covered above.

Landfill gas will be managed by a specialist landfill gas contractor. This contractor will be responsible for the progressive installation of landfill gas infrastructure as the waste mass develops, including installing a flare or other mechanism(s) for the treatment of the extracted gas.

The landfill gas contractor will also be responsible for the monitoring of fugitive emissions from the landfill, and if elevated emissions are recorded, determining and implementing remedial solutions to improve landfill gas capture.

The landfill gas action levels, beyond which the landfill gas contractor or the landfill operator will be required to undertake remedial action include:

- Landfill surface final cap = Methane ≥100 ppm;
- Within 50 mm of penetrations through the final cap = Methane ≥100 ppm;
- Landfill surface intermediate cover areas (no waste within next three months) = Methane ≥ 200 ppm;
- Within 50 mm of penetrations through the intermediate cover = Methane ≥ 1,000 ppm; or,
- Landfill gas flares = Methane and volatile organic compounds ≤ 98% destruction efficiency.

There will be no landfill gas monitoring bores installed.

18.5.2. Groundwater Management

Significant groundwater investigation data and monitoring information has been provide by Stass Environmental.

Ongoing groundwater monitoring will be undertaken by specialist contractor (Stass Environment). The frequency of monitoring will be stipulated in the facility operating licence. This is anticipated to be quarterly monitoring and potentially in time, if there is no contamination detected, that this monitoring could be pushed out to six-monthly.

The groundwater is protected from potential landfill impact by the following:

- Natural environment (as described by Stass Environment);
- The substantial landfill lining system;
- Selective waste receival (only Class II material);
- Ongoing leachate management;
- Progressive landfill closure;
- Comprehensive capping system;
- Cap rehabilitation; and,
- Post closure monitoring.

18.5.3. Contingency Planning

All site staff will be fully trained in the operation of the landfill in accordance with the facility operating licence, management plans and procedures and industry best practise.

To further reduce the risk of operational or environment incidents, contingency measures will be implemented to ensure on-site activities are carried out as programmed and in accordance with standard operating procedures. The site manager will be responsible to ensure that all landfill related activities are undertaken at the appropriate time and to the required standard.

Contingency planning will form part of the environmental and operational management of the site and will include the following:

- The ongoing monitoring and reporting of potential contamination of surface or groundwater;
- The ongoing monitoring and reporting of landfill gas emission levels to detect if there is a shortcoming within the landfill gas management system such as extraction well failure, pipe blockages, flare failure or damage to the landfill capping system;
- The ongoing monitoring and reporting of leachate generation, accumulation and treatment volumes to detect if there is a shortcoming within the leachate management system such as blockage of leachate collection pipes, ineffective treatment systems or excessive leachate accumulation;
- Maintenance of records of landfill fires, including potential ignition sources, actions taken and lessons learnt;
- The ongoing monitoring and reporting of unauthorised waste disposal, including identification of how the vehicle entered the landfill;

- The ongoing monitoring and reporting of odours and dust beyond the Prescribed boundary;
- The ongoing monitoring and reporting of litter washed or blown beyond the Prescribed boundary; and,
- Mobile equipment breakdown and back-up options.

The site manager will be responsible to ensure that the appropriate contingency planning is in place to monitor the performance and outcomes of the above activities and if any shortfalls are identified in the facility operating systems, that the appropriate actions are taken to identify, implement and record system improvements.

18.5.4. Landfill Management Plan

Prior to the commencement of landfilling operations, a comprehensive Landfill Management Plan will be developed to provide detailed information on all aspects of landfill management and operation. This plan will form the backbone of the facility operations and be the primary tool for staff training and facility management.

19. Rights to Water Irrigation Act 1914

The proposed development will be relying on surface water for its operational requirements. There will be no groundwater consumption associated with the proposed activities; hence, there is no requirement for groundwater usage and no consequential impact of the *Rights to Water Irrigation Act 1914*.

Groundwater Licence Number – Not applicable.

Groundwater Allocation and Aquifer - Not applicable.

Groundwater Use - Not applicable.

In future, if there is a need to utilise groundwater (due to insufficient surface water), the appropriate application will be lodged with the Department of Water.

20. Social Environment

20.1. Surrounding Land Uses

The surrounding land uses are rural, broad acre cropping and grazing. Some larger rural living lots are present to the east.

20.2. Sightlines to Neighbouring Properties

There are two neighbouring dwellings on the ridge to the north east of the proposed landfill site at a distance of approximately 1,350 m from the edge of the landfill footprint. These have been developed within the natural bush up on the ridgeline and are somewhat visible from the proposed landfill site. It is presumed that these dwellings have a direct line of sight down to the clay pit.

There is substantial intervening natural vegetation, but even so, the elevation of the vegetation and gaps between trees may allow glimpses of the landfill development. The amount of visual exposure will depend on the elevation and density of trees between the landfill and the dwellings, and their maintenance or additional planting over time.

As part of the proposed landfill development, a vegetated screen of fast growing trees will be planted along an existing ridge line on the northern side of the landfill. In time, this will improve the screening of the landfill operations from the neighbouring properties.

A selection of hardened tube plants or seeds from the following local trees will be used for the vegetation of the screen tree barrier:

- Acacia acuminata
- Acacia microbotrya
- Allocasuarina fraseriana
- Allocasuarina huegeliana
- Eucalyptus accedens
- Eucalyptus calophylla
- Eucalyptu marginata
- Eucalyptus loxophleba
- Eucalyptus occidentalis
- Eucalyptus salmonophloia
- Eucalyptus wandoo

Appendix No. 7 – Drawing 22 Overall Layout Plan shows the location of the proposed vegetated screen.

20.3. Buffer Zones

The issue of appropriate buffers is a matter of the distance and protection measures to prevent impact on adjoining land users. This applies mainly to landfill gas migration, safety and amenity impacts.

The DER landfill development guidelines (*Siting, Design, Operation and Rehabilitation of Landfills October 2014 – EPA Victoria*) recommends a buffer distance of 500 m to a building or structure for a putrescible landfill (Class II).

The *EPA (WA) Guidance for the Assessment of Environmental Factors – Separation Distances between Industry and Sensitive Land Uses No. 3 June 2005* recommends a 500 m buffer to sensitive uses, 150 m buffer to single residences and a 35 m internal buffer.

There is a 1.35 km buffer zone from the landfill footprint to the nearest neighbouring residential property and 1.1 km from the Prescribed boundary to this residence. These buffers are significantly greater than the EPA (WA) minimum recommended 150 m.

The farmhouse on Lot 11 is located 400 m to the south west of the landfill footprint; however, is deemed as an internal residence and is ignored when considering the buffer zones. The landowner has provided written consent to the farmhouse being ignored when considering the potential impacts of the landfill.

21. Stakeholder and Community Consultation

Due to the duration that this project has been progressing through the approvals processes, the local and wider community are well aware of the proposed development.

Historically, there have been numerous opportunities for stakeholders to be informed and provide comment on the proposal and the stakeholders have availed themselves of these opportunities.

The past opportunity for stakeholder comments include:

- Shire of Toodyay advertising of the proposal as part of the first Planning Approval process – July 2010;
- Shire of Toodyay advertising of the proposal as part of the subsequent Planning Approval process – June 2012;
- As part of the SAT Mediation process, on October 2012, the Proponent, its consultants and legal advisors met with Councillors, Council Officers and Council legal representatives on site to run through the proposed development;
- Appeal against the EPA's decision not to formally assess the proposal – late 2013; and,
- DER advertising of the proposal as part of the first Works Approval process – early 2013.

In addition to this, the DER will be advertising this latest Works Approval application.

During all of these past opportunities, the community has raised numerous points of concern and all of these have been addressed by various parties.

22. Heritage

22.1. Aboriginal Heritage

DER's GIS program identified a mythological site of significance running through the south west corner of Lot 11 called Swan River (site number SO2548). This site is located approximately 900 m to the south west of the proposed landfill site adjacent to the Jimperding Brook. The proposed development will have no negative impact on this heritage site.

22.2. European Heritage

There are no known European Heritage sites on or adjoining Lot 11 Chitty Road.

23. Emissions

23.1. Air Emissions

The only air emissions will be landfill gas emitting from the decomposing waste mass.

Composition and Quantity – The composition of landfill gas is typically 50% methane and 50% carbon dioxide. Over time (many years), the composition of methane decreases, with a corresponding increase in carbon dioxide. Ultimately, once the waste mass has stabilised and the vast majority of the organic material has decomposed, the methane content will decrease to proportionally.

The quantity of landfill gas being emitted will be dependent on numerous factors including:

- Waste type/composition;
- Waste quantity;
- Waste compaction;
- Moisture content;
- Landfill capping system; and,
- Landfill gas extraction system.

The IPCC model (refer above) has been used to estimate the quantity of methane to be generated from the landfill. This model also produces the timeline of likely generation. In summary:

- Measurable quantities of gas are emitted from the landfill within two to three years;
- The maximum annual quantity of methane generated is predicted to be 632.7 m^3/yr; and,
- After 45 years (the maximum forecast duration of the model), the facility will be producing 134.9 m^3/yr of methane.

Variability of Emissions – The emissions will not vary dramatically from day to day, these will effectively be constant, but over time, the emissions will gradually increase with the increase in waste mass volume on site. There will be fluctuation when the gas management system is initially installed (year two after commencement) or progressively expanded.

Treatment Methodology – This will be via active gas extraction and flaring. Power generation may be a possibility, but due to the relatively remote rural setting, this is unlikely.

Monitoring – Landfill gas emissions will be assessed in year two to determine the viability of an active gas management system. Once installed, the gas extraction system efficiency will be monitored at least weekly during the initial installation stage and thereafter at least monthly. The landfill gas contractor will also monitor fugitive emissions around the site on a minimum monthly basis.

Contingency Plans – Ongoing monitoring of the performance of the gas extraction system will identify if there are any inefficiencies in the gas extraction system or treatment method (flare) or excessive fugitive emissions around the landfill. If there are issues identified, the landfill gas contractor will be required to investigate the cause and proposed solutions. Following consultation with the Proponent, the appropriate remediation action will be taken.

Environmental Receptors – The major receptor is the atmosphere (ozone layer) as the methane in the landfill gas is a greenhouse gas. Minor receptors may be near by residents experiencing odour from the landfill gas emissions. The extensive buffer zones should adequately manage this occurrence.

Fugitive Emissions – As discussed above.

Cumulative Impact – Nil.

Targets and Limits – The landfill gas emissions targets are as follows:

- Landfill surface final cap = Methane 100 ppm.
- Within 50 mm of penetrations through the final cap = Methane 100 ppm.
- Landfill surface intermediate cover areas (no waste within next three months) = Methane 200 ppm.
- Within 50 mm of penetrations through the intermediate cover = Methane 1,000 ppm.
- Landfill gas flares = Methane and volatile organic compounds = 98% destruction efficiency.

Environmental Risk – Nil.

23.2. Dust Emissions

Potential sources of dust emissions include:

- Construction – minor consideration;
- Dusty loads delivered to site - minor consideration;
- The mobile equipment and delivery vehicles moving around on site - minor consideration;
- Landfill active tipping area activities – minor consideration;
- Vehicle wheels spreading dirt around the site - minor consideration; and,
- Adjacent clay extraction operations (existing operation).

There are no dust emissions that are anticipated to require major considerations. All identified sources are deemed relatively minor and easily manageable within the confines of the Prescribed boundary and the larger Lot 11.

Variability of Emissions – There is the potential for variable emissions, which will depend of the following:

- Material type;
- Vehicle numbers;
- Ambient weather conditions; and,
- Dust management activities undertaken on site.

Treatment Methodology – The following are the suite of preventative measures available:

- Wetting down of access roads and active tipping area;
- Restricted activities during certain weather conditions (strong winds); and,
- Application of dust suppressant chemicals (eg. Dustex).

Monitoring – Dust emissions will be visually monitored on a continuous basis by site operations staff. The facility will also maintain a comprehensive complaints register, which will be used as a gauge of success with regards to dust emissions management. In the event that there be a dust emissions issue identified, formal dust monitoring will be undertaken by an independent third party to determine the extent of the problem and to propose appropriate improved dust management solutions.

Contingency Plans - If unacceptable dust emissions are identified offsite, the following contingency plans are available to improve dust management on site:

- Slow vehicles down by traffic calming methods (speed humps);
- Restrict dust generating activities to the appropriate time of day to reduce dust generation (weather dependent);
- Reject or restrict excessively dusty loads; and,
- Utilisation of chemical dust suppressants (last resort).

Environmental Receptors - Environmental receptors include the site operations staff, customers depositing waste at the facility and neighbouring properties.

Cumulative Impact – The potentially dust generating activities that have been identified above are typically individual activities. If there were two or more of these occurring simultaneously, there is the potential for a cumulative impact being generated. The consequence of this will be highly dependent on the type of activity and the quantity of dust being generated. As there are preventative measures that can be applied (primarily, temporally ceasing the particular operation), the impact on receptors can be controlled.

Targets and Limits – No dust emissions beyond the property boundary and nil community complaints.

Environmental Risk – Extremely low.

23.3. Odour Emissions

Potential sources of odour emissions include:

- Putrescible waste being delivered and unloaded at the active tipping area; and,
- Fugitive landfill gas emissions.

Composition and Quantity – The composition will be a mix of odours emanating from the general waste as it putrefies. The quantity of odour will be a function of the quantity of waste in the landfill and the degree to which the putrescible waste has putrefied (odour intensity). Based on these variables, it is not possible to determine the precise composition or quantity of odour likely to be omitted. The installation of an active gas collection system will dramatically reduce the quantity of landfill gas being emitted from the waste mass and hence reduce the odour impact.

Variability of Emissions – The emissions will be highly dependent on the waste quantity, degree of purification, extent of landfill gas management and ambient weather conditions.

Treatment Methodology – The following are the suite of preventative measures available:

- Rejection of excessively odourous waste streams;
- Application of cover material over incoming waste; and,
- Improved landfill gas management.

Monitoring – Odour emissions will be monitored on a continuous basis by site operations staff. It is acknowledged that site staff do become desensitised to odour after being exposed to the same odour for an extended period. The facility will also maintain a comprehensive complaints register, which will be used as a gauge of success with regards to odour emissions management. In the event that there are odour emissions issues identified, formal odour (olfactory) monitoring will be undertaken by an independent third party to determine the extent of the problem and to propose appropriate improved odour management solutions.

Contingency Plans – If significant odour is identified by the onsite attendant or complaints are received from neighbouring properties, the Proponent will increase odour management activities to ensure appropriate levels of odour management are maintained.

If the odour is emanating from a particular waste stream (eg. crayfish heads), the waste stream will either be rejected from site or received under certain conditions (eg. at a certain time of the day or if it has not yet started putrefying).

Environmental Receptors – Environmental receptors include the site operations staff, customers depositing waste at the site and neighbouring properties.

Fugitive Emissions – Nil.

Cumulative Impact – Nil.

Targets and Limits – The method for assessing the extent of the emissions will be based on the number of complaints received from site operations staff, neighbours and customers. A target of zero complaints is adopted.

The DER sets a target of 500 odour units emitted for a single source and this will be used as the benchmark if any olfactory monitoring is undertaken.

Environmental Risk – Low.

23.4. Noise Emissions

Offsite noise is governed by the *Environmental Protection (Noise) Regulations 1997*.

The *Environmental Protection (Noise) Regulations 1997*, require that sensitive premises including dwellings in non-industrial areas are not subjected to noise levels exceeding 45 dBA for more than 10% of the time, 55 dBA for more than 1% of the time and never exceeding 65 dBA during normal working hours. There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, although impulsiveness is not likely to be relevant.

In December 2014, Herring Storer Acoustics undertook an environmental assessment of the potential noise emissions from the proposed development. This assessment concluded:

"*We understand that it is proposed that the proposed landfill site will operate between 0700 and 1800 hours Monday to Saturday (excluding public holidays). As the landfill will only operate during the day period, noise received at the neighbouring residence from the site needs to comply with the assigned* LA_{10} *noise level of 45 dB(A) for the day period.*

Although we believe that at the calculated noise level, noise received at the neighbouring residence would not be tonal, to be conservative, an allowance for the +5 dB(A) penalty for a tonal component has been included in the assessment.

Noise received at the neighbouring residence from the landfill operations and including the clay operations would comply with the requirements of the Environmental Protection (Noise) Regulations 1997, even with the addition of a +5 dB(A) penalty for tonality."

Appendix No. 34 – Herring Storer Environmental Noise Assessment Dec 14 provides additional information on the study.

Composition and Quantity – Occasional single noise, the noise level being dependant on the incident and also the sound of mobile equipment being driven around the site. These noises are not anticipated to be loud or heard from the nearest neighbouring residential property (as demonstrated by the Environmental Noise Assessment).

Treatment Method – Reducing vehicle speed, increased care when moving waste bins and ensuring that mobile equipment is maintained in an appropriate manner to reduce operational noise and if necessary, reversing beacons will be low frequency type to reduce noise carry.

Monitoring – The site will be monitored on a daily basis by the onsite attendant. The facility will also maintain a comprehensive complaints register, which will be used as a gauge of success with regards to noise emissions management. In the event that there be a noise emission issue identified, formal acoustics monitoring will be undertaken by an independent third party to determine the extent of the problem and to propose appropriate improved dust management solutions.

Contingency Plans – Increased training of site operators to reduce operational noise.

It is not deemed necessary to try and eliminate the impact of a heavy item being dropped in an empty waste bin.

Environmental Receptors – Nearest neighbouring residential property is 1.35 km north east, this is a significant distance and well beyond the required landfill buffer zone. It is not anticipated that this property will be negatively impacted.

Fugitive Emissions – Nil.

Cumulative Impact – Nil.

Targets and Limits – Noise Regulation applicable limits.

Environmental Risk – Nil.

23.5. Light Emissions

All construction and the vast majority of the operations will occur during daylight hours; hence, the proposed activities will not impact on the surrounding environment.

The ongoing operation of the site may require some flood lighting during fringe winter periods. Due to the size of the property, lighting will not be aimed beyond the site boundary and hence will not impact on the surrounding environment.

Security lighting around the weighbridge will be left on after hours; however, this is not external to the property.

23.6. Discharge to Water

There are no permanent surface water bodies flowing through the site. There is only the ephemeral creek line running to the north of the proposed landfill development site. Under normal operating circumstances, there will be no discharge into the creek line. However, in extreme circumstances, there may be a need to discharge collected surface water from within the clay pit void. If this was to occur, in most circumstances, this water would simply flow down the creekline and into the water storage dam 350 m downstream.

Composition and Quantity – The surface water collecting in the clay pit may have elevated salt levels and potentially some turbidity. There is also the slight chance that it may have been contaminated by the landfill activities. Consequently, the water will be monitored and discharge will only be allowed if the water quality is acceptable. With regards to quantity, due to the limited available surface water, only the minimum necessary volume will be discharged. All efforts will be made to retain all surface water within the pit.

Variability of Emissions – There will be no emissions under normal circumstances. Discharge will only occur if there is excessive surface water collected for the available in-pit water storage or there is a need to empty the storage pond and there is no alternative location in which to transfer the water.

Treatment Methodology – Nil.

Monitoring – The salinity content, turbidity and contamination will be tested prior to discharge to confirm water quality.

Contingency Plans – Nil. If the discharge is not allowed (due to water quality), it will be retained within the pit.

Environmental Receptors – The downstream creekline.

Cumulative Impact – Nil

Targets and Limits – The standards to be applied to the quality of the discharge water will be as follows:

- Salinity (TDS) < 5,000 ppm;
- Turbidity Limits:
    - Dry Weather – Max. 50 NTU, Medium 25 NTU;
    - Stormwater Flow – Max. 100 NTU, Medium 50 NTU.
- DER Stock watering guidelines 2010 (based on the accepted beneficial downstream water use).

Environmental Risk – Nil.

23.7. Discharge to Land

These potential sources of discharge to land include:

- Litter generated from the landfill activities.

The environmental impact of windblown litter is only seen as a temporary discharge to land and appropriate site management is able to adequately address this issue. If litter is not collected in a timely manner, it is easily observed and cannot be “covered over” and hidden. Ultimately, all litter will be collected and placed in the landfill.

Composition and Quantity – The composition will be light wind-blown items such as paper and plastic film. The quantity will be a function of the waste type, ambient weather and efficiency of litter prevention activities on site.

Treatment Methodology – Litter control on site is achieved via the following mechanisms:

- Regular pushing up and compaction of the waste;
- Regular collection of uncontrolled tipping and placing of the material into the active tipping face;
- Application of adequate cover material;
- Site fencing acting as a litter collection device (fixed of mobile fencing);
- Regular clearing of litter from fences and other areas of site;
- Progressive closure of completed landfill areas; and,
- Planting vegetative screens (tall trees) around the landfill to reduce wind impact.

All of these activities will be undertaken on site.

There will be a minimum 2 m high litter fence around the perimeter of the active landfill area as well as 4 m high mobile litter screens around the active landfill tipping area.

Litter collections will be carried out at least weekly or more regularly if required.

With there being other site users within close proximity of the landfill site, the Proponent will be required to continuously ensure that there is no litter blowing or washing beyond the active landfill area.

Due to the size of the greater Lot 11, it is highly unlikely that any litter will blow or wash beyond the property boundary. If this does occur, the Proponent will immediately collect the litter and return it to the landfill.

Monitoring – The area surrounding the landfill site will be inspected on a weekly basis or more regularly during strong wind events.

Contingency Plans – If litter management becomes problematic, the Proponent will investigate and implement additional litter management systems to improve the containment and reduction of litter.

Environmental Receptors – Other site users (clay extraction companies and the stock farmer as well as neighbouring properties.

Fugitive Emissions – Nil.

Cumulative Impact – Nil.

Targets and Limits – No litter beyond the site boundary and only minimal litter on site.

Environmental Risk – Low.

24. Vermin Management

The potential sources of vermin include:

- In material being delivered to the site; and,
- Living in and around the landfill site.

Preventative measures include:

- Regular pushing up and compaction of the waste;
- Application of adequate cover material;
- Progressive closure of completed landfill areas; and,
- Vermin control such as baiting and trapping.

Should vermin be identified on site, the appropriate eradication procedures are to be undertaken, this may involve professional pest controllers being utilised to manage the situation. Typically vermin could include:

- Rats and mice;
- Cats;
- Birds; and,
- Cockroaches.

On occasion it may be appropriate to use both mouse and rat traps around the site even if vermin have not been identified. This will assist in identifying the presence of any rats or mice.

25. Weed Management

The potential sources of weed infestation include:

- In material being delivered to the site; and,
- Blow-in from surrounding areas.

Management measures include:

- No green waste processing site;
- Application of adequate cover material;
- Regular site inspections; and,
- Weed eradication as required – small areas controlled by landfill operations staff, larger areas controlled by professional weed control company or with the assistance of the local former.

With the site being located within a rural area, and a large, predominantly agricultural property that is well away from public roads, there are currently very few weeds observed on site. The local farmer has been very successful in the control of weed. This situation is anticipated to continue during the operation of the landfill as all waste being received on site will immediately be delivered to the landfill, placed, compacted and covered daily. Any weeds within the waste will be well contained and covered over within the landfill.

The local farmer will be using the landfill buffers around the landfill for stock grazing and cropping; hence, the current level of weed control will be maintained around the landfill site.

The proponent and the local farmer will work closely together to ensure that there is adequate management of weed on site.

26. Fire Management

Under no circumstances will waste be burnt on site. Burning of waste does not form part of the site waste management activities.

Fire management is a critical activity on all landfills. A significant portion of Class II waste is combustible and due to the wide variety of waste received, it is possible that there could be spontaneous combustion within the waste mass. Consequently there is a risk of fire within the landfills.

The risk of landfill fires can be managed in the following ways:

- Adherence to the DER waste acceptance criteria;
- Appropriate compaction and covering of waste;
- Collection of litter from up against the litter fences;
- Not placing significant quantities of flammable material in a single area within the landfill (piles of tyres);
- Appropriate site security to reduce the likelihood of vandals entering the site;
- Appropriate fire fighting equipment on site:
    - The water cart will be the primary fire fighting piece of equipment on site;
    - Sufficient stockpiles of cover material will be maintained close to the active tipping area to facilitate rapid covering of the waste in the event of a fire;
    - Minimum 50 kL of water will be storage on site (in storage dam); and,
    - The water cart will always be left full to be able to react immediately to a fire; and,
- Adequate training for site operating staff.

Prior to the commencement of landfill operations the Proponent will develop a Fire Management Plan. The Fire Management Plan will include the following:

Preventative measures:

- Maintenance of fire breaks;
- Waste placement and materials handling; and,
- Appropriate signage.

During operating hours:

- Actions to be taken by staff following the identification of a fire;
- Appropriate PPE and fire fighting equipment;
- Actions to be taken in the event of a large scale fire:
    - Evacuate facility;
    - Notify Fire Brigade;
    - Notify senior management;
    - Notify the DER;
    - Notify Shire; and,
    - Control fire as appropriate; and,
- Actions to be taking following a fire:
    - Identification of potential fire source;
    - Notify the police in the event of vandalism;
    - Report to the DER;
    - Notify the Shire; and,
    - Lessons learnt.

After operating hours:

- Local farmer to raise the alarm; and,
- Appropriate signage advising the general public of actions to be taken if fires are noticed on site:
    - Emergency number(s) to call; and,
    - Do not enter site.

27. Solid/Liquid Waste

27.1. Solid Waste

It the context of the proposed development, “solid waste” is not seen as an emission as “solid waste” acceptance is the core business behind the proposed development and not a potential emission from the proposed development. The activities on site will not produce any solid waste.

The type, quantity and environmental management of solid waste being received on site is covered extensively in the above documentation.

Composition and Quantity – Not applicable as there are no solid wastes produced as a function of the proposed site activities.

Variability of Emissions – Not applicable.

Treatment Method – Not applicable.

Controlled Waste Tracking – Not applicable.

Contingency Plans – Not applicable.

Environmental Receptors – Nil.

Comparison Against Relevant Standards – Not applicable.

Cumulative Impact – Not applicable.

Waste Reuse – Not applicable.

Targets and Limits – Not applicable.

Environmental Risk - Not applicable.

27.2. Liquid Waste

It the context of the proposed development, “liquid waste” produced as a result of the proposed development and associated activities will consist of leachate and contaminated surface water runoff. Both of there waste streams have been covered extensively in the above documentation.

Composition and Quantity – Not applicable as there are no solid wastes produced as a function of the proposed site activities.

28. Hydrocarbon/Chemical Storage

28.1. Hydrocarbon Storage

Initially fuel is not proposed to be kept on site. Normally machinery and plant accessing the site will be fuelled from mobile refueling, with fuel being placed directly into each machine/plant.

At some time in the future, should fuel be required to be stored on site, it will be stored in purpose built, self-bunded fuel dispensing containers. These units come with their own fuel pump, bowser and spill kit.

There will also be limited quantities of oils and greases stored on site for regular maintenance of mobile equipment. These hydrocarbons are typically contained in small quantities of up to 5 litres, but occasionally in 25 litre drums. All of these hydrocarbons are stored undercover (in shipping containers).

Minor spills fuel (< 5 litres) will be cleaned up and placed in the landfill but will not affect the groundwater because of the low permeable nature of the liner and underlying clay. Bacteria breakdown will dissipate small quantities of fuel or lubricants in the same manner as any other organic waste stream.

Any spillages of greater than 5 litres will be reported to the DER as soon as practicable, but within 24 hours. The spillage clean up methodology will be dependent on the size of the spill and in accordance with the DER requirements.

28.2. Chemical Storage

Quantity and Type – There will be no chemicals stored on site.

29. Contaminated Site Identification

A review of the DER Contaminated Sites Data Base (www.dec.wa.gov.au/contaminatedsites) has indicated that the site is not a registered Contaminated Site.

30. Financial Assurance

The matter of a financial assurance was first brought up by the Shire of Toodyay at its Council Meeting of 19 August 2010, where the Shire resolved:

"*That Council defer consideration of the planning application until such time as the Environmental Protection Authority and/or Department of Environment and Conservation has issued works approval and a licence for the facility and they have agreed to receive and manage a financial assurance from the Applicant in accordance with the provisions of the Environmental Protection Act 1986.*"

During the SAT process, this matter was discussed and as a result thereof, the SAT included order 27 – Cash Bond, which stated:

"*Prior to the commencement of operation of the facility, the applicant shall provide a cash bond of $120,000 to the Shire of Toodyay as a performance guarantee against the satisfactory completion of the rehabilitation of the site, such funds to be held in an interest bearing account, with the interest forming part of the bond. The performance guarantee will be refunded at a rate of 50% following completion of the final stage of rehabilitation works and 50% at the conclusion of the three year monitoring period. Any such bond is to be accompanied by a bonding agreement and written authorisation from the owner of the land that the respondent may enter the site to complete or rectify any outstanding work. The respondent will recover the bond, or part thereof as appropriate, for any costs to the respondent in completing and/or rectifying the outstanding works.*"

The DER (Victorian) landfill development guidelines cover the matter of financial assurance:

"*Financial assurance is a requirement of the EP Act and all licensed landfill are required to hold an EPA-approved financial assurance.*" This statement is valid for the Victorian EP Act, but is not correct for the WA *Environmental Protection Act 1986*, where the Act (Part VA – Financial Assurances) allows the CEO to require a developer to provide a financial assurance; however, the Act states "*A financial assurance requirement is not to be imposed under section 86B(1) or (2), or continued under section 86B(7), by the CEO unless the Minister has consented to the imposition or continuation.*"

In consideration of this consent, the Minister, is to have regard to the following aspects:

- The degree of risk of pollution or environmental harm associated with the implementation of the authorisation (proposed development);
- The likelihood of action being required to deal with waste or prevent, control or abate pollution or environmental harm arising from acts associated with the implementation of the authorisation (proposed development);
- The environmental record of the responsible person or proposed responsible person;
- Other financial assurances required to be held by the responsible person or proposed responsible person under the Act and other written laws; and
- Any other matters prescribed.

The implementation of a financial assurance in WA is not a mandatory requirement under the Act, but a discretionary one.

To date, the Minister has never seen the need for the implementation of a financial assurance for any landfill development within WA.

The requirement for a financial assurance, above what has already been implemented through the SAT process is a matter for the DER to determine, based on its assessment of the proposal; however, the requirement thereof needs to be justified on environmental grounds.

The Proponent believes that the site location, low Class of landfill and the environmental protection incorporated within the proposal is sufficient to ensure that there will be no negative environmental impact such that a financial assurance is warranted.

Appendices

Appendix No. 1 – Location – Land Uses and Buffers

Appendix No. 2 – Stass Ground Water Assessment, Dec 14

Appendix No. 3 – CMW Earthquake Stability Assessment Report Aug 12

Appendix No. 4 – CMW Earthquake Stability Assessment Report Feb 13

Appendix No. 5 – Golder Opal Vale Technical Studies to Support Design Dec 14

Appendix No. 6 – Drawing 21 Cover Sheet, DRG. Schedule and Locality Plan

Appendix No. 7 – Drawing 22 Overall Layout Plan

Appendix No. 8 – Drawing 23 General Arrangement Layout Plan

Appendix No. 9 – Drawing 24 Landfill Earthworks Layout Plan

Appendix No. 10 – Drawing 25 Landfill Typical Sections

Appendix No. 11 – Drawing 26 Landfill Liner Details – Sheet 1 of 2

Appendix No. 12 – Drawing 27 Landfill Liner Details – Sheet 2 of 2

Appendix No. 13 – Drawing 28 Leachate Extraction Layout Plan

Appendix No. 14 – Drawing 29 Leachate Extraction Details - Sheet 1 of 2

Appendix No. 15 – Drawing 30 Leachate Extraction Details - Sheet 2 of 2

Appendix No. 16 – Drawing 31 Leachate Evaporation Ponds Layout Plan

Appendix No. 17 – Drawing 32 Leachate Evaporation Ponds Details

Appendix No. 18 – Drawing 33 Leachate Evaporation Ponds Safety System

Appendix No. 19 – Drawing 34 Landfill Cell 1 Filling layout Plan

Appendix No. 20 – Drawing 35 Landfill Cell 2 Filling layout Plan

Appendix No. 21 – Drawing 36 Landfill Cell 3 Filling layout Plan

Appendix No. 22 – Drawing 37 Landfill Cell 4 Filling layout Plan

Appendix No. 23 – Drawing 38 Landfill Cell 5 Filling layout Plan

Appendix No. 24 – Drawing 39 Landfill Cell 6 Filling layout Plan

Appendix No. 25 – Drawing 40 Final Presettlement Waste Profile layout Plan

Appendix No. 26 – Drawing 41 Stormwater Drainage Layout Plan

Appendix No. 27 – Drawing 42 Landfill Gas Installation Layout Plan

Appendix No. 28 – Drawing 43 Landfill Gas Installation Detail

Appendix No. 29 – Shawmac Traffic Study Jan 12

Appendix No. 30 – IWP Landfill Development Guideline Comparison Dec 14

Appendix No. 31 – IWP Rehabilitation Management Plan Dec 14

Appendix No. 32 – IWP Construction Specifications Dec 14

Appendix No. 33 – IWP CQA Plan Dec 14

Appendix No. 34 – Herring Storer Environmental Noise Assessment Dec 14