

DEFINITIONS

Aquifer	A saturated, permeable geological unit that can transmit significant quantities of groundwater under ordinary hydraulic gradients
Commercial / Industrial Waste	Waste derived from commercial and industrial activities
Compactor truck	A waste collection vehicle which is able to compact / compress the collected waste materials, and consequently is able to carry more waste material.
Composting	The controlled aerobic decomposition of organic materials
Construction and demolition waste	Waste generated from construction and demolition activities
Daily Cover	Soil, earth, rock, mulch or like material which is placed over the exposed waste at the end of each day to ensure that it is covered to minimise litter, odour, fires and vermin
Domestic solid waste:	Solid waste generated at private residences / households
Garden Waste	Organic waste from gardens (such as clippings, grass, etc)
Geosynthetic Clay Liner	A manufactured product combining the benefits of a geosynthetic membrane or fabric with (usually) a bentonite clay to form a low permeable barrier to water / liquids.
Green Waste	Organic wastes including garden waste, food and wood wastes
Industrial premises:	Food manufacturing, sheet metal and steel fabricators, furniture makers, screen printing, paint making, automotive repair shops, fibre glass makers, tank manufacturing, petrol and oil distributors etc
Institutional premises:	Government offices, schools, colleges, hospitals etc
Landfill	Facility where wastes are buried for disposal
Landfill Cell	A constructed section of the landfill.
Landfill Fire	The combustion of landfilled wastes due to spontaneous combustion or human ignition causing high heat, smoke, vapour, and flames.
Landfill Gas	Gaseous emissions resulting from the decomposition of organic matter within the landfilled waste mass. The gas typically comprises 60% methane and 40% carbon dioxide
Landfill Liner System	The low permeable barrier that minimises the risk of leachate escaping from the landfill cell. Often the liner systems are

	constructed of clay or a combination of clay and a secondary layer such as GCL.
Leachate	Water that has percolated / migrated through landfilled waste and generally contains contaminants absorbed from the waste material
Methane	A colourless, odourless gas that is explosive when mixed with air in the range 5% - 15% methane.
Putrescible Waste	Waste which undergoes rapid biodegradation eg. household and commercial food waste, food processing waste
Recycling	The collection of selected waste materials, usually packaging, for making the same but new packaging eg. waste glass bottles to make new glass bottles, waste aluminium cans to make new aluminium cans
Reprocessing	The conversion of waste materials into another product / material eg. composting, which converts organic waste materials into compost
Re-use	Re-use of waste materials eg. Used glass jars for storing home made jam or spreads
Sanitary Landfilling	An engineered method of disposing of solid waste on land in a manner that protects the environment, by spreading the waste in thin layers, compacting it to the smallest practical volume, and covering it with compacted soil by the end of each working day or at more frequent intervals if necessary (ASCE, 1976)
Scavenging	Recovery of waste materials from the active tipping face of the waste landfill
Septage	Solids and liquid from septic tanks
Shredder	A machine designed to reduce the size of a range of materials including garden and wood waste through a cutting / shearing action
Sludge	Solids and liquid from waste water treatment plants
Small Vehicle Waste Disposal Facility	A facility specifically designed to provide a clean and convenient process for the disposal of waste delivered by small vehicles
Solid Waste:	Garbage, rubbish, trash, (in solid form)
Spadeable Sludge	A sludge which has dried sufficiently so as to be able to be moved using a spade.
Special wastes	Any waste which requires special management and includes but is not limited to customs wastes, biomedical waste, chemical waste, liquid wastes, highly odorous wastes, oils and batteries
Tipping Face	The area of the landfilling operation where incoming waste is

	deposited
Transfer Station	A facility designed to receive waste from a range of vehicle and to compact the received waste into larger containers / vehicles for transport to the waste disposal site
Vermin, insects and pests	Unwanted rats, insects (flies, mosquitoes, other), dogs, cats, pigs, goats, and birds
Waste management facility:	A facility which manages waste materials and may encompass a recycling centre, landfilling operation, and composting operation
Waste minimisation	Waste management measures encompassing the upper levels of the waste management hierarchy ie. waste avoidance, waste re-use, recycling, and waste reprocessing
Watertable	The surface of the underlying groundwater

APPENDIX A
CHECKLIST FOR REVIEW AND EVALUATION OF
AN EXISTING LANDFILL WASTE DISPOSAL OPERATION

CHECKLIST FOR A REVIEW AND EVALUATION OF AN EXISTING LANDFILL WASTE DISPOSAL SITE

1. PRELIMINARIES

- 1.1 Waste Depot:
- 1.2 Location:
- 1.3 Inspected By:
- 1.4 Date of Inspection:
- 1.5 Weather Conditions PRIOR to Inspection:
- 1.6 Weather Conditions DURING Inspection:
- 1.7 General Comments / Other Notes:

2. GENERAL

2.1 Site Facilities

- Gatehouse?
- Weighbridge?
- Wheel wash / Vehicle washdown area?
- Services Available?
- Recycling Area?
- Plant, Vehicle and Machinery Workshop/ Maintenance area?

2.2 Documentation?

- Licence ? Approval for Operation?
- Landfill Management and Operation Plan ?
- Closure and Rehabilitation Plan?
- Emergency Response Plan ?
- Previous Audits / Assessments?

2.3 Waste Generation

- Waste Types Accepted and Excluded?
- Waste Quantities?
- Special Wastes?
 - Hospital / Clinical Wastes?

- Quantity
- Management & Disposal?
- Animal Carcasses
 - Quantity
 - Management & Disposal
- Liquid Waste Disposal
 - Oils?
 - Sludges?
- Remaining Landfill Capacity?
- Remaining Landfill Life?

3. OPERATIONAL ASPECTS

3.1 Waste Disposal Operation

- Provide General Description
- Licensing and Approvals ?
- Types of Wastes Accepted
- Waste Quantities?

3.2 Site Supervision and Staffing

- No. Staff / Personnel?
- Duties of Staff / Personnel ?
- Hours of Operation
 - Weekdays
 - Weekends / Public Holidays
 - Emergency Operations

3.3 Site Security

- Site fenced ?
- Condition of Fence ?
- Lockable Access Gates ?

3.4 Waste Control Procedures

- Signage / Notifications
 - Traffic Controls

- Excluded Wastes
- Vehicle Inspections
- Waste Segregation?
 - Recyclables;
 - Green waste (Compostable organics);
 - Special Wastes?
- Weighbridge?
- Vehicle entry, waste quantity, waste type records/logs?
- Permitted / Excluded Wastes?
- Monitoring of waste during deposition, spreading, compaction and covering?

3.5 Equipment

- Machinery Used?
- Frequency of Maintenance, Checks, & Repairs ?

3.6 Preparation for Landfilling

- Clearing required?
- Excavation / Methodology?
 - Topsoil removal and stockpiling separate to bulk excavation?
 - Bund Construction (area cell method)
 - Trench Construction?
- Lining of waste Cell ?

3.7 Waste Deposition

- Separation of vehicle types ?
 - Small vehicles separated from compactor trucks during dumping ?
- Depth of each lift of waste?
- Length of Active Tipping Face ?
- Waste Compaction?
- Waste Covering?
 - Daily?
 - Intermediate?

- Final?
- Final Grading of cover layer (min 1%)
- Source of Cover? Cover Material Type?
- Quantity of Cover Used / Available?
- Special Wastes?

3.8 Rehabilitation & Landscaping

- Progressive Restoration of Site?
- Revegetation Activities?

3.9 Access Roads

- Safe entry and exit from site ?
- Condition of roads?
- Width and Type of Road ?
- Maintenance?
- Wet Weather Access?
- Emergency Access around site ?

3.10 Fire Control

- Fire break around site ?
- Fire Control Measures?
 - Extinguishers?
 - Emergency Action Plan / Procedure?
 - Water Tanker?
 - Water Source / Supply ?
- Communication to Fire Service ?

3.11 Management of Special Wastes

- Medical / clinical waste;
- Sludges / septage;
- Waste oil;
- Quarantine waste;
- Other;

4. ENVIRONMENTAL ASPECTS

4.1 Surface Water

What surface waters (rivers, streams, creeks, lakes) are located near the landfill site and what measures are undertaken to prevent them being contaminated by the landfill waste disposal operation?

- Size of upstream catchment?
- Topography? Elevation?
- Nearest Watercourse ?
- Diversion of Clean Upstream stormwater runoff ?
- Management of On-site stormwater runoff ?
- Sedimentation Basins?
 - Location
 - Size
 - Spillway
 - Operation & Management ?
 - Discharge
 - Flocculation
 - Monitoring
- Monitoring of Surface water discharge?
- Prone to Flooding?
- Existing Problems? Complaints?

4.2 Leachate Management

How much leachate is generated at the site and how is it managed?

- Leachate generation quantities?
- Leachate Collection?
 - Surface?
 - Subsurface?
- Leachate Storage / Treatment / Disposal
- Leachate Ponds ?
 - Location

➤ Size / Capacity?

- Monitoring
- Wet weather operation? Alternative Leachate Disposal Arrangements?
- Existing Problems / complaints?

4.3 Groundwater

Is the site underlain by groundwater? Where is it located and in which direction does it move? What is the groundwater used for? What measures are implemented at the site to monitor and protect the groundwater from contamination?

- Depth to Groundwater Level (GWL)?
- Groundwater Movement?
 - Direction?
 - Flow Velocity?
- Underlying Strata / Subsoils
 - Material?
 - Permeability?
- Management measures?
- Groundwater monitoring wells?
- Existing Problems / complaints?

4.4 Landfill Gas Management

- Monitoring ?
 - Surface?
 - Subsurface?
 - Existing Problems / Complaints ?
- Contingency Plans ?

4.5 Litter Control

- Existing Problems / Complaints?
- Current Control measures?
 - Daily Compaction of Waste?
 - Daily Covering of Waste ?
 - Litter Fences ?
 - Litter Patrols?

- Monitoring?

4.6 Vermin Control

- Existing Vermin Problems / Complaints ?
- Current Control measures
 - Daily Compaction and Covering of Wastes?
 - Ponding Water?
 - Pesticide/ Herbicide use?
 - Baiting and Trapping (feral cats, dogs, foxes)?
 - Bird Control (scarecrows, bird scares)?
- Monitoring

4.7 Dust Control

- Existing Dust Problems / Complaints?
- Current control measures?
 - Water Cart?
 - Sprinklers?
 - Daily compaction ?
- Monitoring?

4.8 Noise Control

- Existing Noise Problems/ Complaints?
- Current Noise Controls?
 - Equipment properly silenced
 - Mounding & Vegetation Screens?
- Monitoring?

4.9 Visual Amenity

- Current Views
 - Direct View from residential area
 - View from commercial / industrial areas
 - View from transport routes?
- Current Control Measures
 - Mounding?

- Vegetation Screens?
- Landscaping?

5. RELEVANT GOVERNMENT AGENCIES

- Identify all relevant Government agencies involved in waste management. Define the roles and responsibilities of the various departments and provide contact details.

6. FUNDING OF WASTE MANAGEMENT

Describe the following:

- Costs of providing waste collection services? (Refer Appendix G if required)
- Costs of establishing and operating the waste disposal site? (Refer Appendix G if required)
- Mechanisms used for recovering costs eg. fees for waste collection, fees for waste disposal?
- Source of funds for paying for waste management services / activities, equipment, waste disposal site and any other infrastructure?
- Funding for equipment, maintenance and operation?
- Funding for environmental monitoring?
- Funding for closure and rehabilitation of the site?
- Budget Allocation (1yr, 3yr, 5yr, 10yr outlook) ?

7. ATTITUDES / CULTURAL ISSUES

7.1 Public

- Awareness?
- Storage and discharge manner;
- Willingness to pay Fees;
- Complaints;
- Receptivity to fines;

7.2 Decision Makers & Government

- Awareness?
- Priority?
- Support

- Admin, Personnel
- Planning,
- Public Relations and Health Education
- Technical capability and support
- Financial capability and support.

APPENDIX B
EXAMPLE ANALYSIS OF WASTE MANAGEMENT COSTS
AND FUNDING ARRANGEMENTS

1. HOW TO DETERMINE SUSTAINABLE FEES FOR WASTE COLLECTION AND WASTE DISPOSAL

1.1 WASTE DISPOSAL FEES

The fees charged for waste disposal need to reflect the full costs of the landfill waste disposal operation, to be sustainable. The process to determine sustainable fees for waste disposal encompasses:

- v) Calculation of the life cycle costs of the proposed (upgraded) landfill waste disposal site including:
 - The cost to establish / upgrade the waste disposal depot;
 - The waste disposal site operating costs, over the whole life of the site, including management costs, labour costs, and equipment operation, maintenance and replacement costs;
 - Landfill site closure and rehabilitation costs, ie. for capping and revegetation; and
 - Landfill post closure management and monitoring costs – possibly for more than 20 years.
- vi) Determination of the cost for disposal of 1 tonne of waste, ie. total life cycle cost / capacity of the site (tonnes of waste);
- vii) Determination of the typical mass of waste brought in by various vehicle types. It will likely be necessary to undertake a waste disposal survey to determine such – see SPREP (1999).
- viii) Determination of the charges / fees for the various vehicle types based on the average mass of the waste per vehicle and cost per tonne of waste landfilled at the facility.

1.2 FEES FOR A WASTE COLLECTION AND DISPOSAL SERVICE

The fees charged for waste collection and disposal need to allow for both the waste collection costs and the waste disposal costs. The fees charged for waste collection and disposal need to consider the quantity of waste collected (for disposal) and the frequency of collection. Institutional, commercial and industrial waste generators generally generate larger quantities of waste than householders and receive a more regular, often daily, waste collection and disposal service. However, the fees they are charged do not commonly reflect this substantially higher, and more costly, level of service.

The process for determining the fees for a waste collection and disposal service should encompass the following:

- iv) Calculation of the cost of providing the waste collection service, on a per premise per collection basis, considering:
 - Vehicle capital costs;

- Vehicle operating and maintenance costs;
 - Labour costs; and
 - Management costs;
- v) Determination of the cost of disposal of the collected waste at the landfill waste disposal site – on a mass basis for various size bins. There will be a need to determine typical masses for the commonly used bin types – via a waste generation survey – see SPREP (1999).
- vi) Calculation of the charge / fee for the service provided to each premise on the basis of size of bin (mass of waste collected), no. of bins and collection frequency.

Local / site specific cost data should be used where available.

TYPICAL WASTE MANAGEMENT COSTS AND FUNDING ISSUES

1. WASTE COLLECTION SERVICE

- 1.1 Planning / Options Study
- 1.2 Privatisation of Waste Collection Services
- 1.3 Purchase of Waste Collection Vehicles
- 1.4 Operation of Waste Collection Services
 - Labour
 - Fuel
 - Maintenance & Equipment Replacement

2. LANDFILL PLANNING & DESIGN

- 2.1 Background Technical Studies and Reports
- 2.2 Landfill Design and Reporting
- 2.3 Preparation of Specifications & Tender for Construction
- 2.4 Management of Tender Process

3. APPROVALS

- 3.1 Environmental Impact Assessment
- 3.2 Development Application

4. LANDFILL ESTABLISHMENT / CONSTRUCTION

- 4.1 Access
 - Site Access Road (Construct / Upgrade);
 - Gatehouse;
 - Access Gate;
 - Weighbridge
 - Wheel wash
 - Internal Access Roads

4.2 Site Facilities

- Site Fencing
- Site Amenities
- Staff Lunchroom
- Site Office
- Machine & Vehicle maintenance workshop
- Machine & Vehicle storage
- Lighting
- Storage Shed
- Recycling / Materials Stockpile Area

4.3 Site Services

- Water Supply Connection
- Sewer Connection
- Power / Electricity Connection
- Phone Connection

4.4 Stormwater Management and Drainage

- Clean Stormwater Diversion Drainage
- Dirty Stormwater Collection Drainage
- Sedimentation Pond(s)
 - Excavation
 - Inlet works
 - Lining (if required)
 - Outlet works
 - Spillway

4.5 Leachate Management

- Installation of Groundwater monitoring wells
- Leachate Pond / Basin
 - Excavation
 - Lining

- Leachate Sump & Riser
- Leachate Recycling Pump
- Leachate Treatment & Storage
- Leachate Irrigation system

4.6 Landfill Gas Management

- Landfill Gas extraction / venting wells
- Landfill Gas extraction network
- Flaring System

4.7 Waste Cell Construction

- Clean stormwater diversion drainage around cell
- Waste Cell Excavation
- Waste Cell Lining
- Leachate Collection Drainage
- Access Ramp to Waste Cell
- Waste Cell Cover

5. LANDFILL OPERATION

5.1 Labour Requirements

- Landfill Site Manager
- Gatehouse Attendant
- Plant Operators

5.2 Machinery & Vehicle

- Landfill compactor / Dozer & Plant
- Recycling Machinery (Shredder / Woodchipper)
- Maintenance & Replacement of Landfill compactor / dozer & Plant

5.3 Cost of Services

- Water Supply Connection
- Sewer Connection
- Power / Electricity Connection
- Phone Connection

5.4 Miscellaneous

- Landfill Management and Operations Plan
- Environmental Monitoring

6. SITE REHABILITATION AND LANDFILL CLOSURE

- Closure & Rehabilitation Plan
- Landfill Gas Drainage Layer
- Final Capping
- Landscaping
- End Land use establishment

7. POST CLOSURE MANAGEMENT

- Leachate Management
- Environmental Monitoring

8. FUNDING STRATEGY PROCESS

- Review existing funding arrangement and waste management costs
- Prepare Cost estimate of proposed works;
- Forecast quantity of waste collected by proposed facility/services;
- Calculate cost of providing facility/service per tonne of waste
 - $\text{Cost/tonne} = \frac{\text{\$(Total cost of service/facility)}}{\text{(Total amount of waste managed) tonnes}}$
- Calculate likely fees for users of facility/ services
 - Eg. Consider Waste Depot Charges for
 - Cars, Vans, Utilities;
 - Small Trucks
 - Medium Trucks
 - Large Trucks
 - Waste Compactor Trucks
 - Eg. Consider charges for waste collection from different waste sources
 - Residential
 - Offices (Commercial)
 - Restaurants, Hotels, Motels, Guest houses (Commercial)

- Markets (Commercial)
- Industries
- Schools, Hospitals, Government Premises (Institutions)
- Agriculture
- Assess impact of likely charges
 - Socio-economic impacts;
 - Willingness to pay;
 - Political Issues
 - Adherence / Consistency with Waste Management Policies, Management Plan, etc
 - Differential Pricing to promote recycling ?
- Identify Likely Revenue Sources
- Negotiate Funding arrangements with Revenue Sources
 - Fees & External Funding ?
 - Phasing in of Fees / Phasing out of Funding ?
- Refer attached Example worked up for Tonga.

TONGA ENVIRONMENTAL PLANNING & MANAGEMENT STRENGTHENING PROJECT (TEMPP)

INTEGRATED DEVELOPMENT OF THE TAPUHIA WASTE MANAGEMENT FACILITY

SUMMARY OF COSTS

Item	Amount (Tongan \$)
1. Tapuhia Waste Management Facility	
1.1 Establishment Costs	\$1,525,450 To be funded by AusAID?
1.2 Operating costs (\$/yr)	\$141,810 \$/yr
1.3 Waste Disposal Cell No.2 - Establishment Costs	\$500,000
1.4 Waste Disposal Cell No.3 - Establishment Costs	\$500,000
1.5 Waste Disposal Cell No.4 - Establishment Costs	\$500,000
1.6 Equipment replacement costs after 10 years	\$445,000
1.7 Site closure and rehabilitation cost	\$872,840
1.8 Post closure management & monitoring	\$25,000 \$/yr for 20 years
1.9 Project design	\$40,000 Estimate only. To be confirmed
1.10 Project manager / construction engineer for construction / commissioning (8 person months)	\$150,000 Estimate only. To be confirmed
1.11 Training program for all WMF personnel (4 person months)	\$100,000 Estimate only. To be confirmed
1.12 Technical support program (after commencing operations - 8 x 7 day visits)	\$75,000 Estimate only. To be confirmed
1.13 GoA subsidy to operate Tapuhia over first 3 years	\$329,865
Sustainable waste disposal charge => \$30/1	
See attached schedule of proposed waste disposal fees for various size vehicles	
2. Improving the Urban Solid Waste Collection Service	
2.1 Planning / options study	\$25,000
2.2 Privatisation of waste collection service	\$50,000
Preparation of tender documentation	\$30,000
Management of Tendering process	\$80,000
2.2 Provision of New Waste Collection Trucks	\$300,000
Waste collection vehicles (compactor trucks)	3 Trucks \$100,000
2.3 Cost of MoH Operating Expanded Waste Collection Service	\$190,000 \$/yr
Waste collection trucks & crew	2 Trucks + crew \$95,000 \$/yr/crew
Sustainable waste collection and disposal charges:	
Residential premises	\$8.75 /premise/month
Other premises	\$30.00 /premise/month / per bin
- 6 days/wk - 240L MGB / 200L drum	\$15.00 /premise/month / per bin
- 3 days/wk - 240L MGB / 200L drum	\$10.00 /premise/month / per bin
- 1 day/wk - 240L MGB / 200L drum	\$10.00 /premise/month / per bin
2.4 GoA Subsidy to operate upgrade collection service for first year	\$100,000.00 Estimate only. To be confirmed
3. Community Education Program	\$100,000 Estimate only. To be confirmed
4. Closure and Rehabilitation of the Tukutonga Dump Site	\$600,000 To be funded by the NZ Government

TONGA ENVIRONMENTAL PLANNING & MANAGEMENT STRENGTHENING PROJECT (TEMPP)

**TAPUHIA WASTE MANAGEMENT FACILITY
PRELIMINARY COST ESTIMATE - ESTABLISHMENT COSTS (Tongan \$)**

Item		Amount (\$)
1. Preliminaries		\$40,000
2. General earth works and drainage		\$107,450
3. Roadworks		\$25,000
4. Waste Disposal Cell 1		
Earthworks	\$197,250	
Geosynthetic liner & associated works	\$140,650	
Leachate drainage system including pump sump	\$145,100	\$483,000
5. Leachate storage, treatment and disposal system		
Leachate ponds / treatment system		
Earthworks	\$62,500	
Liner	\$30,000	
Pumps, pipework, aeration system	\$30,000	
Leachate irrigation system	\$100,000	\$222,500
6. On Site Transfer station		
Earthworks	\$7,150	
Retaining wall	\$15,750	
Roadworks	\$7,500	
Other misc	\$5,000	\$35,400
7. Compost area		
Subgrade preparation	\$12,500	
Bunding	\$100	
Hardstand	\$12,000	
Drainage works	\$25,000	\$49,600
8. Other Infrastructure		
Site fencing	\$40,000	
Gatehouse (refurbish existing)	\$5,000	
Office and amenities	\$20,000	
Maintenance shed	\$35,000	
Septage drying beds	\$65,000	
Recycling area / shed	\$20,000	
Signage	\$5,000	\$190,000
8. Utilities		
Water tanks and pipework	\$4,000	
Septic system	\$3,500	
Electrical services	\$10,000	
Telephone	\$1,000	\$18,500
9. Equipment		
Sheepsfoot roller	\$15,000	
Steel wheeled loader - modified (Cat 950G)	\$100,000	
Shredder / grinder	\$150,000	
Transfer truck	\$50,000	
Transfer bins	\$15,000	\$330,000
10. Groundwater Monitoring Wells (6)	\$24,000	\$24,000
	TOTAL	\$1,525,450

TONGA ENVIRONMENTAL PLANNING & MANAGEMENT STRENGTHENING PROJECT (TEMPP)

**TAPUHIA WASTE MANAGEMENT FACILITY
PRELIMINARY COST ESTIMATE - OPERATING COSTS (Tongan \$)**

Item	Quantity	Units	Unit Cost \$/unit	Cost \$	Notes
1 Utilities					
Electricity	3744	kWh	0.28	\$1,048.32	
Phone	1	Item		\$240.00	
2 Equipment Operation & Maintenance					
Steel wheeled loader / landfill compactor	15	hr/wk	55.00	\$42,900.00	Includes fuel and maintenance
Shredder mill	10	hr/wk	25.00	\$13,000.00	Includes electricity and maintenance
Leachate collection, treatment and disposal system	1	Item	10,000.00	\$10,000.00	Includes electricity and maintenance
Transfer truck	12	hr/wk	20.00	\$12,480.00	Includes fuel and maintenance
Excavator / bulldozer (for cover material extraction/recovery)	40	hrs/qtr	75.00	\$12,000.00	Includes labour fuel and
3 Staff / Labour					
Professional Officer (Site manager)(1/2 time)	0.5	\$ per year	6,500.00	\$3,250.00	
Site supervisor	1	\$ per year	4,500.00	\$4,500.00	
Plant operator	1	\$ per year	3,000.00	\$3,000.00	
Gatehouse attendant	1	\$ per year	2,500.00	\$2,500.00	
Labourer	2	\$ per year	2,000.00	\$4,000.00	
4 Environmental Monitoring					
	1	Item	10,000.00	\$10,000.00	Laboratory consumable costs only. Assumes MoH, TWB, MAF undertake analysis
5 Other Maintenance					
Road maintenance works	1	Item	5,000.00	\$5,000.00	
Maintenance of drainage system					By site labourers
Other general maintenance	1	Item	5,000.00	\$5,000.00	
			Sub total	\$128,918.32	
			Contingency (10%)	\$12,891.83	
			Total	\$141,810.15	
6 Equipment Replacement Costs					
Steel wheeled loader	100000			\$15,858.09	
Shredder mill	150000			\$23,787.13	
Leachate collection, treatment and disposal system	130000			\$20,615.51	
Transfer truck	50000			\$7,929.04	
Transfer bins	15000			\$2,378.71	\$70,568.49
	445000				

TONGA ENVIRONMENTAL PLANNING & MANAGEMENT STRENGTHENING PROJECT (TEMPP)

TAPUHIA WASTE MANAGEMENT FACILITY

SUSTAINABLE WASTE DISPOSAL CHARGES

Capacity and Life of Site

1. Estimated tonnage of waste to be landfilled at Tapuhia		
Total waste generated on Tongatapu (t/yr)	20400	Year 2000
Likely maximum (t/yr)	18360	
Likely Initial Quantity (t/yr)	7135	
Average quantity (t/yr)	12747	
2 Capacity of the site		
Airspace (m3)	450000	
Approx. quantity of waste (tonnes)	270000	At 600kg of waste per m3 of airspace
3 Estimated life of site (yrs)	21.2	

Life Cycle Costs

1 Site establishment costs			Nil	Funded by AusAID (\$1.5 million)
2 Operating Costs				
	\$141,810 /yr		\$3,003,686	Over the full life of the site - 21 years
3 Future waste disposal cell development costs				
Waste disposal cell No.2		\$500,000		
Waste disposal cell No.3		\$500,000		
Waste disposal cell No.4		\$500,000	\$1,500,000	
4 Equipment replacements costs at 10 years				
Steel wheeled loader		\$100,000		
Shredder mill		\$150,000		
Leachate collection, treatment and disposal system		\$130,000		
Transfer truck		\$50,000		
Transfer bins		\$15,000	\$445,000	
5 Site closure and rehabilitation cost				
Cloure and rehabilitation plan		\$50,000		
LFG drainage system		\$75,000		
Capping layer (300mm compacted coral + GCL)		\$322,240		
Revegetation layer (100mm coral + 200mm soil)		\$395,200		
Landscaping		\$30,400	\$872,840	
6 Post Closure monitoring and Maintenance (for 20 years)				
Leachate management		\$200,000		
Monitoring		\$100,000		
Other general maintenance		\$200,000	\$500,000	
		Sub Total	\$6,321,526	
		Contingency (20%)	\$1,264,305	
		TOTAL	\$7,585,832	
		Landfilling cost per tonne	\$28.1	

TONGA ENVIRONMENTAL PLANNING & MANAGEMENT STRENGTHENING PROJECT (TEMPP)

TAPUHA WASTE MANAGEMENT FACILITY

PROPOSED SCHEDULE OF FEES FOR WASTE DISPOSAL

Vehicle Type / Waste Type	Year 1			Year 2			Year 3			Year 4			Revenue (T\$)	Fee (T\$) (Note 3)						
	Avg No. of Vehicles / yr	City of waste per vehicle (tonnes)	Total City of Waste (tonnes)	Fee (T\$)	Revenue (T\$)	Avg No. of Vehicles / yr	City of waste per vehicle (tonnes)	Total City of Waste (tonnes)	Fee (T\$) (Note 1)	Revenue (T\$)	Avg No. of Vehicles / yr	City of waste per vehicle (tonnes)			Total City of Waste (tonnes)	Fee (T\$) (Note 2)	Revenue (T\$)	Avg No. of Vehicles / yr	City of waste per vehicle (tonnes)	Total City of Waste (tonnes)
1 Car (sedan)	2547	0.05	127.4	Nil	Nil	3024	0.05	151.2	\$0.50	\$1,512	3578	0.05	178.9	\$1.00	\$3,578	4250	0.05	213.0	\$1.50	\$6,390
2 Car with trailer or Car (wagon)		0.1	0.0	Nil	Nil				\$1.00	\$0				\$2.00	\$0				\$3.00	\$0
3 Pick up / Van	8781	0.1	878.1	Nil	Nil	10634	0.1	1063.4	\$1.00	\$10,634	12245	0.1	1224.5	\$2.00	\$24,890	14699	0.1	1469.9	\$3.00	\$44,098
4 Small truck (1-3m3)	5952	0.25	1488.0	Nil	Nil	7112	0.25	1778.0	\$2.50	\$17,780	8415	0.25	2103.7	\$5.00	\$42,074	10020	0.25	2504.9	\$7.50	\$75,147
5 Medium truck (3-7m3)	2404	0.6	1442.4	Nil	Nil	2853	0.6	1712.0	\$6.00	\$17,120	3378	0.6	2025.6	\$12.00	\$40,512	4020	0.6	2411.9	\$18.00	\$72,357
6 Large truck (7-11m3)		1.5	0.0	Nil	Nil				\$15.00	\$0				\$30.00	\$0				\$45.00	\$0
7 V. Large Articulated truck (11-30m3)		5	0.0	Nil	Nil				\$50.00	\$0				\$100.00	\$0				\$150.00	\$0
8 Waste collection truck (15m3)	825	2.5	2063.1	Nil	Nil	980	2.5	2448.8	\$25.00	\$24,488	1159	2.5	2897.3	\$50.00	\$57,946	1390	2.5	3445.9	\$75.00	\$103,496
9 Waste collection truck (25m3)		5	0.0	Nil	Nil				\$50.00	\$0				\$100.00	\$0				\$150.00	\$0
Separated garden waste				Free	Free				Free	Free				Free	Free				Free	Free
Soil / rock / clean fill				Free	Free				Free	Free				Free	Free				Free	Free
Waste oil				Free	Free				Free	Free				Free	Free				Free	Free
Recyclable materials				Free	Free				Free	Free				Free	Free				Free	Free
TOTAL	20559		6009.9		\$0.00	24403		7133.5		\$71,335	28972		8440.0		\$168,800	34379		10048.6		\$301,488

Notes:
 1. Fee @ \$10/tonne
 2. Fee @ \$20/tonne
 3. Fee @ \$30/tonne

TONGA ENVIRONMENTAL PLANNING & MANAGEMENT STRENGTHENING PROJECT (TEMPP)

TAPUHIA WASTE MANAGEMENT FACILITY

PROPOSED FUNDING STRATEGY

Revenue Source	Year 1	Year 2	Year 3	Year 4	Total
1. Fees for Waste Disposal	\$0	\$71,335	\$168,800	\$301,488	\$541,623
2. Govt of Tonga	\$25,000	\$25,000	\$25,000	\$0	\$75,000
3. Govt of Aust	\$155,000	\$116,665	\$58,200	\$0	\$329,865
Total	\$180,000	\$213,000	\$252,000	\$300,000	Note 1
Forecast Qty of Waste	6000	7100	8400	10000	

Notes:

1. Revenue required @ \$30/tonne

TONGA ENVIRONMENTAL PLANNING & MANAGEMENT STRENGTHENING PROJECT (TEMPP)

1a. Current waste collection costs \$45,000 \$/yr for 1 very old garbage truck
 4 crew
 1250 services per week
 No disposal costs
 Transport to Tukumotonga
 No vehicle replacement costs
 \$36.50 per service per year

1b. Future Waste Collection Costs
 Equipment - 10 hrs/d 5.5 days/wk @ \$25/hr \$71,500.00 /yr
 Labour (1driver+3 crew) \$12,450.00 /yr
 \$83,950.00 /yr
 \$68.09 per service per year

2. Waste collection vehicle replacement costs
 10 year operational life 936,000 Services per vehicle life
 Cost of replacement vehicle \$100,000
 \$0.11 per service
 \$5.56 per service per year

3. Extra transportation costs
 Assume Nil - offset by improved efficiency & new equipment

4. Waste disposal costs
 Residential premise \$33.95 per residence per year
 6.2 persons per household
 0.5 kg /person/d
 \$30/tonne

 Other premises
 - 6 days/wk - 240L MGB / 200L drum \$234.00 per MGB per year
 - 3 days/wk - 240L MGB / 200L drum \$117.00 per MGB per year
 - 1 day/wk - 240L MGB / 200L drum \$39.00 per MGB per year
 Avg 25kg of waste per bin per service
 \$30/tonne

3. Waste Collection and Disposal Costs (based on future waste collection costs)
 Residential premise \$107.59 per residence per year
 \$8.97 per residence per month

 Other premises
 - 6 days/wk - 240L MGB / 200L drum \$307.64 per MGB per year
 \$25.64 per MGB per month
 - 3 days/wk -- 240L MGB / 200L drum \$190.64 per MGB per year
 \$15.89 per MGB per month
 - 1 day/wk - 240L MGB / 200L drum \$112.64 per MGB per year
 \$9.39 per MGB per month

4. Waste Collection and Disposal Fees & Revenue

Premise	Existing No. of	No. of Bins per premise	Frequency of Collection per week	No. of Services per week	Qty of Waste (tonnes/yr)	Fee per Premise per bin per year	Fee per Premise (\$/yr)	Revenue (\$/yr)
Residences and Offices	951	1	1	951	1073	\$105	\$105	\$99,855
Schools and Stores	79	3	1	79	308	\$120	\$360	\$28,440
Restaurants, Motels, Hotels, guest houses	20	2	1	20	52	\$120	\$240	\$4,800
Restaurants, Motels, Hotels, guest houses	21	2	6	126	328	\$360	\$720	\$15,120
Whole store Industries	31	3	1	31	121	\$120	\$360	\$11,160
Talamahu Market	1	12	6	6	94	\$360	\$4,320	\$4,320
Government offices / premises	20	3	1	20	78	\$120	\$360	\$7,200
	1123			1233	2053			\$170,895

APPENDIX C
EXAMPLE LANDFILL WASTE DISPOSAL
RECORDING SYSTEM

WASTE DISPOSAL DEPOT DAILY LOG OF VEHICLES

Day / Date:

Gate Attendant:

Time	Vehicle ID eg. Rego	Vehicle Type (A - K) (Note 1)	% full ?	Weight - full (kg)	Weight - empty (kg)	Source of Waste (Note 2)	Types of Waste (Note 3)					
							%	%	%	%	%	%

Notes:

- 1. See attached page - Vehicle Types
- 2. See attached page - Source of Waste
- 3. See attached page - Types of Waste

WASTE DISPOSAL DEPOT

VEHICLE TYPES

Vehicle Type	Approx. Volume of Waste (m3)	Typical Mass of Waste (tonnes)		
Small Vehicles				
A - car / station wagon	0.5	0.06		
B - Van / utility / trailer	1.0	0.3		
Open Truck		Municipal Waste	Building & Demolition	Clean Fill
C - Single rear axle with two rear wheels or four small rear wheels	2.0	0.6	1.0	2.5
D - Single rear axle with four normal size wheels	3.0	1.2	2.8	5.6
E - Tandem rear axle (bogie drive)	7.0	3.8	7.1	11.0
F - Twin steer with twin rear axles	11.0	5.6	7.6	11.0
G - Tipping semi-trailer	30.0	5.8	15.0	15.0
Enclosed Truck and Compactor Trucks				
H - Single steer with single rear axle	10.0	2.7		
I - Single steer with tandem rear axle	15.0	6.4		
J - Twin steer with tandem rear axle	25.0	8.0		
Other				
K - Tractor with Trailer	To be determined			

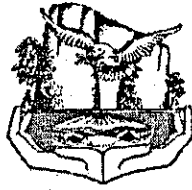
WASTE SOURCE

- Residential / Domestic** - waste from houses eg. household waste
- Commercial** - waste from commercial premises eg. shops
- Industrial** - waste from industrial premises eg. factories
- Building and demolition** - waste from building / demolition sites
- Agriculture** - waste from agricultural activities eg. from farms
- Institutions** - Hospitals, Schools ..etc
- Other** - other waste

WASTE TYPES:

1. - Vegetable / Putrescible / Food
2. - Paper & Cardboard
3. - Plastics
4. - Garden Waste : Grass, Leaves, Wood
5. - Leather & Rubber
6. - Metals
7. - Glass & Ceramics
8. - Miscellaneous

APPENDIX D
MANAGEMENT AND OPERATION PLAN
FOR A LANDFILL WASTE DISPOSAL SITE
TYPICAL TABLE OF CONTENTS



**Tonga Environmental Planning and Management
Strengthening Project (TEMPP)**

WORKING PAPER WP 57

**TAPUHIA WASTE MANAGEMENT FACILITY
MANAGEMENT AND OPERATION PLAN**

FINAL DRAFT

June 2001

Tonga Environmental Planning and Management Strengthening Project

Working Paper WP 57

Tapuhia Waste Management Facility

Management and Operation Plan

Final Draft

Table Of Contents

	PAGE
EXECUTIVE SUMMARY	
1 INTRODUCTION	
1.1 General	
1.2 Purpose and Objectives Of The Management and Operation Plan	
1.3 Scope Of The Management and Operation Plan	
2 BACKGROUND	
2.1 Solid Waste Management Plan for Tongatapu	
2.2 Environmental Impact Assessment	
2.3 Engineering Drawings, Specifications and Cost Estimate	
3 POLICIES, LEGISLATION, REGULATIONS, PLANNING AND APPROVALS	
3.1 Waste Management Policy	
3.2 Legislation And Regulations Relating To Waste Management	
3.3 Waste Management Planning	
3.4 Approvals	
3.4.1 Cabinet Waste Management Committee	
3.4.2 Ministry of Lands	
3.4.3 Ministry of Health	

4 MANAGEMENT AND OPERATION STRUCTURE

4.1 Background

4.2 Waste Management Working Group

4.3 Structure

4.4 Roles And Responsibilities

4.4.1 Waste Management Working Group

4.4.2 Ministry of Health

4.4.3 Ministry of Works

4.4.4 Department of Environment

5 THE EXISTING SITE

5.1 Site Location

5.2 Land Ownership

5.3 Land Use

5.4 Topography And Surface Water Hydrology

5.5 Soils

5.6 Geology

5.7 Hydrogeology

5.8 Climate

5.9 Vegetation

5.10 Fauna

5.11 Visual and Scenic Value

5.12 Social Environment

5.13 Cultural Environment

6 DESCRIPTION OF THE WASTE MANAGEMENT FACILITY

6.1 General

6.2 Site Access

6.3 Facility Layout

- 6.4 Site Fencing**
- 6.5 Site Entrance and Associated Facilities**
- 6.7 Site Services**
- 6.8 Internal Access Roads and Sign Posting**
- 6.9 Recycling Centre**
- 6.10 Small Vehicle Waste Disposal Facility**
- 6.11 Garden and Wood Waste Processing Facility**
- 6.12 Stormwater Drainage**
- 6.13 Landfill Waste Disposal Cell No.1**
 - 6.13.1 General
 - 6.13.2 Formation of Waste Disposal Cell
 - 6.13.3 Leachate Containment (Lining) System
 - 6.13.4 Leachate Drainage System
 - 6.13.5 Leachate Collection Sump/Pump Well
- 6.14 Leachate Treatment, Storage and Disposal System**
 - 6.14.1 Leachate Generation
 - 6.14.2 Leachate Treatment and Effluent Storage Facility
 - 6.14.3 Leachate Disposal
- 6.15 Septage/Sludge Drying Facilities**
- 7 SOURCES, TYPES AND QUANTITIES OF WASTE AND CAPACITY OF THE SITE**
 - 7.1 General**
 - 7.2 Sources of Waste**
 - 7.3 Types and Composition of Solid Waste**
 - 7.4 Quantities of Solid Waste**
 - 7.5 Special Wastes**
 - 7.6 Landfill Waste Disposal Capacity of the Site**

8 OPERATION OF THE WASTE MANAGEMENT FACILITY

8.1 General 38

8.2 Education of Users of Facility

8.3 Hours Of Operation

8.4 Facility Management and Staffing

8.5 Staff Training

8.6 Site Supervision and Operation

8.7 Gate Keeping and Waste Receival

8.7.1 General

8.7.2 Vehicle/Waste Inspection

8.7.3 Waste Disposal Fees

8.7.4 Record Keeping

8.8 Recycling And Materials Recovery

8.9 Garden and Wood Waste Processing Area

8.10 Separation of Construction And Cover Materials

8.11 Small Vehicle Waste Disposal Facility

8.12 Landfill Waste Disposal Operations

8.12.1 Staging of Landfilling

8.12.2 Waste Deposition, Spreading and Compaction

8.12.3 Supervision

8.12.4 Covering of Landfilled Waste

8.13 Equipment

8.14 Leachate Collection, Treatment and Disposal System

8.14.1 General

8.14.2 Leachate Collection Sump/Pump Well

8.14.3 Leachate Treatment and Storage Facility

8.14.4 Leachate Disposal (Irrigation) System

8.15 Management of Special Wastes

- 8.16 Septage/Sludge Drying Beds**
- 8.17 Health And Safety Procedures**
- 8.18 Fire Prevention and Management**
- 8.19 Site Security**
- 8.20 Access Road Maintenance**
- 8.21 Wet Weather Operation**
- 8.22 Operational Monitoring**
- 8.23 Complaints**

9 PUBLIC HEALTH AND ENVIRONMENTAL MANAGEMENT

- 9.1 General**
- 9.2 Vermin, Insects and Pests**
- 9.3 Odour**
- 9.4 Litter**
- 9.5 Fires and Smoke**
- 9.6 Stormwater**
- 9.7 Leachate**
- 9.8 Landfill Gas**
- 9.9 Other Wastewaters**
- 9.10 Dust**
- 9.11 Noise**
- 9.12 Visual Aesthetics**

10 PUBLIC HEALTH & ENVIRONMENTAL MONITORING

- 10.1 General**
- 10.2 Public Health Inspections**
- 10.3 Environmental Management Inspections**
- 10.4 Ground Water**
- 10.5 Stormwater**

10.6 Leachate

10.7 Landfill Gas

10.8 Other

10.9 Complaints

11 CONTINGENCY PLANS

11.1 General

11.2 Problem Management

11.3 Groundwater Contamination

11.4 Surface Water Contamination

11.5 Vermin, Insects and Pests

11.6 Litter

11.7 Odour

11.8 Noise

11.9 Fires

11.10 Landfill Gas Migration

11.11 Irrigation Operation

11.12 Equipment Failure

11.13 Electricity Failure

11.14 Deviations from the Management and Operation Plan

12 SITE REHABILITATION AND POST CLOSURE MANAGEMENT

12.1 General

12.2 Final Landform

12.3 Final Capping Layer

12.4 Future Land Use

12.5 Post Closure Management and Monitoring

12.5.1 General

12.5.2 Ongoing Management and Maintenance

12.5.3 Leachate Collection, Treatment and Disposal System

12.5.4 Ongoing Monitoring

12.5.5 Contingency Plans

12.5.6 Complaints

12.5.7 Reporting

13 REPORTING

13.1 Incident Reporting

13.2 Monthly/Quarterly Reporting

13.3 Annual Review Report

13.4 Post Closure Reporting

14 ANNUAL REVIEW OF FACILITY OPERATION

15 COMMUNITY CONSULTATION

16 COSTS AND FUNDING

16.1 Facility Establishment

16.2 Facility Operation

16.3 Facility Monitoring

16.4 Facility Closure and Rehabilitation

16.5 Post Closure Management and Monitoring

16.5.1 Post Closure Management

16.5.2 Post Closure Monitoring

16.6 Funding

16.6.1 Government of Australia

16.6.2 Waste Disposal Charges

17 REFERENCES AND BIBLIOGRAPHY

FIGURES

APPENDICES

Appendix A - Operational Checklists, Records and Procedures

Appendix B - Public Health Monitoring Checklists

Appendix C - Environmental Monitoring Schedule, Checklists and Procedures

Appendix D - Details of Costs

APPENDIX E
EVALUATION CRITERIA FOR SELECTING A LANDFILL SITE

TYPICAL CRITERIA FOR SELECTING A LANDFILL WASTE DISPOSAL SITE

1. POTENTIAL SITES

Potential Sites that could be considered include:

- Existing Quarries;
- Existing Waste Facilities (extension OF?);
- Agricultural Land;
- Government Owned Land;

2. PRELIMINARY ASSESSMENT

2.1 General

- Site inspection of identified site;
- Collect background information:
 - Mapping and topography;
 - Land Ownership details;
 - Land use
 - Geology & Hydrogeology;
 - Surface water and Hydrology;
 - Previous reports and studies.

2.2 Land Ownership Considerations

- Land ownership / Lease issues
- Existing Land Use
- Surrounding Land Use and Government Planning issues
- Possibility of getting neighbouring consensus
- Necessity of Compensation

2.3 Technical and Engineering Issues

- Site Access;
- Size / Capacity and Life of Site
- Site Geology & Hydrogeology;

- Site Topography;
- Surface Water and Hydrology;
- Availability of materials for liner (eg clay);
- Ease of Construction & establishment;
- Availability of Cover material;
- Availability for construction and landfill equipment access;
- Ease of Leachate management
- Ease of Surface water management
- Availability of Services
- Site Stability

2.4 Potential Environmental Impacts

- Distance to/from waste generation area;
- Traffic Impacts (noise, litter, dust);
- Compatibility with adjacent land uses
- Contamination of Groundwater
- Contamination of Surface water
- Landfill Gas Emissions
- Impact on Flora and Fauna
- Visual aesthetics / Impact on natural landscapes
- Possibility of Drinking water pollution
- Impact of flooding
- Distance from populated areas and public facilities

2.5 Economic Factors

- Distance to/from waste generation areas (Collection and transportation costs);
- Need to upgrade local road;
- Need for construction of:
 - Site access road;
 - Gatehouse
 - Site Amenities;

- Site fencing and screening
- Need to provide services;
- Waste disposal cell construction and establishment costs, including:
 - Excavation;
 - Lining;
 - Leachate Drainage;
- Landfill Gas Management Costs;
- Leachate Management Costs;
- Stormwater / Surface water management costs;
- Cover Material costs;
- Operational Costs, including
 - Staffing;
 - Equipment and Maintenance;
 - Services and Amenities;
- Site Closure costs including
 - Final capping;
 - Landscaping and revegetation
 - Final land use.

APPENDIX F
CHECKLIST FOR ENVIRONMENTAL IMPACT ASSESSMENT OF
A LANDFILL WASTE DISPOSAL SITE

CHECK LIST FOR ENVIRONMENTAL IMPACT ASSESSMENT OF A LANDFILL WASTE DISPOSAL SITE

1. THE PROPOSAL

1.1 Objectives of the Proposal

Clearly State and Justify the proposal for landfilling waste, discussing

- Role of any existing waste management strategies or policies already set in place by the government, especially including waste minimisation, reuse, recycle aspects;
- Anticipated level of performance in meeting the present and future communities waste management needs;
- Anticipated level of performance in meeting the environmental and health performance objectives;

1.2 Review of Waste Management Practices

Consider:

- Population and Development profile for the waste region or catchment;
- Significant sources and generators of waste, and the potential for growth of these sources and generators;
- Quantity (tonnes/annum) and waste stream classification (Refer Appendix I & J) of waste currently generated in the region or catchment, and the potential growth in each of these classes;
- Existing waste management facilities and services in the region (if any) including
 - Existing facilities such as landfills, tips, transfer & collection stations, composting, reprocessing or recycling facilities;
 - The existing capacity of these facilities to meet the existing and future waste management needs of the community;
 - Any commitment to close the existing facilities;
 - The appropriateness of the location of the existing facilities to the principal generators and sources of waste;
- Any waste management options as alternatives to landfilling

1.3 Permitted Wastes

Outline the wastes permitted at the landfill including:

- The quantity (in tonnes/annum) and characteristics (waste stream classification, source) of wastes to be accepted (Refer Appendix I & J);

- The quantity (in tonnes/annum) and characteristics of waste that will require special management measures (eg. Hospital / Clinical, Hazardous, Chemical wastes, etc.)
- The quantity (in tonnes/annum) and characteristics of waste that will be accepted for recycling/composting (eg. Greenwaste, aluminium cans, etc)
- The wastes that will be specifically excluded
- Major sources or generators of wastes

1.4 Review of any landfill on or near the site

Consider:

- The catchment and performance of the existing landfill in terms of:
 - Quantity of waste received;
 - Quality of waste received;
 - Shortcomings of the existing landfill to meet the needs and expectations of the communities existing or future needs, or environmental, or health goals
 - The future role of the existing landfill including any proposal to modify, upgrade, decommission, or integrate the existing facility with the new proposal

1.5 Establishment & Operation of the Landfill

Consider:

- Waste reception procedures
 - Waste reception areas for trucks and smaller vehicles, any waste transfer facilities to the working face;
 - Procedures for inspecting, testing and sorting waste
 - Any pre-landfilling treatment procedures for waste such as:
 - Shredding
 - Compacting
 - Bailing
 - Chemical treatment
 - Procedures for monitoring compliance with permitted wastes at:
 - Gatehouse;
 - Recycling centre;
 - Within waste Cells
 - Protocols for handling wastes not permitted at the facility if discovered
 - Procedures for record keeping of wastes received

- Recycling Procedures

Consider:

- Procedures for waste recovery and transfer to other sites
- Procedures for identifying, sorting, separating, compacting, temporarily storing wastes, other handling processes in preparation for recycling or reuse of wastes
- Any on-site reprocessing, such as composting
- Any measures associated with these activities to prevent unacceptable noise, odour, dust or visual impacts.

- Cell Preparation

Consider:

- If a purpose constructed void will be used for landfilling, or an on site quarry is required to obtain cover and landscaping material:
 - Outline the methods of extracting , processing, transporting and sorting the extracted material, considering the geological characteristics of the extracted material and underlying geological formation;
 - Outline the staging of excavation;
 - Outline the slope of the excavated area;
 - Outline erosion and water control measures within the void;
 - Outline haul road locations and construction ;
 - Discuss the potential for use of the extracted material on site as cover material or landscaping, or off-site for minerals recovery or as building material;
 - Discuss the material requirements for landfill cover and landscaping and the adequacy of the on-site material to meet the requirements;
- If an existing void is to be used for landfilling:
 - Outline the works required in preparation for landfilling, including stabilisation or adjustments to void floor and walls;
 - Outline erosion and water control measures within the void;
 - Outline haul road locations and construction;

- Cell Management

Consider:

- Propose sequence of filling the void;
- Areas reserved for disposal of 'special wastes';
- Special management protocols;
- Cell filling procedures including

- Maximum lift heights;
- Working face size and slope
- Methods of compaction and compacted density of waste;
- Any additional stabilisation works;
- Daily, intermediate and final cover protocols, including material type, thickness and management
- Management program for daily dust, litter, bird, pest and vermin.

- Leachate and Landfill Gas Emissions

Consider:

- Predicted Leachate and Landfill Gas emission likely to be generated including
 - Major constituents of leachate and landfill gas during the various phases of waste decomposition;
 - Likely quantities of leachate and landfill gas during the various phases of waste decomposition;
- Proposed management practices including
 - Cover material type and management;
 - Surface water controls;
- Type and quantities of waste to be landfilled;
- Proposed barrier to prevent leachate or gas emissions from contaminating surrounding soils and water, including
 - Characteristics of the barriers' including thickness, permeability, flexibility of components and layers of the barrier system;
 - Integrity of the barrier system, the likely presence of imperfections and/or joins that could compromise its effectiveness, the likely reaction between the barrier material and leachate;
 - Efficacy of the barrier to contain or immobilise hazardous components of the leachate;
 - Risk of rupture or failure of the barrier (eg. Effect of root intrusion, cracks, corrosion, effects of operational activities
- Design parameters of the cover material
 - Characteristics of the cover material, including thickness, permeability, method of laying, material type;
 - Monitoring to ensure design standards are met;
 - Maintenance program to maintain the efficacy of the system
- Design and Location of the leachate management system;

- Location and capacity of drains, holding tanks, pits, & dams;
- Design parameters, eg volume of leachate allowed to accumulate over the liner or in storage;
- Maintenance program to maintain the efficiency of the drainage and storage system;
- Measures to deal with flood and high rainfall events
- Leachate treatment system
 - Proposed use and/or disposal options for leachate;
 - Proposed quality of leachate to be discharged to sewer, natural body, recycled, reused, or irrigated;
 - Proposed treatment system
- Design and Location of Landfill Gas Treatment System
 - Extraction system components & and storage;
 - Management system for any condensate
 - Maintenance program to maintain the efficacy of the system
 - Systems for disposal or use of gas
 - Performance standards for any combustion or oxidation including risk management and gas emissions
 - The performance of any power generation systems, including the efficiencies of gas use and emissions
- Surface Water Management System
 - Measures to prevent off-site surface water from flowing into any landfilling, working or storage areas (including bunding);
 - Measures to contain, collect, and manage surface water within landfilling, working or storage areas
 - Parameters of any first-flush or storage systems;
 - Proposed use or disposal options for surface water collected on the site
 - Proposed quality of water to be discharged to sewer, recycled, reused, irrigated or discharged to natural water body
 - Any proposed water treatment system;
- Infrastructure and Management Issues
 - Establishment of site facilities including:
 - access roads,
 - parking,

- weighbridge,
- administration,
- maintenance compound;
- stores;
- wheel wash / wash down areas;
- Establishment of site security measures;
 - lighting
 - fencing
 - gatehouse
- Establishment of landscaping and bunding for visual and noise barriers
- Site Operation hours
- Establishment of site monitoring system
- Establishment of facilities / system to deal with emergencies (eg. Spills, fires, floods);

1.6 Site Layout Plans

Plans showing:

- Existing site contours and significant environmental features
- All components of Landfilling Facility, including
 - Full extent of landfilling operations
 - Proposed staging and final contours
 - Areas to be excavated for cover or topsoil material, storage and processing areas for material, storage of barrier materials
 - Schematic overview of surface water and leachate management systems, including stormwater, sedimentation and leachate drains and dams; leachate treatment and management facilities, any irrigation areas
 - Gas collection, treatment and management facilities;
 - access and haul roads, weighbridge, gatehouse, tipping areas, wash-down and wheel wash areas, parking areas;
 - recycling, reprocessing and transfer facilities;
 - administration and maintenance buildings, stores for pipes, fuels, chemicals, explosives, and other dangerous goods
 - monitoring locations
 - security facilities, fencing, lights, firefighting equipment;

- landscaping and rehabilitation works
- Any proposed buffer areas separating proposed facilities and nearby land uses.

1.7 Site rehabilitation, closure and end use

Consider:

- End use objectives of the site;
- Landscaping plans showing final contours for the site, species to be planted, staging of rehabilitation and measures to ensure the long term stability of the landfill
- Proposals for progressive rehabilitation of the landfill (including weed control);
- Proposals for post closure management including
 - Surface water and Leachate Management
 - Landfill Gas Management (including collection, disposal or use)
 - Landscaping maintenance
 - Ownership responsibilities and liability
 - Ongoing Monitoring

1.8 Consideration of Alternatives and Justification for Preferred Option

- Consider the environmental impacts or consequences of adopting alternatives including:
 - Structural and Non-structural options to remove the need for the proposal
 - Waste Minimisation, reuse, and recycling options
 - Administration practices to remove the need for additional landfill capacity
 - Transferring waste to another landfill instead of proposed landfill
 - Alternative waste disposal network options (provide 1 large regional landfill with transfer stations; several local or smaller landfills)
 - Alternative Landfill site locations
 - Alternative site configurations
 - Alternative transport & access routes
 - Alternative waste services
 - Alternative Landfill Management options
 - Alternative Site rehabilitation and end-use options
 - Do-nothing Options
- Justification of the selected Preferred Option
 - Ability to satisfy the objectives of the proposal

- Acceptability of Environmental Impacts
- Acceptability of Environmental Risks or uncertainties
 - Leachate and Landfill Gas containment
 - Reliability of design and management measures
 - Public health risks
- Ability to handle abnormal events (eg. fire, flood, earthquakes)
- Efficiency with which the proposal meets present demand;
- Flexibility of the proposal to meet future demand
- Opportunity to maximise recycling and reuse of wastes
- Efficient use of land, extracted material, energy, water and other resources
- Relative environmental, economic, technical and social costs and benefits of each alternative

2. THE LOCATION

2.1 Planning Context, Site Description & Locality Information

- Land Title Details, Land tenure; Owners consent
- Compatibility of proposal with any exiting Waste Management and/or Environmental Legislation, Regulations, Planning Policies, or Instruments
- Compatibility of the proposal with any easements or restrictions affecting the site, including any heritage or environmental protection provisions
- Maps, Plans or Aerial Photographs to clearly identify the location of the proposal in relation to
 - Surrounding Roads
 - Adjoining communities, dwellings, land uses or natural features likely to be affected by the proposal(in particular nearby airports or water supply resources)
 - Utilities, including transmission lines, pipelines, cables, or easements
 - Sightlines from dwellings and public places
 - Activities that, in combination with the landfill, will have the potential to generate significant cumulative impacts.

2.2 Overview of the Affected Environment

Provide general overview of:

- Meteorological characteristics of the site
 - Influence flooding, erosion, dust, odour and noise impacts;

- Wind direction and velocities and seasonal distribution;
- Rain intensities, frequencies, duration and seasonal distribution;
- Geomorphological factors
 - Major landform features, slope gradients, geological characteristics
 - Use and Vulnerability of natural water bodies potentially affected by the proposal
 - General hydrology;
 - Water quality;
 - Use and Vulnerability of Groundwater
 - General hydrology;
 - Water quality;
 - Characteristics of land
 - General soil characteristics
 - Salinity problems?
 - Acid Sulphate Soil potential?
 - Erosion problems?
 - Predominant vegetation communities
 - Potential habitat Values
 - Conservation Values
 - Heritage conservation, archaeological, historical , cultural , scientific or scenic significance

3. IDENTIFICATION AND PRIORITISATION OF ISSUES

3.1 Overview of Methodology

Outline procedures or methodology to identify and prioritise issues, including:

- Review relevant sources of information on potential issues:
 - Any relevant guidelines;
 - Environmental Impact Assessment for similar projects
 - Relevant research or reference material
 - Similar Projects operating in similar locations
 - Relevant preliminary studies or pre-feasibility studies

- Outcome of consultation with stakeholders
 - Planning focus meetings, community focus meetings, community workshops, or issues groups;
 - Meetings with stakeholders;

3.2 Outcomes of process

Summarise the outcome of the identification and prioritisation process, including:

- All key issues identified;
- All key issues that will require full analysis;
- All key issues that do not require full analysis, but are addressed in the mitigation strategy, and justification for the proposed level of analysis

4. ENVIRONMENTAL ISSUES

4.1 General

For all potential impacts, the following should be included:

- Description of the existing environmental conditions (baseline conditions);
- Analysis of the potential impact of the proposal on the environment, including
 - Level of confidence for the prediction of outcomes
 - Resilience of the environment to cope with the impacts;
- Proposed mitigation, management and monitoring program, including
 - Level of confidence that the measures will effectively mitigate or manage the impacts

4.2 Infrastructure Issues

Consider:

- Energy Issues
 - Energy requirements
 - Provision of electricity supply and potential impacts from provision of these services
 - Assessment of efficiencies of energy use
 - Consideration of alternatives
 - Potential for Landfill Gas use as a power source
 - Efficiency of power generation
 - Impact of on-site power generation on grid requirements
 - Potential Greenhouse Gas Implications

- Water Supply Issues:
 - Impact of proposal on local water supply system,
 - Need to upgrade / augment the water supply or reticulation system ?
 - Assessment of the efficiency of use of water in the operation of the landfill
 - Proposed water management plan including use, storage, reuse, recycling of water on the site
- Stormwater Management Issues:
 - Potential for increased stormwater impacts on neighbouring properties
 - Need for augmentation of stormwater management infrastructure
 - Need for diversion of natural flow channels
- Transport Issues:
 - Road, rail or shipping modes and routes for transport of waste, cover materials or chemicals
 - Alternative routes or transport modes
 - Ability of road, rail or waterways to handle the traffic
 - Physical condition of the road, rail or bridges on the proposed route
 - Any upgrade requirements or proposals for additional infrastructure
 - Potential impact of proposal on route maintenance program
- Traffic Issues:
 - Current traffic loads (volume and vehicle types) on roads leading to the site
 - Estimated average and maximum daily and weekly truck movements generated by the proposal
 - Noise and Odour impacts on sensitive land uses along the transport route (eg. Schools & Hospitals) and proposed mitigation measures
 - Road safety issues
 - Adequacy of road network to deal with traffic
 - Potential conflicts, or areas of high risk including any sight distance, constraints, existing congestion, poor road standards;
 - Potential risks of associated with transport of hazardous substance given road and traffic regime
 - Proposed measures to improve safety
- Other Infrastructure Issues:
 - Utility service requirements

- Telecommunications
- Gas
- Measures to protect existing easements, cables, pipelines

4.3 Groundwater Issues

Consider:

- Vulnerability of Groundwater to pollution and leachate contamination, including
 - Depth to groundwater
 - Overlying geological characteristics
- For aquifers at risk
 - Groundwater gradients, flow rates and flow direction;
 - Location of recharge, seeps or springs
 - Baseline groundwater quality assessment;
- Potential risk of contamination of groundwater, given the proposed location, design and management of the landfill, including:
 - Likely impact on groundwater movement and recharge areas
 - Adequacy of proposed measures to prevent transmission of leachate to groundwater
 - Proposals for Remedial action, should leachate containment fail
 - Proposals to monitor groundwater to identify early stages of contamination
- Location of nearby bores, current and potential users of groundwater, and potential impacts on existing and future uses of groundwater in the area
- Location and nature of any rising groundwater or salination problems in the area
- Assessment of adequacy of the proposed measures to prevent groundwater contamination;

4.4 Surface Water Issues

- Condition of any existing natural water bodies or wetlands
- Description of potential sources of pollution, likely pollution characteristics, magnitude and probable frequency of pollution events, and assimilation capacity of receiving environment, including:
 - Intentional or accidental discharges
 - Impact of erosion and sedimentation from site establishment (including cell establishment)
 - Discharges from workshops, washdown facilities, plant, equipment, fuel and chemical storage;
- Potential impact on other users of the water bodies from a change in water quality

- Adequacy of stormwater management measures to prevent off-site stormwater from entering the site;
- Adequacy of design and management measures to minimise impacts, including
 - Leachate and contaminated stormwater management measures
 - Erosion and sedimentation control measures
 - Measures to prevent contamination of water from accidental spillages
- Plan for ongoing monitoring and maintenance of water quality controls
- Plan for monitoring the water quality at the site and nearby water bodies likely to be affected

4.5 Flooding Issues

- Flooding status of the site, including frequency of flooding;
- If Flood liable
 - Direction of flood flow;
 - Vulnerability of cells, dams, ponds, storage facilities, and access roads to inundation or damage
 - Potential impact from inundation on
 - Future operation of the facility
 - Management of contaminated waters and litter on adjoining land and nearby water bodies
- Adequacy of flood mitigation measures
- Proposals to monitor stormwater to provide early warning of potential flooding
- Any future flood mitigation measures that may influence the impact of the proposal

4.6 Soil Issues

- Description of the existing site characteristics
 - Contours
 - Terrain stability
 - Slope gradient and length
 - Susceptibility to erosion and landslip
- Soil and Geological survey of site, including soil profile characteristics
- Potential direct or indirect effects on soils:
 - Existing level of soil contamination (type & extent)
 - Potential for erosion

- Soil characteristics
- Landform
- Meteorological characteristics
- Potential for lateral and vertical movement of groundwater (permeability of soils)
- Suitability of soils to be used as cover or for rehabilitation and final landscaping works
- Proposed measures to manage and monitor impacts including
 - Erosion and Sediment control plans and management

4.7 Air Quality Issues

- Identify local and regional air quality, and any land uses likely to be sensitive to air quality impacts
- Identifying fixed and mobile sources of air pollution from the site
- Assess the performance of any landfill gas containment, extraction, disposal or use, considering
 - Leachate barrier system
 - Type and management of cover material
 - Design and management of Landfill gas extraction system
 - Disposal or use of landfill gas
 - Air quality goals of flaring or electricity generation options
 - Adequacy of measure to prevent:
 - Migration of LFG off site via the subsurface
 - Accumulation of LFG in nearby buildings, structures, underground utilities
 - LFG causing fire or health hazard
 - Rehabilitation and landscaping plans
- Performance of any burning facility or incinerator
- Impact of the proposal on local and regional air quality considering
 - Sensitivity of nearby land uses
 - Likely chronic or acute risks on humans and natural ecology
 - Greenhouse and Ozone layer implications
 - Likely type, quantity, quality, frequency and times of emissions
 - Dispersion characteristics, having regard to the influence of local topography and weather conditions

- Possible generation of dust and odour contours
- Operational and meteorological conditions that would result in nearby dwellings and sensitive land uses being affected, and the likely frequency of this occurrence
- Migration and management measures to control generation and impacts of Landfill gas, odour, and other air pollutants, including
 - Windbreaks & buffer zones
 - Odour control measures
 - Dust management measures
- Monitoring programs including
 - Locations
 - Acceptable criteria
 - Remedial action (if required)

4.8 Health Issues

- Overview of public health risk associated with existing landfill or waste disposal facility
- Assessment of potential health implications, including
 - Likelihood of increasing existing health problems with the community
 - Air Quality, Water Quality, Soil Contamination, Road Safety
 - Transmission of pathogens, carcinogens, mutagens or teratogens
 - Potential exposure pathways
- If there is a significant health risk, a full health assessment considering:
 - Impacts from direct exposure, aspiration or consumption to substances with high risk implications
 - During operation
 - During rehabilitation and post closure
 - Transmission by pests and vermin
- Adequacy of the proposed design, management, mitigation and monitoring program with regards to health risks
- Adequacy of buffer zones from dwellings, recreational areas, Public roads,
- Potential for improvement to community health as a result of the proposal

4.9 Social Issues

- Affect of proposal on future development in the area

- Impact of Community Profile, structure & cohesion
- Impacts from construction or operation on the amenity of the area
- Social equity considerations
- Review of community consultative process

4.10 Noise Issues

- Existing acoustic environment,
 - Meteorological conditions
 - Topographical features
 - Buffer zones
 - Nearby land uses sensitive to noise
- Proposed hours of operation
- Potential noise sources
 - Site establishment & winning of cover
 - Operation of facility including landfilling and covering processes
 - Waste transport, reception, sorting or processing
- Prediction of noise levels at potentially affected dwellings
- Adequacy of mitigation and management measures, including
 - Alternative location of site access or noise generating facilities
 - Use of equipment with silencers
 - Design or management strategies to reduce impacts (eg bunding / landscaping)
 - Control hours of operation
- If blasting is involved:
 - Identify areas or properties likely to be affected
 - Management strategies for drilling, blasting, frequency of blasting
 - Prediction of vibration, overpressure and flyrock impacts based on proposed blasting pattern
 - Impacts of blasting on neighbouring dwellings and leachate barrier
 - Outline management and mitigation strategies
- Proposed monitoring program including proposed monitoring locations

4.11 Visual Issues

- Visibility of site from surrounding areas
- Visual impacts
 - Strategic viewpoints
 - Areas adjacent and within vicinity of site
 - Clearing of vegetation
 - Landfilling operations
 - Lighting
 - Litter across access roads
 - Final landform and final land use
- Proposed Mitigation and Management Measures
 - Site Layout and Design
 - Landscaping
 - Working Face Protocols to minimise litter
 - Protocols for transport vehicles to minimise windblown litter

4.12 Flora & Fauna Issues

- Identify plant and animal habitats and ecological communities
 - Populations and species
- Indicate significance of identified species
 - Local and regional scarcity
- Potential impacts on species and populations
 - Directly via clearing
 - Indirectly via changes in water, groundwater, noise, air impacts;
 - Impacts on number, distribution and size of population
- Sensitivity of species and communities to disturbance,
- Impacts from disturbance on biodiversity
- Landscaping and Rehabilitation proposal and role in mitigating impacts
 - Compensatory rehabilitation with indigenous species
 - Provision of new habitats

- Opportunities for re-colonisation
- Timing of major disturbances
- Identify potential weeds, pest species, vermin, feral animals
 - Measures to control and prevent infestations
 - Measures to prevent spread into localities adjacent to proposal
- Proposed monitoring to determine effectiveness of migration and verify predictions

4.13 Heritage Issues

- Identify items of heritage or archaeological significance
 - Collate information from previous research, heritage study or conservation plan;
 - Survey area likely to be affected
- Assess significance of items of heritage or archaeological significance;
- Assess potential impacts on items of heritage or archaeological significance;
- Propose measures to mitigate impacts or to conserve items of heritage or archaeological significance;
- Follow necessary procedures of local legislation, regulation or customs in relation to removing, destroying or relocating heritage or archaeological items.

4.14 Hazards Issues

- Fires
 - Assess considering
 - Topography
 - Climate
 - Surrounding Vegetation
 - Proposed site management practices
 - Assess adequacy of fire management protocols
 - Measures to reduce risks of on-site fires (eg. Use fire breaks)
 - Provision for fire fighting on site (eg. access, water supply)
 - Provision of training, equipment and maintenance
- Explosions & Accidental release of toxic substances
 - . List of hazardous chemicals, quantities used, transported, stored and disposed on site
 - Identification of possible causes of these incidents
 - Likelihood of Occurrence

- Consequences to public and environmental health and safety
- Adequacy of operation and emergency procedures
- Natural events (eg. Flood, earthquake, severe storms)
 - Assessment of risks:
 - Climate
 - Location
 - geological formation
 - on site management practices
 - likelihood of occurrence
 - assessment of likely performance of the landfill under these conditions;
 - assessment of adequacy of design and management procedures to maintain the integrity of the landfill

4.15 Economic Issues

- Cost & Benefits of establishing, operating, and maintaining the facility, including
 - Changes in waste management strategies resulting from the proposal
 - Possible economic benefits from reuse or recycling of wastes
 - Possible economic benefits from energy generation from waste or LFG
 - Flow on costs to augment any existing infrastructure indirectly affected by proposal (eg. Roads for transport route)
 - Additional employment resulting from the proposal
 - Impacts on property values adjacent to site
 - Impact on economic activities in the region
 - Economic benefits from rehabilitation and end land use of the site
- Proposed funding arrangement for the scheme
 - Financial implications on households or industry
- Any proposal for performance bond considering
 - Appropriate site rehabilitation and site closure arrangements
 - Failure of safeguards resulting in significant environmental impacts

4.16 Cumulative Impacts

Consider cumulative impacts from:

- Other existing or planned landfills in the region

- Nearby activities with similar impacts
- Advantages / disadvantages from placing similar operations, or activities with similar impacts in close proximity to each other
- Likely long and short term cumulative environmental impacts (eg. air, water, noise, public health).
- The ability of the receiving environment to achieve and maintain the environmental quality objectives for that region

5. APPROVALS AND LICENCING

- Identify all approvals and licences that are required under any legislation or regulation of the region;
- Involve relevant authorities with the project to ensure integrated approach in granting of approvals

6. MITIGATION MEASURES

- Outline how the environmental safeguards of the proposal will be implemented
- Include Specific Design, Operations and Monitoring procedures to ensure compliance with environmental objectives
- Include Landfill Management and Operational Plan (Refer Appendix L)

7. JUSTIFICATION OF THE PROPOSAL

- Provide Reasons why the proposal should be undertaken in the manner proposed
 - Ability to meet the objectives and goals within the broader waste management plan or policy for the region
 - Demonstrate economic efficiency to meet the short, medium and long term community requirements for waste services
 - Meet environmental performance requirements and objectives
 - Safeguard public health.

**APPENDIX G
SUGGESTED PROCEDURES FOR CONTROLLED
LANDFILLING OF SPECIAL WASTES**

SUGGESTED PROCEDURES FOR THE CONTROLLED LANDFILLING OF SPECIAL WASTES

1. PREPARATION FOR WASTE RECEIVAL

- Notification of delivery of special wastes must be provided to Waste Depot at least 24hrs prior to arrival on site, including
 - Source of Waste (Hospital, Airport, etc);
 - Type of Waste (Medical/Clinical Wastes, Animal Carcasses, Quarantine Waste);
 - Quantity of Waste
 - Date & Time of Delivery
- Waste Depot is to allocate a special area for disposing of the type of waste, considering
 - Location of the existing active waste disposal area
 - Future staging of the landfilling cells
 - Proximity of proposed filling location to adjacent lands
 - Land use of adjacent land
- In general, it is suggested that the area allocated for disposing of the special waste be located:
 - close to the centre of the landfill,
 - in the waste cell that is currently being filled (but away from the active work face), OR
 - in the next waste cell that will be filled;
 - not in the final lift of the landfill;
- Waste Depot is to prepare an excavation to store the special waste once delivered on site. The excavation must have
 - Sufficient capacity to store the indicated quantity of special waste, AND
 - Sufficient capacity to store the required 0.5m cover material over the special waste;
- Waste Depot is to ensure adequate cover material is stockpiled in close proximity to the excavation to enable immediate covering of the special waste
- Waste Depot is to ensure that adequate equipment to enable the immediate stockpiling of special waste without compromising the existing landfill operations. This may include:
 - Backhoe / Dozer for excavation and covering of special waste;
 - Compactor to compact cover over the special waste;
 - OH&S equipment and protective clothing for staff undertaking the disposal of the special waste

- Waste Depot is to ensure adequate staff is on site to enable the immediate stockpiling of special waste, without compromising the existing landfill operations. This may include:
 - 1 supervisor to supervise and record disposal of the special waste
 - operators to operate the required machinery
- Waste Depot is to ensure adequate access to the allocated special waste disposal area, including
 - Access ramp down to landfill waste cell;
 - Haul track to allocated special waste disposal area,

2. GENERAL LOADING AND HANDLING

- Wherever practicable, special wastes will be handled using equipment and machinery rather than manually;
- All care should be taken when handling special wastes including:
 - Constant visual checks for risk of accidental spillage;
- Regular Visual checks will be undertaken on containers holding special waste,
 - Prior to,
 - During; and
 - After the handling and transport of special wastewith particular consideration given to:
 - Adequacy of size of container to hold the volume of the special waste;
 - Adequacy of strength of container to hold the weight of the special waste;
 - Existence of punctures, leaks or cracks in the proposed container;
 - Ease of washing / disposal of container once special waste has been disposed;
- OH&S equipment and wearing of protective clothing will be provided for, and used by staff handling the special waste;
- Containment and remediation equipment will be on hand when handling special wastes;

3. TRANSPORTATION

- Waste Sources that anticipate regular disposal of Special wastes at Waste Depot should predetermine a transport route (and if necessary, an alternate transport route) between the waste depot and waste source considering
 - Land uses along the road
 - Condition and size of the road
 - Risk of accidental spillage

- Risk of flooding/ inundation of the road during transport
- Effect of accidental spillage
- Ease of containment and remediation of accidental spillage
- Wherever practicable, special wastes will be transported using vehicles, equipment and machinery rather than manually;
- All vehicles transporting special wastes will have Containment and remediation equipment will be on hand when handling special wastes;
- Special wastes will be transported in secure, covered / sealed, and leak proof containers.

4. ARRIVAL ON LANDFILL SITE

- Vehicles carrying special wastes access the site via a specially designated lane, separate from vehicles entering the site with normal solid waste
- As with all incoming waste, Vehicles transporting are to report to the Gatehouse prior to entry into the Waste Depot
- Vehicles transporting special wastes will be directed to the allocated special waste disposal area;

5. UNLOADING OF SPECIAL WASTES

Special wastes will be unloaded

- in a manner that prevents spread, dispersion around the allocated area
- directly into the excavation prepared for the special wastes
- in a manner that prevents contact with earthmoving, landfilling equipment

6. COVERING OF SPECIAL WASTE

- Special wastes will not be compacted prior to covering;
- Special wastes will be immediately covered once unloaded into the prepared excavation;
- Cover material for special waste will be:
 - in accordance with the cover material for normal wastes for the waste depot facility
 - compacted as per normal cover for the waste depot facility
 - be placed to a compacted depth of 0.5m over the special waste

7. DOCUMENTATION

- Information of all incoming special wastes will be documented (refer Appendix H), including
 - Date and Time of Arrival on site
 - Source of Waste

- Type of Waste
- Quantity of waste
- Date and Time of Burial
- Location of the allocated area for the special waste
 - Including waste cell number
 - Waste lift layer

8. SPECIAL REQUIREMENTS RELATING TO ASBESTOS WASTE

- Requirements relating to the collection and storage of asbestos waste are as follows:
 - a) Asbestos waste that is in the form of asbestos fibre and dust waste must be covered in such a manner as to prevent the emission of ant dust;
 - b) Asbestos waste that is in the form of asbestos fibre and dust waste must not be collected and stored except in accordance with the following procedures:
 - The waste must be collected and stored in impermeable bags;
 - Each bag must be made of heavy duty low density polyethylene of at least 0.2mm thickness, and have dimensions of no more than 1.2m in height and 0.9m in width;
 - Each bag must be sealed by a wire tie, and contain no more than 25kg of waste; and
 - Each bag must be marked with the words "CAUTION ASBESTOS".
 - c) If asbestos waste in any form is stored in a bag, the following procedures must be followed:
 - The bag must be placed in a leak-proof container that is used only for the purposes of storing asbestos waste; and
 - The container must be marked with the words "DANGER-ASBESTOS WASTE ONLY-AVOID CREATING DUST";
 - The container have a close-fitting sealed cover so as to prevent any spillage or dispersal of the waste.
 - d) Asbestos waste in any form must not be stored except in accordance with the following procedures:
 - The waste must be stored in a secure area so to prevent entry by unauthorised persons and to prevent the risk of environmental harm; and
 - The waste must, if it is practicable to do so, be stored separately from other types of waste.
 - e) If asbestos waste that is in the form of stabilised asbestos waste in bonded matrix is stored otherwise than in a bag in accordance with paragraph c) above, the following procedures must be followed:
 - If it is practicable to do so, the waste must be wetted so as to prevent the emission of any dust;

- In wetting the asbestos waste, care must be taken to ensure that the wetting process does not cause any emission of dust or lead to any discharge of polluted water; and
- The waste must be kept covered at all times.
- The requirements relating to the disposal of asbestos waste are as follows:
 - a) Asbestos waste in any form must be disposed of only at a landfill site that may lawfully receive the waste;
 - b) Disposal of asbestos waste in any form must be by way of burial;
 - c) Before disposal of the asbestos waste, arrangements must be made with the occupier of the landfill site for the purposes of ensuring that the asbestos waste will be covered:
 - Initially to a depth of at least 0.5m, and
 - Finally to a depth of at least 1m (in the case of stabilised asbestos waste is bonded matrix) or 3m (in the case of asbestos fibre and dust waste) beneath the planned final land surface of the landfill site.
 - d) The asbestos waste must:
 - Be disposed of in accordance with the arrangements under paragraph (c); and
 - Be buried to the initial depth on the same day it is received at the landfill site,
 - e) In disposing of asbestos waste in any form at a landfill site, the waste must:
 - Be unloaded in such a manner as to avoid the creation of dust; and
 - Not be compacted before it is covered; and
 - Not come into contact with any earthmoving equipment at any time.

