THE LEADER IN RESOURCE RECOVERY

# RISK ASSESSMENT – CONSTRUCTION ACTIVITIES FOR ALLAWUNA FARM LANDFILL

This document describes the Occupational Safety and Health risks associated with the Construction of the Site Infrastructure and Landfill Cell 1 and Landfill Infrastructure for Allawuna Farm Landfill, as identified during the design and approvals process.

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Prepared By

Bowman & Associates Pty Ltd

Environmental Engineering Consultants
Waste Management Specialists
www.bowmanassociates.com.au

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# CONSTRUCTION RISK ASSESSMENT AND REVIEW

Bowman & Associates has considered the construction practicalities and likely risks to be faced by the contractor(s) executing the construction of the Site Infrastructure, Landfill Cell 1 and associated infrastructure for Allawuna Farm Landfill.

The assessment of the specific environmental aspects for the operation of the site infrastructure and Landfill Cell 1 has been addressed in separate risk assessment reports provided by Bowman and Associates and Golder Associates.

The risk management approach outlined in this document is based on the framework in the Australian Standard Risk Management (AS/NZS ISO 31000:2009) on which the Victorian EPA Licence Assessment Guidelines (2010) have been based. We have also considered the Western Australian Occupational Safety and Health Regulations (1996).

The below tables describe the risk ranking system used when assessing a particular activity for both personnel and environmental risk using the Victorian EPA Assessments Guidelines structure.

**Table 1 Qualitative measures of likelihood**

| Rating | Indicator | Description | Frequency |
|---|---|---|---|
| 5 | Almost certain | Multiple incidents have been recorded | Is expected to occur almost all of the time |
| 4 | Likely | Several incidents have been recorded | Is expected to occur most of the time |
| 3 | Probable | Some incidents have been recorded | Might occur |
| 2 | Not likely | Few recorded or known incidents | Might occur but not expected to |
| 1 | Rare | No recorded or known incidents | Only expected to occur under atypical conditions |

**Table 2 Qualitative measures of consequence/impact**

| Rating | Indicator | Description |
|---|---|---|
| 5 | Severe | Human deaths, operations cause catastrophic off-site impacts, immense financial loss |
| 4 | Significant | Extensive human injuries or illness, operations cause substantial off-site impacts, major financial loss |
| 3 | Medium | Some health impacts to humans, operations cause some external impacts, large financial loss |
| 2 | Minor | First aid treatment, operations cause minimal off-site impacts, small financial loss |
| 1 | Negligible | Operations cause no injuries, negligible off-site impacts, and negligible financial loss |

**Table 3 Qualitative risk analysis matrix – Level of risk**

| Consequence | Likelihood | | | | |
|---|---|---|---|---|---|
| | Almost certain | Likely | Probable | Not likely | Rare |
| Severe | V | V | V | V | H |
| Significant | V | V | V | H | H |
| Medium | V | H | H | M | M |
| Minor | H | H | M | L | L |
| Negligible | H | M | L | L | L |

V = Very high risk; immediate action required

H = High risk; management required from senior staff

M = Medium risk; specify required management

L = Low risk; manage with standard operating procedure

**Table 4** below describes some of the typical risks that have been identified during the design phase, their impacts, assessed levels of risk and control measures that have been taken to mitigate them to acceptable levels

The risk assessment generally covers the following site construction and infrastructure works:-

- Earthworks (Excavation and Filling),
- Construction of intersection to Great Southern Highway and Landfill entrance,
- Construction of Entrance Road from GSH to Infrastructure area,
- Construction of internal access road and Infrastructure area (car parking, truck parking),
- Construction of perimeter access road and turning bays (to Landfill cells and ponds),
- Construction of swale drains and installation of stormwater culverts,
- Installation of conducts, cabling and electronic systems including pumps,
- Installation of security fencing and gates,
- Installation of potable and fire fighting water tanks,
- Installation of 4 bay carport,
- Installation of site office and ablution,
- Construction and installation of weighbridge,
- Construction of power generator (genset) pad including concrete and pipework, and
- Installation of mud shaker and sump pit.

The risk assessment generally covers the following Landfill Cell 1 construction and associated infrastructure works:-

- Earthworks (Excavation and Filling),
- Excavation and Construction of Cell 1,
- Construction of Leachate Pond pad including concrete and pipework,
- Construction of subsurface drainage well and associated pipework,
- Construction of Cell leachate sump including concrete and pipework,
- Construction of Stormwater Dam and associated spillway,
- Installation of geosynthetic lining system in Cell 1, Leachate Pond and Retention Pond,
- Placement of leachate drainage aggregate,
- Installation of ballast for pond liners, and
- Installation of conducts, cabling and electronic systems including pumps.

This list is by no means exhaustive, as many risks are a function of the construction methods and techniques employed by the construction contractor(s), and cannot be clearly defined during the design phase.

**Table 4 Risk Assessment - Construction Activities for Allawuna Farm Landfill**

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| **General** | | | | | | |
| General | Travel of personnel to and from the site. | Extensive human injuries. | 2 | 4 | High | Co-ordination between construction and landfill operations contractors.<br>Awareness of all site users, standard operation procedures and use of appropriate visibility gear. |
| General | Contamination of site with hydrocarbons or polluted water. | Polluted water source. | 2 | 2 | Low | The storage and handling of chemicals and fuels will be in accordance with the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007* and Australian Standard *AS 1940 The storage and handling of flammable and combustible liquids*.<br>Spill response established in Landfill Management Plan.<br>Water discharge procedure described in Landfill Management Plan. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| General | Stormwater event - excessive rainfall | Erosion of partially completed construction works, wash out of road, or temporary works. | 3 | 2 | Medium | Design has considered storm events and has allowed adequate drainage along roads, hardstand areas, along creek lines, near low lying areas.<br>Stormwater culverts have been designed for stormwater events.<br>Contractor(s) to employ temporary stormwater control during works as per the specification. |
| **Clearing and Stripping** | | | | | | |
| Clearing and Stripping | Trees falling on bystanders during clearing. | Serious injury to human. | 2 | 4 | High | Plant operators to be proficient in the use of their machinery.<br>Bystanders to be clear of machinery when it is operating.<br>Contractor to operate safely when felling trees.<br>High visibility clothing for persons on site. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| **Earthworks** | | | | | | |
| Earthworks | Injury due to buried services such as gas and power. | Unintentional piercing of gas or power lines may result in severe injury. Unlikely if correct procedures are followed. | 2 | 4 | High | Contractor required to 'dial before you dig' and locate services prior to commencement of works.<br>Initial works will be on undeveloped land, underground services will be recorded as installed. |
| Earthworks | Rollover of plant equipment. | Injury or death of Plant operator or bystander. | 2 | 4 | High | Design batter slopes at maximum 1:3 grade.<br>Design calls for no deep excavation or steep grades.<br>Contractors are responsible for safe operation of vehicles. |
| Earthworks | Personnel falling into excavated holes or trenches. | Injury from a fall or ledge collapse. | 2 | 3 | Medium | No deep excavations or high ledges in the designed landform.<br>Contractor(s) expected to using bunting or flagging for temporary hazards in line with their own Occupational Health and Safety procedures. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| Earthworks | Machinery falling into excavated holes, trenches or large excavations. | Machinery or personnel injury from fall. | 2 | 3 | Medium | No deep excavations or high ledges in the designed landform.<br>Contractor(s) expected to using bunting or flagging for temporary hazards in line with their own Occupational Health and Safety procedures. |
| Earthworks | Personnel struck by machinery | Serious injury to bystander. | 3 | 4 | Very High | Effective communication between onsite personnel and machine operators as per site procedures.<br>UHF radios to be carried by site personnel and in every machine onsite.<br>Onsite toolboxes to inform site personnel of current works onsite. |
| Earthworks | Radiation exposure from Nuclear Density Soil Gauge. | Low powered instrument, single dose no impact. | 1 | 1 | Low | Contractor will employ an appropriately NATA accredited soil laboratory. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| **Site Infrastructure** | | | | | | |
| Cranes<br>Truck Lifters<br>Manitou | Use of machinery to lift and place site facilities<br>(for example office blocks, water tanks, Generator, HDPE pipes, concrete wells, concrete culverts etc) | Head trauma from falling objects. | 4 | 4 | Very High | Materials to be lifted using correct lifting points and with suitability sized crane or lifting equipment.<br>No personnel to be positioned under lifting area or in front of moving lifting machinery. |
| Manual handling | Personnel injury when handling or lifting objects. | Injury/strains from incorrect lifting techniques. | 4 | 2 | High | Current manual handling techniques.<br>Two or more person lifts where required.<br>Heavy items to be lifted or carried by appropriate lifting equipment. |
| Site traffic | Vehicle / machinery being struck or collisions. | Vehicle or machinery collisions. | 3 | 3 | High | Traffic management plan to be in place during construction works.<br>Designated parking areas for truck and light vehicles.<br>All contractors to be inducted.<br>Regular toolbox talks.<br>Entrance road and internal roads designed to suit construction and operational traffic, with good lines of sight and suitable road widths. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| **Landfill Construction (Cell 1, Leachate Pond, Retention Pond, Stormwater Dam)** | | | | | | |
| Lifting Geosynthetic rolls | Use of Manitou to lift and place geosynthetic rolls and pipework. | Head trauma from falling objects, Hit by moving machinery. | 3 | 4 | Very High | Materials/rolls to be lifted using correct lifting points and with suitability sized lifting equipment.<br>No personnel to be positioned under lifting area or in front of moving lifting machinery. |
| Liner Installation - GCL | Personnel injury when deploying the rolls of geosynthetic clay liner (GCL) material. | Slips, trips and falls, or injury due to incorrect lifting technique. | 3 | 2 | Medium | Installer must comply with manufacturers guidelines.<br>Installer must develop a work method statement for safe roll deployment.<br>Smooth subgrade limits opportunity to fall over rocks or loose stones.<br>Design liner orientation (long seam down slope) reduces work required on sloping ground. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| Liner Installation - HDPE | Personnel injury when deploying HDPE geomembrane liner. | Slips, trips and falls, or injury due to incorrect lifting technique. | 3 | 2 | Medium | Installer must comply with manufacturers guidelines.<br>Installer must develop a work method statement for safe roll deployment.<br>Liner is not to be deployed in windy conditions. |
| Liner Installation - HDPE | Personnel injury when traversing HDPE liner on batters and in sump. | Minor sprains. | 4 | 2 | High | HDPE liner is designed to be double textured.<br>Rope ladders to be used on batters.<br>Access to the sump to be in the corners where gradient is least. |
| Liner Installation - HDPE | Personnel injury when welding HDPE liner. | Minor burns from extrusion equipment or cuts from knife use. | 4 | 2 | High | Amount of welding required minimised by panel layout.<br>Main joins performed with automatic wedge welder, limiting extrusion welding requirement.<br>Test welds required to ensure operator proficiency. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| Liner Installation - Cushion Geotextile | Personnel injury when deploying the rolls of cushion geotextile material. | Slips, trips and falls, or injury due to incorrect lifting technique. Minor burns from heat bonding panels together. | 4 | 2 | High | Design liner orientation (long seam down slope) reduces work required on sloping ground.<br>Preceding liners are maintained free of debris which may cause injury. |
| Leachate Collection System - HDPE pipes | Personnel injury when installing HDPE pipes. | Manual handling injuries.<br>Burns from welding HDPE. | 2 | 2 | High | Pipes to be handled in accordance with Australian Standard AS2033 - *Installation of polyethylene pipe systems*.<br>Appropriately qualified pipe welding technician to perform welding activities. |
| Leachate collection system - HDPE pipes | Use of hand tools or power equipment for HDPE pipe drilling and holes in concrete pipe | Manual handling injuries and power tool injuries. | 3 | 3 | High | Contractor will employ appropriately trained personnel to undertake these tasks.<br>Drilling equipment to be checked prior to use. |
| Leachate Collection System - Pumps | Personnel injury when installing leachate pumps | Hand or arm trauma. | 3 | 2 | Medium | Leachate riser pipes to be secured with concrete anchor block.<br>Correct manual handling techniques to be employed. |

| Construction Element | Description of Risk | Potential Impacts | Likelihood / Frequency | Consequence Severity Rating | Level of risk | Design Control Measures |
|---|---|---|---|---|---|---|
| Leachate Collection System - Aggregate | Personnel injury when placing leachate drainage aggregate | Trip, slip and falls or Being struck by machinery. | 3 | 2 | Medium | Contractor will employ appropriately trained personnel to undertake these tasks.<br>Effective communication between onsite machinery placing aggregate and site contractors working within cell footprint. |
| Separation Geotextile Installation | Personnel injury when deploying the rolls of separation material. | Slips, trips and falls, or injury due to incorrect lifting technique.<br>Minor burns from heat bonding panels together. | 4 | 3 | High | Design liner orientation (long seam down slope) reduces work required on sloping ground.<br>The aggregate material is placed as a smooth working surface. |
| Subsurface Drainage System | Personnel injury when placing 1200 mm diameter concrete sump. | Being struck by concrete sump | 3 | 3 | High | Correct machinery used for lifting.<br>Suitable clear area around lifting area, no personnel within clear area.<br>Bunding of flagging around perimeter of lifting area. |