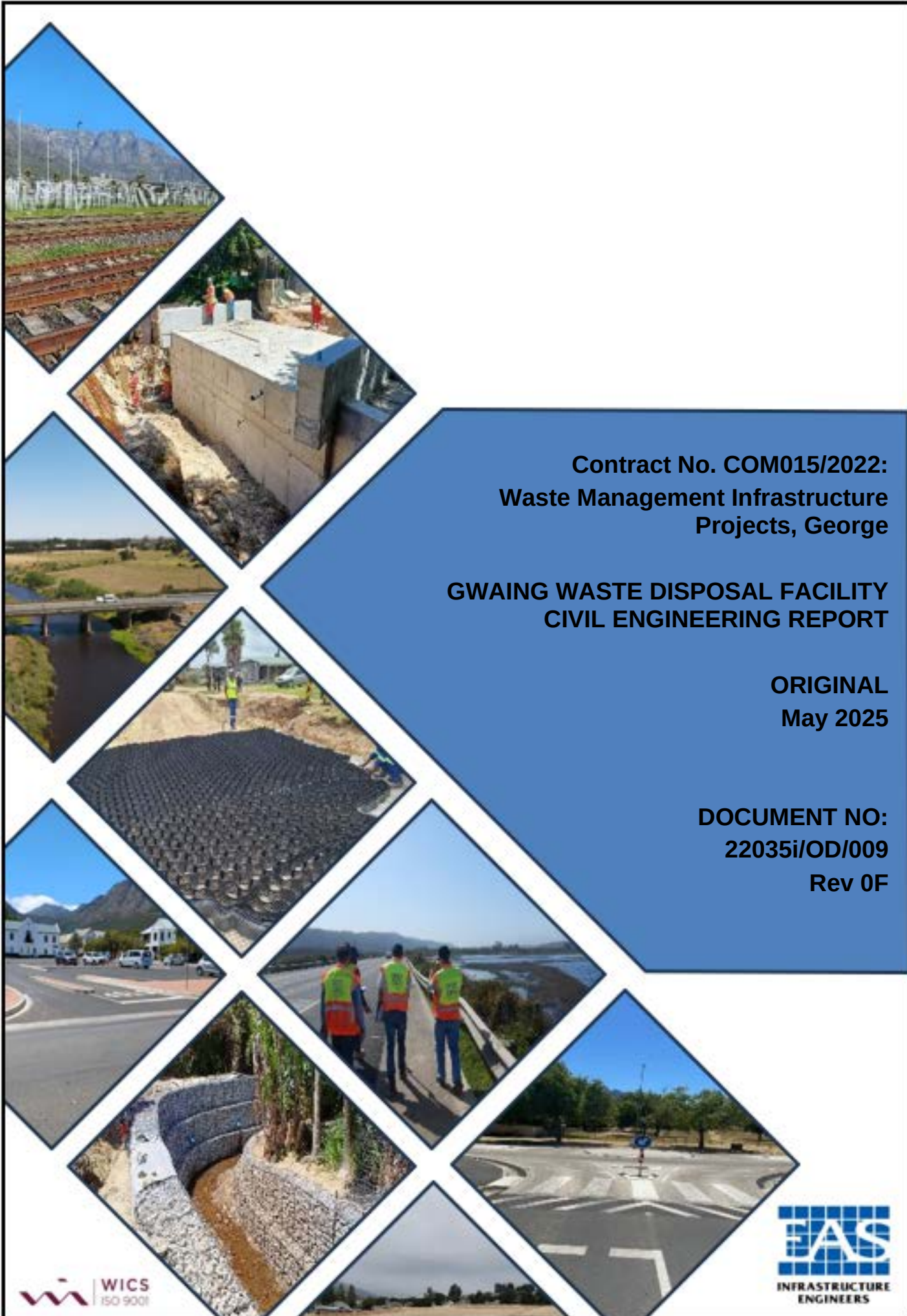




**Contract No. COM015/2022:
Waste Management Infrastructure
Projects, George**

**GWAING WASTE DISPOSAL FACILITY
CIVIL ENGINEERING REPORT**

**ORIGINAL
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1 LOCALITY

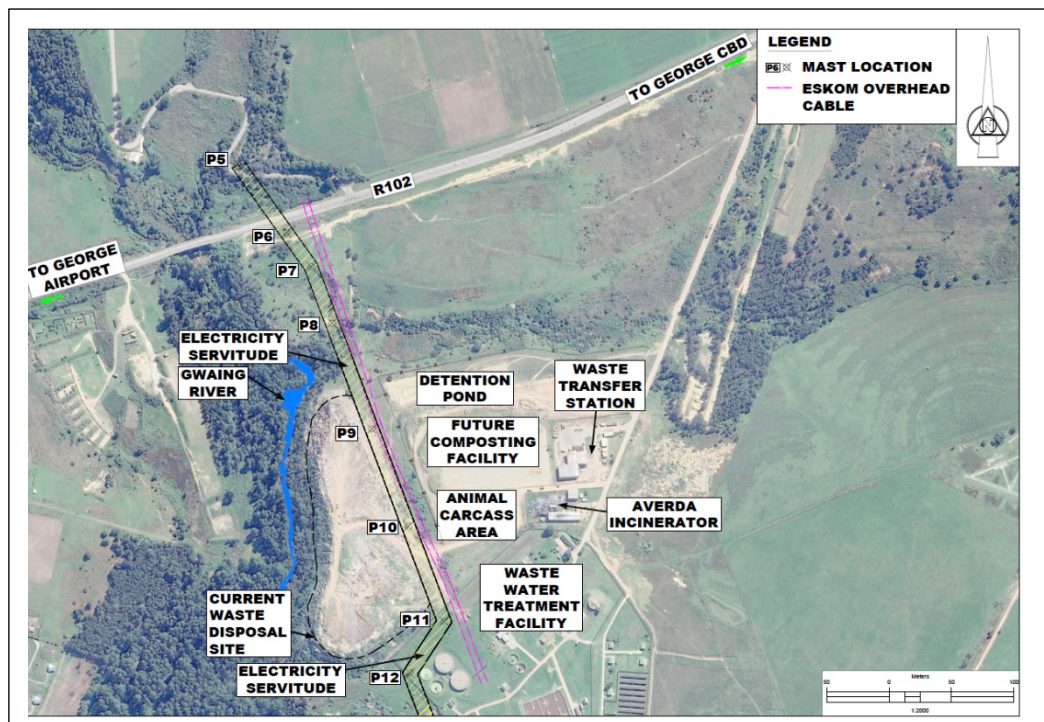


Figure 1: Locality Plan

2 INTRODUCTION

2.1 Terms of Reference

In December 2022, EAS Infrastructure Engineers were appointed by the George Local Municipality in Terms of the *Tender for the appointment of a Consulting Engineer for Waste Management Infrastructure Projects, for a period of five years Contract COM015/2022*.

2.2 Background

The Gwaing Waste Disposal Facility (GWDF) had been in operation since the early 2000's (initially without any appropriate licence). In order to bring the site to a compliant state, a Permit Application was submitted and in November 2005, a Record of Decision was issued¹. Since that time, the site has been granted the following authorisations:

- Original Permit B33/2/1000/10/P107
- Permit amendment B33/2/1000/10S/P107
- Variation Waste Management Licence 19/2/5/1/D2/19/WL0085/14
- Waste Management Licence for decommissioning 19/2/5/4/D2/19/WL0031/18 of 16 April 2018
- Waste Management Licence 19/2/5/4/D2/19/WL00139/19 of 6 Nov 2019 (issued in order to extend the "...date for decommissioning to commence to 10 November 2024...").

The Gwaing landfill reached its capacity in 2013. In the absence of viable alternative processes for the treatment and use of garden waste and Construction & Demolition (C&D) waste, disposal continued.²

During the early stages of planning for the decommissioning, it had been noted that the list of co-ordinates defining the site footprint, as reflected in the various authorisations, contained an error. As a result, a letter was issued by the Western Cape Government Department of Environmental Affairs and Development Planning (reference 19/2/5/4/D2/19/WL00139/19, dated 30 June 2024). The Department requested that the co-ordinates reflected in the letter, be determined by the Municipality to then apply for the said amendment.

The letter further noted that "...More than half the waste body is located outside the licenced footprint..." and recommended that "...the licence holder apply to rectify the illegal disposal of waste outside the authorized footprint of the WDF under section 24G of the National Environmental Management Act...". In this regard, the 24G process is currently underway and the outcomes will dictate requirements for the rehabilitation of the site.

¹ Basic Assessment Report...for the closure of the George Gwaing Landfill site. Report No GEO001/2014 by VR Environmental Consultants.

² George Solid Waste Management, dynamic compaction findings report, draft report
revision 00 October 2022 - delta

The granting of authorisations notwithstanding, the site has no formal engineering features (basal liners, leachate capture, leachate treatment etc.) and does not comply with current technical standards.

2.3 Scope of this Report

Given the above background, a Report was prepared in Nov 2025³, the purpose of which was to set out the proposed engineering measures for the decommissioning and rehabilitation of the Gwaing Waste Disposal Facility, as well as to make recommendations on the way forward. Since its compilation, further information has been obtained and an update is necessary. Accordingly, the report below incorporates new data and reflects any changes in approach etc. In addition, it will still serve as a companion report for the National Environment Management Act, Section 24G application.

Accordingly, the Report covers the following:

- Status quo
 - o Physical features and surroundings
 - o Waste footprint
 - o Waste volume/quantity
 - o Licenced boundary/footprint
 - o Other relevant boundaries
 - o Existing services
- Closure/rehabilitation options
- Estimated costs.

2.4 Location of the project

The site is located approximately 5 km to the West of George, adjacent to the R102. It is bounded, on the West, by the Gwaing River.

Figure 1 highlights various features of the overall site and surrounds (see section. 1 Locality).

³ GWAING WASTE DISPOSAL FACILITY CIVIL ENGINEERING REPORT: Rev0D- Nov 2025

3 STATUS QUO

3.1 Current operations

The site continues to receive builders' rubble and garden waste while the Transfer Station sends domestic waste to Petro SA in Mossel Bay. In addition, a compost facility (adjacent to the Transfer Station) is nearing the construction stage. It is intended to handle the green waste currently being disposed of on the dumping area.

According to the latest airspace report⁴ on average 13 000 m³ of waste per month, is disposed of at the site.

Although the site is only authorised to receive inert or clean waste (rubble and garden waste) there appears to be inadequate control of incoming waste (with regard to the type) and also of where and how, material is discharged. In addition, daily cover is not consistently applied. Due to the practice of the pushing of material over the side of the waste body, side slopes are unacceptably steep (approximately 1 Vertical to 1 Horizontal) and waste has spilled down onto the riverbank (see Figure 2 and Figure 3).

A further consequence is that waste has spilled down the slope, into the George Municipality electricity servitude on the Eastern side of the site. Apart from the waste being present in the servitude, one of the masts supporting the power line is in danger of being pushed over (see Figure 4 and Figure 5).



Figure 2: Steep side slope

⁴ Remaining Airspace Determination Report of Gwaing Waste Disposal Facilities, October 2025 Prepared by VPM Surveys



Figure 3: Waste spilling down onto riverbank



Figure 4: Waste spilling into servitude



Figure 5: Waste spilling onto power line, support mast

Figure 6 shows the extent of the waste body. This is an area of approximately 66 000 m². The maximum height is 30m above the surrounding ground and the waste has a volume of approximately 1.4 million m³ (October 2025 airspace survey).

It is crucial to note that waste continues to be disposed of on a daily basis and that overfilling is increasing. Clearly, the status quo cannot continue, and in keeping with the requirements of the Western Cape Government Department of Environmental Affairs and Development Planning, the Municipality is taking steps to seek alternatives, to cease operations and to close the site as soon as feasible. A consequence of this plan is that the incoming waste will have to be dealt with elsewhere.

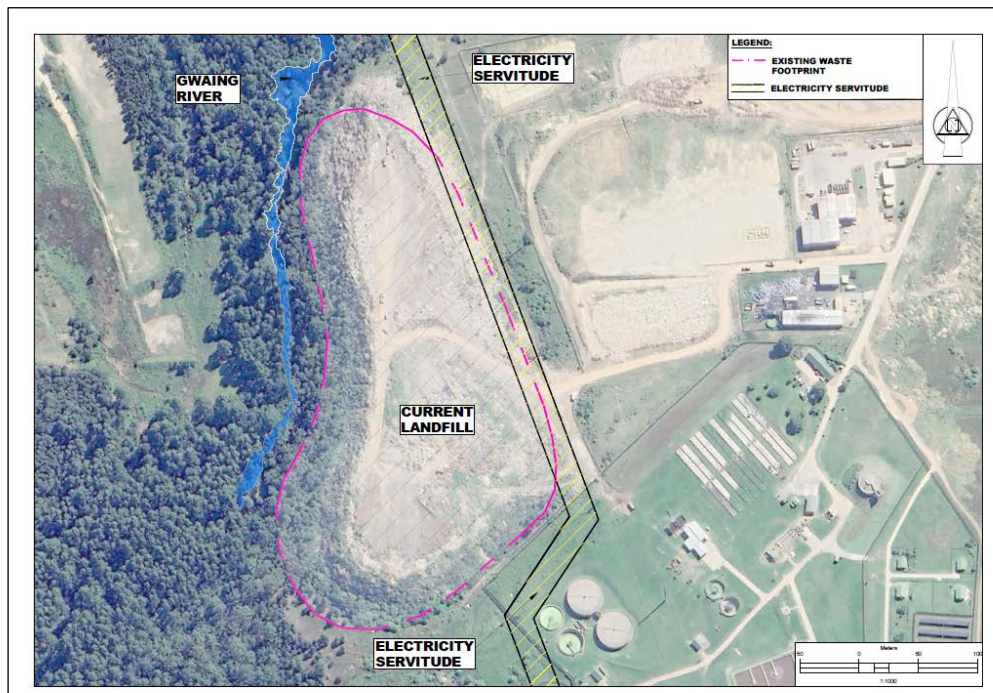


Figure 6: Existing Waste Body

3.2 Licenced footprint

The official footprint is shown in Figure 7 (based on the corrected co-ordinates as discussed in Section 2.2) and covers an area of 71 500 m². This clearly shows the extent to which waste has been dumped outside of the boundary. In addition, certain sections, although being within the boundary, are not feasibly accessible for disposal i.e. much of the area within the boundary, cannot be utilised for waste.

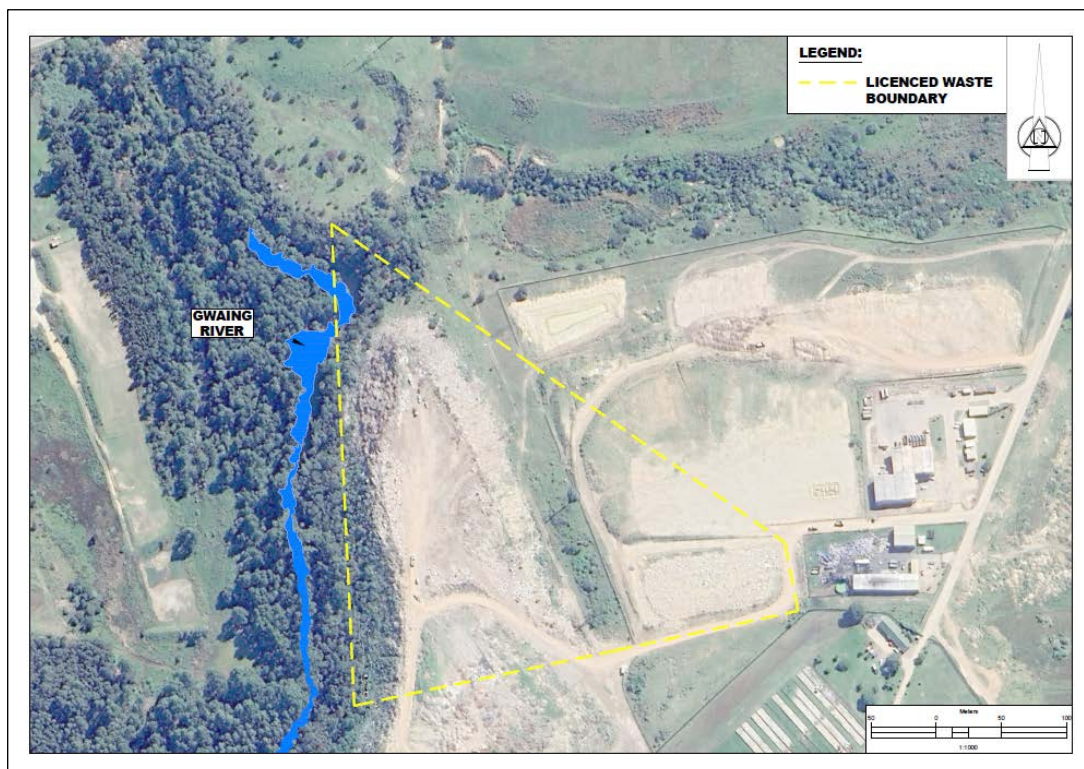


Figure 7: Licenced Boundary

3.3 Other relevant boundaries

The George Solid Waste Transfer Facility, the Averda, private incinerator and the ESKOM servitude, are shown in Figure 8.

3.4 Audits and compliance with Authorisations

The site is audited on a regular basis. Recent findings are:

- Internal Compliance Audit, 24 June 2024, score of 82.10% (Partially Compliant)
- DEA&DP Audit, 8 August 2024, score of 85.27% (Compliant)
- External Compliance Audit, 8 August 2024, score of 83.47% (Compliant)
- Internal Compliance Audit, 29 May 2025, score of 86.19% (Compliant)
- External Compliance Audit, 5 August 2025, score 56.04% (Non-Compliant).

The most recent audit highlights non-compliance and reinforces the need to close and rehabilitate the site.

3.5 Freshwater and Geohydrology

A number of recent reports highlight the risk posed by the Gwaing WDF, on the surrounding environment^{5,6,7}. Test results show an impact on the local groundwater and the Gwaing River. In addition, the encroachment of waste onto the immediate bank of the river is highlighted.

The Geohydrology Report notes that “.... *Leachate from the landfill site finds its way through the loamy soils and subsurface into the clayey soils underneath and adjacent to the slopes of the site. Most of the impact is retained in the clayey soils.....*”. This is an important point, insofar as it implies that there is little, to no, migration of leachate beyond the waste footprint. This must also be borne in mind when contemplating engineering measures for rehabilitation, so that the natural material is not unnecessarily disturbed.

The report recommends that additional/ongoing sampling and monitoring takes place, and that the site is closed and rehabilitated.

Any rehabilitation strategy will have to take these recommendations into account.

During a recent assessment in August 2025⁸ both groundwater and borehole water, were sampled. Conclusions drawn is that the impact from leachate is present in the soil profile below and adjacent to the landfill site, but groundwater and surface water quality shows no signs of leachate reaching these two sources.

Freshwater report(s) will be compiled as part of the 24G process and will carry information that will influence rehabilitation strategies.

3.6 Other reports

As part of the Section 24G process, a number of Specialist Reports have been completed and these will have bearing on proposed rehabilitation strategies.

⁵ Freshwater Report Gwaing landfill site Nov 2024. UMDES and WATSAN

⁶ Gwaing Waste Disposal Facility: Groundwater and Surface Water Sampling Report – February 2025 SRK Consulting

⁷ Report on the geohydrological assessment at the Gwaing landfill site - Veltwater Nov 2024.

⁸ Report on the Geohydrological Assessment at the Gwaing Landfill Site Monitoring and Impact Assessment Report – Veltwater Aug 2025

4 LIMITATIONS AND RESTRICTIONS

There are several regulatory and physical limitations to how the site can be configured.

4.1 River

To the West of the site, and within some 30m, is the Gwaing River. Presently, Waste from the Western slope, has encroached onto the riverbank and possibly into the river.

Restrictions and requirements associated with operations in the proximity of this water body, include:

- Operations to be no closer than 32m from the river edge⁹. This will result in a significant reduction in available airspace.
- Operations within 500m from the boundary of a wetland, and/or with the 1 in 100-year floodline, require a Water Use Licence¹⁰
- Water use from the river (nearby nursery)
- Fix the approved boundary/restrictions etc.
- Assess physical position of waste

It must be stressed that the final determination of the relevant restrictions and limitations, will emerge from the Section 24G process. These could cause assumptions and recommendations in this report, to change.

4.2 Licenced boundary

Figure 7 shows the boundaries of the WDF as per the current licence.

Any requirements for a buffer zone, will be determined during the Section 24G process.

4.3 Other waste facility boundaries

The George Solid Waste Transfer Facility and the Averda, private incinerator, are shown in Figure 8.

⁹ *The National Environmental Management Act (NEMA)*

¹⁰ *Waste Management Licence 19/2/5/4/D2/19/WL0139/19*

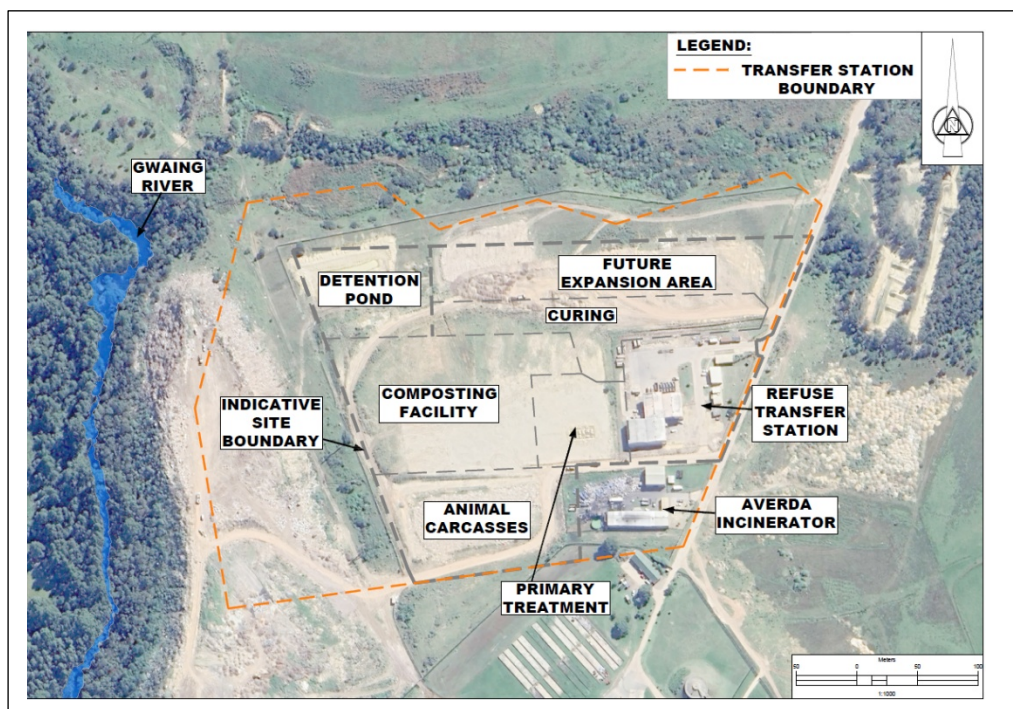


Figure 8: Other boundaries

It is to be noted that certain boundaries overlap the authorized GWDF footprint. This is discussed in **Section 5.2**.

4.4 The need to consolidate boundaries

It is clear that in order to reach a workable solution, the various boundaries will have to be consolidated to address any overlaps or gaps, and thereby to formalise a waste footprint. This is discussed in **Section 5.2**.

5 CLOSURE/REHABILITATION CONSIDERATIONS

5.1 Fundamental approach

With the goal that the site is being prepared for closure and not for on-going operations, the fundamental approach is informed by the following:

- To leave as much waste, in place, as can be authorised i.e. the minimum amount of surplus waste will be removed from the site.
- To honour and implement all relevant boundaries (servitudes, river, flood lines, licenced boundaries etc.). This will effectively define the footprint that remains and upon which waste can be present.
- To formalize the remaining footprint, define a new boundary and fulfil requirements of necessary waste and environmental authorisations.
- To engineer the waste body and then bring the site to a compliant, legal state, so that closure and rehabilitation can take place as soon as feasible (as per Western Cape Government Department of Environmental Affairs and Development Planning, requirements).

Limitations and requirements that underpin the fundamental approach and subsequent decisions on options, include:

- Licence requirements – with particular reference to the requirement for a 1 Vertical to 4 Horizontal (or flatter) side slope on the waste body (Ref 19/2/5/4/D2/19/WL0031/18, clause 5.2)
- Licence requirements – The requirement for a Water Use Licence (clause 5.7)
- Buffer Zone
- Buffer/offset from the Gwaing River
- Eskom Reserve – the 132kV and 66kV lines run to the East of the waste body
- Licenced boundaries of the Transfer Facility and Incinerator
- Cadastral boundaries (including the Wastewater Treatment Works).
- Other requirements of the 24G process.

5.2 Repositioning of licenced boundary.

Boundaries are one of the major considerations in contemplating rehabilitation options. It is thus necessary to rationalise the overlaps between boundaries. In this regard, the following is proposed:

- Reposition the Gwaing WDF boundary on the Eastern side, so that it runs on/along, the Western side of the ESKOM servitude
- Reposition the Transfer Facility's Western Boundary, to be on/along, the Eastern side of the ESKOM servitude
- Reposition the Northern and Southern sections of the WDF boundary, to be consistent with the waste footprint in those areas
- Reposition the Western boundary of the WDF to be 32m East of the centre of the Gwaing River.

Once the above has been achieved, it is then necessary to establish what remains of the current waste footprint. See **Figure 9** for the proposed boundary and waste footprint.

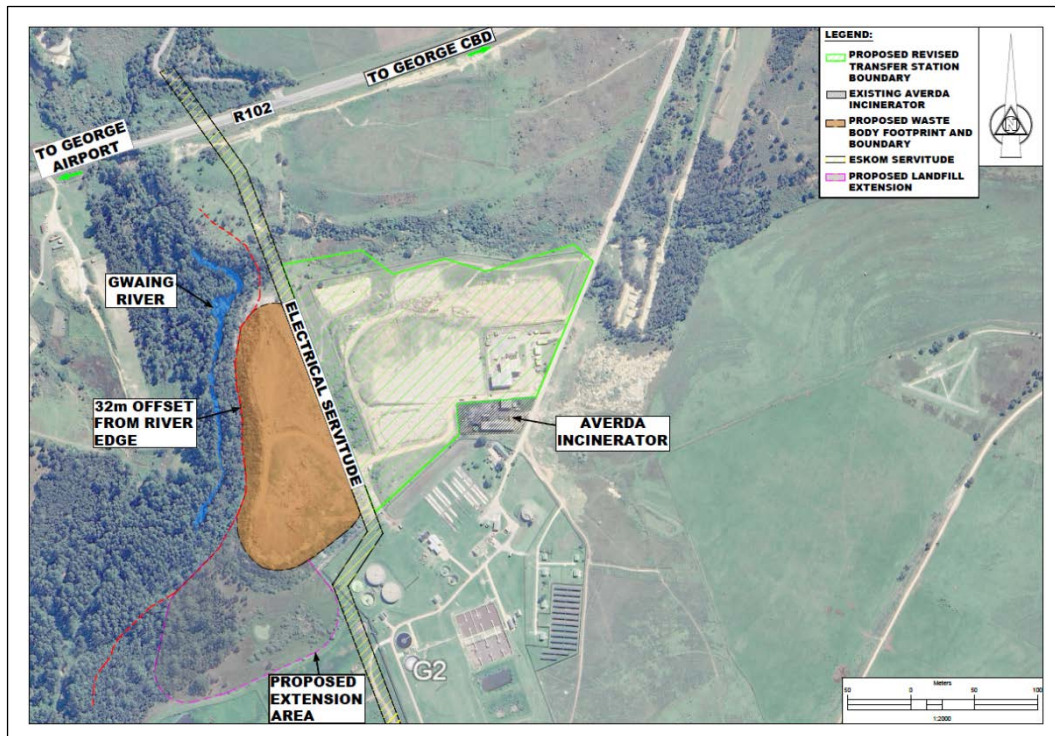


Figure 9: Proposed WDF boundary

5.3 Identification of the waste footprint

A further measure that will be necessary before adopting any rehabilitation strategy is to identify the waste footprint i.e. the area upon which waste will be left. Prior to any construction, careful observations will have to be made in the field, accompanied by the excavation of test pits/trenches. This is in order to as accurately as possible, determine the extent of the waste footprint. Thereafter, the practicalities of either accepting the position of waste and/or to selectively relocate or clean up relatively small quantities of loose and scattered waste, will have to be considered.

This will be an extremely important task and will contribute to the reduction in unnecessary costs.

6 CLOSURE/REHABILITATION OPTIONS

6.1 Engineering aspects common to all options

The following engineering measures will be common to any option that may be chosen. These include:

- Establish and fix the extent of the final waste footprint (as discussed above).
- Cut back sides of the waste body, to the approved slope (see Figure 10):
 - o Note that a slope of 1v to 4H is an authorization requirement
 - o 1V to 3H is an industry norm that recognizes the ability to carry out construction, as well the practicality of constructing the capping layers, on this slope.
 - o Construct benches as possibly required by design. These will allow for access, as well as the construction of stormwater management infrastructure (channels, berms etc.).
 - o Carry out Dynamic Compaction on slopes and benches (*if technically justified as being a feasible means of stabilizing slopes - see short discussion below*).
- Trim and shape the eventual top surface of the final waste body in accordance with the design and to allow working space for closure operations and construction, as well as to incorporate stormwater management measures.
- Construct toe stabilisation and erosion protection, infrastructure.
- Investigate perimeter toe area for presence of leachate, formulate and implement appropriate management measures.
- Construct capping and other rehabilitation features.

All of the above will be based upon a detailed engineering design and an assessment of slope stability. The latter will dictate the final side slope.

A further measure that will be common to all options is:

- Transport surplus waste to an alternative site(s).

6.1.1 Dynamic compaction

A Dynamic Compaction operation was carried out in October 2022. The purpose thereof was to establish whether this method would be feasible for the treatment of the Western slopes of the waste body (engineering and addressing the steepness of the slope).¹¹

Although this yielded positive results, the study stressed that “....*It should be noted that the purpose of the DC trial project was not to create additional airspace on the Gwaing landfill, but rather to determine whether it could be a feasible solution to reduce the steep western side slopes....*”. In this regard, this method may be seen as a companion strategy (as opposed to an overall solution) but needs to be assessed to demonstrate feasibility and efficacy.

¹¹ George Solid Waste Management, dynamic compaction findings report, draft report
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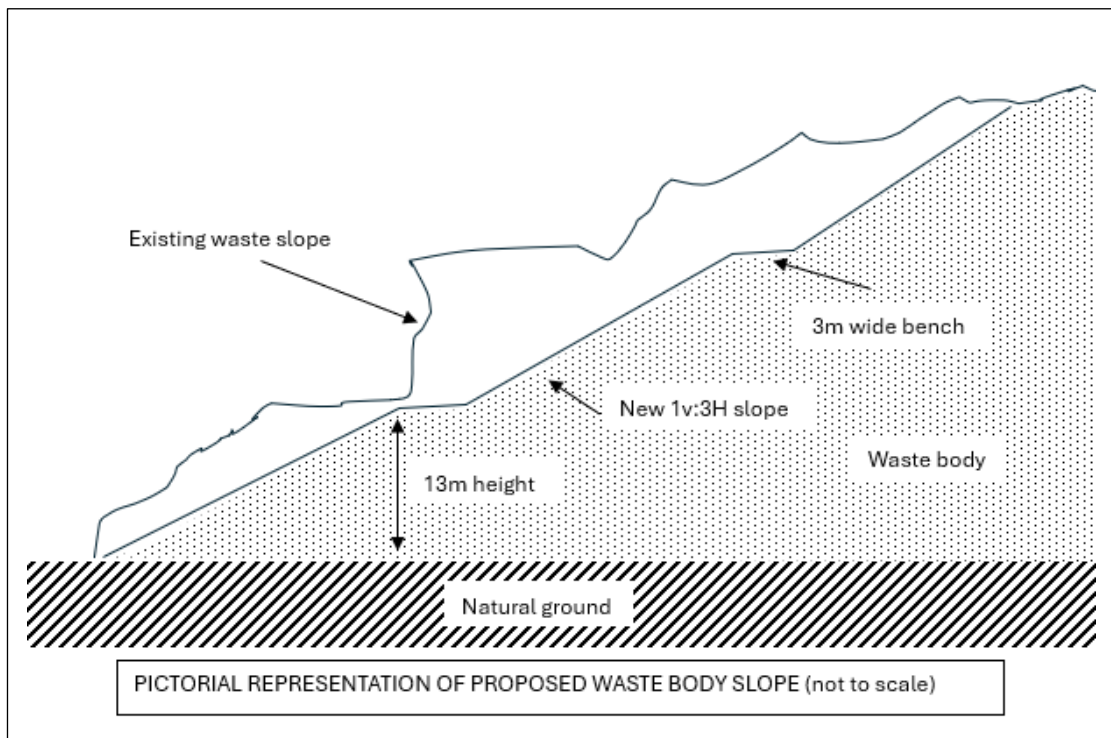


Figure 10: Proposed 1V to 3H slope

6.2 Option 1 – Do nothing (business as usual)

Continue with waste disposal operations as per present practices.

6.3 Option 2 - Rework waste body to be within the current, licenced boundary (river, Eskom, other WMF boundaries)

Honour all existing boundaries and establish what remains of the area defined by the current licenced boundary (See Figure 8).

6.4 Option 3 - Leave waste on current footprint and within a new, formalised boundary

This option will (a) be consistent with the repositioned boundary discussed in **Section 5.2** and (b) within a formalised, existing waste footprint (discussed in **Section 5.3**). The essence of this option is to leave as much waste as possible, where it currently is.

Figure 11 shows the proposed footprint and typical cross-sections through the waste body. It is important to note that the introduction of the 1V to 3H side slope results in a major reduction in the amount of waste that can be left in place. In fact, this slope allows for no platform or flat area on the top of the waste body. This demonstrates the historical, negative impact of the 1V to 1H (approx.) existing slope that has been built up over time.

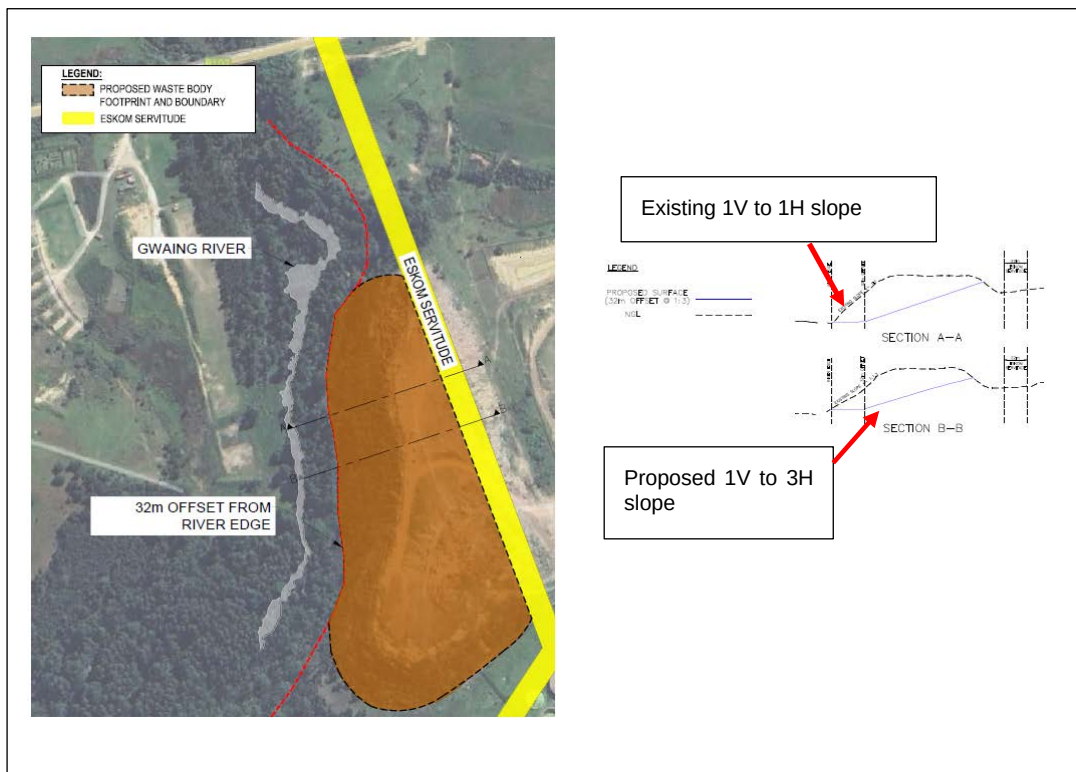


Figure 11: Proposed waste footprint and typical cross-sections

This option yields a waste body of some 394 000m³ that will remain in place with 992 000m³ having to be removed from site i.e. more waste has to be removed from site, than is left in place.

6.4.1 Options for relocation of waste (taking off site)

A feature of Options 2 and 3, is that waste will have to be taken off site and a licenced disposal facility will have to be used for this purpose. The closest suitable site is the Garden Route District Municipality Regional Landfill site, outside Mossel Bay. This is a distance of approximately 60km from the Gwaing WDF. This site has not been fully constructed and the adjacent PetroSA will have to be considered.

Other sites include Karwyderskraal, near Kleinmond and Aloes in Gqberga. Both of these sites are in excess of 350km from the Gwaing WDF.

The primary question in the case of the Garden Route site, is whether this quantity of waste will be accepted. In this context, some 992 000 m³ is under discussion. It is to be noted that the disposal site is being constructed in phases and that the amount of waste from the Gwaing WDF, will exceed the capacity of the first cell. As stated above however, the site is not yet operational.

6.5 Analysis of options

6.5.1 Option 1 (do nothing)

It can be said that the WDF is currently being operated on a “Do nothing” basis. Clearly this is not legal, not sustainable and therefore this option is not considered from this point.

6.5.2 Option 2 (remain inside licenced boundary)

It can be seen from Figure 7 that to stay within the licenced boundary, as well as to honour the other boundaries, would leave a very small footprint that would (a) not accommodate much waste, and (b) would require that a very large volume would have to be taken off site.

This option is deemed to be unworkable.

6.5.3 Option 3 (formalize the existing waste footprint)

Selecting this option would allow the maximum quantity of waste to be left in place. This is a major benefit (or the “least bad” option) as 394 000m³ can remain in place and 992 000 m³ would be sent off site.

This option is based upon side slopes of 1V to 3H.

Other side slope configurations:

If the slope were to be steepened to 1V to 2H, additional waste could be accommodated. This concept would have to be tested by carrying out detailed design calculations and slope stability assessments. A further assessment would have to be carried out to confirm that capping layer works could indeed be feasible at this slope.

By the same token, it is noted that a slope of 1V to 4H as required in the Licence, is unworkable.

Any strategy will require approval from the Department of Environmental Affairs and Development Planning.

This option is provisionally selected, but must undergo further assessment with respect to the associated options for the off-site disposal of the surplus waste.

6.6 Options for the off-site disposal of surplus waste

6.6.1 Option A (use adjacent area for new disposal)

If one were to ignore the need to rationalise boundaries, there appears to be a small area to the East of the waste body, that could accommodate waste (the so-called animal carcass area). Unfortunately, this area is too small (capacity of 30 000 m³ maximum) and due to the limited footprint, would be impractical to develop and operate. This option is thus set aside.

6.6.2 Option B (dispose of surplus waste at a new landfill in the vicinity)

The need to dispose of surplus waste, off site, can be satisfied by establishing a completely new landfill in the area (an undisturbed, or greenfield area). However, this could prove to be a time-consuming and complicated process (site selection, authorisation process, construction etc.). In addition, cost estimates would have to assess the feasibility of this option. This option is carried forward for assessment of estimated costs.

6.6.3 Option C (dispose of waste at alternate sites in the Municipal area)

In general, these options differ from Option B in that they are situated on already disturbed land (brownfield areas) owned by the Municipality and should, in relative terms, be easier to take through the authorization process.

On this basis, the following are potentially available:

- i. An area directly to the South-West of, and adjacent to, the current disposal site (the so-called "extension"). This is shown on Figure 9. The benefits here are proximity (no haul distance to speak of) as well as it being immediately against the current waste body and thereby achieving efficient utilisation of airspace.
- ii. The old, closed landfill located approximately 500m to the North-East of the WDF and adjacent to the R 102. Benefits are proximity and the fact that this is a brownfields site, with a capping that could serve as a basal liner for a new site.

In both cases, the sites will have to be engineered to current standards – this includes lining and leachate management, systems.

This option appears to have merit and is carried forward for an assessment of costs.

6.6.4 Option E (dispose of waste at commercial, or Government-owned, disposal facilities)

- PetroSA disposal facility – the site is approximately 60 km away. Disposal charges will have to be paid and due to the fact that the site will be closing, they are likely to be seeking only clean material to use for cover or capping. On this basis, both quantity and quality will have to be guaranteed by George Municipality. In addition, the volume that needs to be disposed of, is likely to exceed the capacity of the site. For illustrative purposes, this option is carried forward for assessment of estimated costs.
- Garden Route Municipality Regional Waste Disposal Site - the site is not yet operational.
- Oudtshoorn Municipality – this body has shown interest in waste. The site is some 60km away and it is likely that the same requirement for clean, cover material, will apply here. This option is treated as for the Petro SA site

6.7 Discussion of airspace availability offered by off-site disposal options

One of the main considerations when discussing off-site disposal options, is that of the amount of airspace offered. It has been noted above, that some 992 000 m³ of waste, needs to be relocated. Accordingly, the following:

- 6.6.3 i – the Extension - yields some 766 000 m³ of airspace (shortfall 226 000 m³)
- 6.6.3 ii – old landfill – yields some 134 000 m³ of airspace (shortfall 858 000 m³)
- PetroSA and Oudtshoorn Municipality – airspace availability not determined

On the basis of airspace availability, it appears that a combination of 6.6.3 i (extension) and disposal at an alternative site could offer a solution.

6.8 Estimated cost

In the estimates below, high-level costs have been used to establish an order of magnitude and to use for comparative purposes.

The report "*George Local Municipality Gwaing landfill rehabilitation cost 2024 Final report revision 01 August 2024*" by Delta Built Environmental Consultants, as well as the Gwaing Waste Disposal Facility: Annual Monitoring and Maintenance Cost Report Document No:25035i/Gwng/001 Rev 0b, by EAS Infrastructure, were used in drawing up the cost estimate. As the Delta document was issued in August 2024, a nominal 6% has been added to allow for the escalation in costs.

In using the Delta reports as a basis for estimating costs, the following must be noted:

- The use of Dynamic Compaction and the construction of Toe Stabilisation infrastructure, has been included

6.8.1 Estimated cost to dispose off-site at PetroSA (Option E)

- Transport has been based upon the use of the PetroSA and a haul distance of 60 km
- Amount of waste to be relocated 992 000 m³
- Disposal cost R 400 per tonne, but assume zero as the material will be used as cover.

	PETROSA/OUTDSHOORN	Unit	Quantity	Rate	Amount
1	Dynamic compaction	sum	R1.00	R8 568 110.94	R8 568 110.94
2	Toe stabilisation (adjacent to river)	sum	R1.00	R10 043 312.08	R10 043 312.08
3	Earthworks – dig and load surplus waste	m3	992000	R285.66	R283 374 720.00
4	Earthworks – Trim, Cut, Fill and Shape Landfill	m3	54000	R142.93	R7 718 241.60
4	Transport	m3km	59 520 000	R8.48	R504 729 600.00
5	Disposal costs	tonne	1 240 000	R0	R0.00
6	Capping of rehabilitated site	m2	66 000	R417.06	R 27 525 960
	Total				R 841 959 944.63

Table 1: Option E cost estimate (transport to PetroSA or Oudtshoorn)

6.8.2 Estimated cost to establish a new site (Option B)

The following is assumed:

- Amount of waste to be accommodated 992 000 m³
- Footprint size 300m x 300m = 90 000 m²
- Height 15m
- Side slope 1V:3H
- New site 20km away (assumption)

In addition, the costs of rehabilitating the existing site must be included as well.

	NEW LANDFILL	Unit	Quantity	Rate	Amount
1	Dynamic compaction	sum	R1.00	R8 568 110.94	R8 568 110.94
2	Toe stabilisation (adjacent to river)	sum	R1.00	R10 043 312.08	R10 043 312.08
3	Earthworks – dig and load surplus waste	m3	992000	R285.66	R283 374 720.00
4	Earthworks – Trim, Cut, Fill and Shape Landfill	m3	54000	R142.93	R7 718 241.60
4	Transport to new landfill	m3km	19 840 000	R8.48	R168 243 200.00
5	Disposal costs	tonne	1 240 000	R0	R0.00
6	Capping of rehabilitated site	m2	66 000	R417.06	R 27 525 960.00
7	Construction of new landfill	m2	90 000	R 503.10	R45 279 000.00
8	Capping of new landfill	M2	93 000	R417.06	R38 786 145.86
9	Cost of authorisation processes				tbc
	Total				R 589 538 690.48

Table 2: Option B cost estimate (new landfill)

6.8.3 Estimated costs to use the extension and the disposal at alternative site (Option C)

	NEW EXTENSION AND ALTERNATIVE SITE	Unit	Quantity	Rate	Amount
1	Dynamic compaction	sum	R1.00	R8 568 110.94	R8 568 110.94
2	Toe stabilisation (adjacent to river)	sum	R1.00	R10 043 312.08	R10 043 312.08
3	Earthworks – dig and load surplus waste	m3	992000	R285.66	R283 374 720.00
4	Earthworks – Trim, Cut, Fill and Shape Landfill	m3	54000	R142.93	R7 718 241.60
5	Transport to alternative site	m3km	113 000	R8.48	R958 240.00
6	Disposal costs	tonne	1 240 000	R0	R0.00
7	Capping of rehabilitated site	m2	66 000	R417.06	R 27 525 960.00
8	Construction of extension	m2	60 000	R 503.10	R30 186 000.00
9	Capping of extension	m2	50 000	R417.06	R35 032 647.87
10	Construction on Gwaing WDF	m2	38 400	R503.10	R19 319 040.00
11	Capping of Gwaing WDF	m2	40 000	R417.06	R 16 682 213.27
12	Cost of authorisation processes				tbc
	Total				R 522 111 130.18

Table 3: Option C cost estimate (extension and on alternative site)

6.8.4 Discussion on costs

As can be seen above, the cost estimates for the 3 options, are:

- Option E cost estimate (transport to PetroSA or Oudtshoorn) R 841 959 944.63
- Option B cost estimate (new landfill) R 589 538 690.48
- Option C cost estimate (extension and disposal at alternative site) R 522 111 130.18

Comments on estimated costs:

- The cost of rehabilitating the existing site, is common to all three options
- The costs of transporting waste over a distance of 60km, is a major contributor in Option E
- The costs of transporting waste over a distance of 20km is one of the major differences between Options B and C. The distance is based upon the assumption that a new landfill can indeed be established in that proximity. A greater distance will mean a higher transport cost.
- The costs of authorisation (Environmental process, Public Participation, licencing etc.) for Options B and C have not been included. The expectation is, however, that in the case of identifying and authorising a new site (option B) the costs will be higher than those for Option C (see discussion below).

6.8.5 Assessment of options

It is important to note that an assessment of options cannot be done on cost alone, as there are other contributing factors. For this reason, a multi-criteria analysis was carried out and is shown below. A scoring system of Preferable/favourable (1 points) and not preferable/not favourable (0 points) was used. The highest score indicates the preferred Option.

<u>Criteria and discussion</u>	<u>Option E</u>	<u>Option B</u>	<u>Option C</u>
<u>Ease of identifying a site</u>			
- Identifying a new site is a complex process. Suitable land in a peri-urban environment is difficult to come by	0		
- This consideration is not an issue for disposal at Petro SA/Oudtshoorn		1	
- The extension is adjacent to the existing site and is thus not likely to be seen as valuable land. Equally, the old landfill is already a disturbed/brownfields area			1
<u>Ease of authorisation</u>			
- Taking a new site through an authorisation process is complex and for most members of the public, unpopular.	0		
- This consideration is not an issue for disposal at Petro SA/Oudtshoorn		1	
- Because the two sites are already disturbed and are located in areas that are not likely to be developed, is favourable. - The proximity to the river, in the case of the extension, can to a large degree, be mitigated.			1
<u>Ease of construction</u>			
- Option E requires no construction	1		
- The other options require construction		0	0
Cost			
- Option E carries the highest, estimated cost	0		
- Option B carries the second-highest estimated cost		0	
- Option C carries the lowest estimated cost			1
Acceptability of waste at disposal point			
- It has been noted in earlier this report, that there is a very strong likelihood that PetroSA/Oudtshoorn, are needing clean waste to use as cover. To achieve this will require extensive sorting and selecting of the waste, prior to transport. This will be both costly and difficult	0		
- This is not an issue		1	1
Total Score	1	3	4

Table 4: Multi-criteria analysis

Although this is neither a perfect nor an absolute system, it is useful for comparative purposes.

7 CONCLUSIONS

- There is no “do nothing” option. The current operation is illegal and the site must be rehabilitated and closed.
- The rehabilitation of the site will result in a significant amount of surplus waste that will have to be disposed of in a legal manner.
- Options considered are for site closure and not for on-going waste disposal.
- Waste quantities have been estimated at the time of this report. However, waste continues to arrive and is disposed of, at a rate of some 13 000 m³ per month. This aggravates the existing problem and requires additional capacity at the receiving site(s).
- Alternative methods and means to deal with incoming waste, will have to be found. Accordingly, the management of rubble and of garden waste, will have to be improved. In addition, control on the quality of waste brought for processing, will have to be tightly controlled.
- The proximity of the Gwaiing River, could bring about restrictions that will have a significant effect on options and construction. This goes about the required distance between the waste body and the riverbank.
- The outcomes of the Section 24G rectification process could also bring about restrictions to the proposed rehabilitation and site extension. In this regard, no final decisions can be made until the process has run its course.

8 RECOMMENDATIONS

8.1 Regarding the rehabilitation of the existing site:

- Rectify boundary co-ordinates.
- Seek formal confirmation of all boundaries.
- Formalise the final boundary.
- Confirm that the requirement of carrying out no landfilling closer than 32m from the river bank, is indeed correct.
- Confirm that there are no further river-related requirements (flood lines, buffers, water Use Licence etc.).
- Confirm that all requirements of the ESKOM servitude have been satisfied.
- Confirm if there are other services in the ESKOM servitude.
- Confirm with DEA&DP that the proposed slope of 1V to 3H will be acceptable.
- Confirm with DEA&DP that a buffer around the waste body, is not required.
- Proceed with the 24G process in order to establish what limitations are/are not placed on the rehabilitation of the existing site.

8.2 Regarding the disposal of surplus waste

- Carry out a waste characterization in order to determine the content and characteristic of the incoming waste.
- Seek clarity from PetroSA or Oudtshoorn Municipality, with regard to their expectations of waste quality and quantity.
- Proceed with the 24G process in order to establish what limitations are/are not placed on the extending the siter and using the old landfill.

8.3 Regarding ongoing disposal operations

- Carry out a waste characterization in order to determine the content and characteristic of the incoming waste.
- Launch the tender for sorting of waste and carry out aggressive sorting to get to a clean residue.
- Enforce quality controls on waste quality at source.
- Accelerate commissioning of the composting operation.
- Step up acceptance controls at the site.