THE IDENTIFICATION AND RISK EVALUATION OF THE HISTORIC LANDFILLS IN THE CITY OF CAPE TOWN

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ABSTRACT

During the time of the Cape Metropolitan Council (CMC) from 1997 to 2000, various historic landfills were already identified. The City of Cape Town, a new unicity, was formed in 2000 which comprises the CMC and 6 Metropolitan Councils. A number of additional historic landfills were located within their footprints.
During 2010, the City initiated a project to trace, investigate, evaluate and rate the possible environmental risk posed by the historic sites. The top 10 priority sites were internally earmarked for rehabilitation. The Licencing and Rehabilitation of two of the priority sites were approved while the other involved Licence to Closure applications and will be staggered to spread the costs.
The progress and milestones in the Licence applications of Atlantis Historic- and Waterkloof Historic landfills will be discussed in detail.
The City is a partner in a project with the Department of Environment Affairs (DEA), administered by the Western Cape Department of Environment and Development Planning (DEA&DP) to Licence to Closure an additional 11 historic sites previously identified.
This paper deals with the initial findings and the priority rating for the rehabilitation of historic facilities and focus on two case studies, namely the Waterkloof Historic landfill near Somerset West as well as the Atlantis Historic Landfill near Atlantis.

KEYWORDS

Historic landfills, old rubble dumps, old garden waste sites, Listed activities, Environmental authorisation, Licence to Closure, specialist consultants

1. INTRODUCTION

From 1997, historic landfill sites were inherited by the City from all the various previous municipal and Metropolitan Council's waste management activities operating within the footprint of the City of Cape Town. The amalgamation and movement of offices and repositioning of previous staff in waste management caused a major loss of records.
Once the City grasped the extent of this scenario a decision was made to pro-actively evaluate all the historic sites in terms of risk to the environment. The next question was: When is a site historic or old? The Environmental Conservation Act, Act 73 of 1989 (ECA) acted as a watershed for decision making. Thus, historic sites operated prior to 1989 when ECA was proclaimed. ECA was a wonderful tool at the time. The Minimum Requirement Series by DWA acted as a guideline to sanitary landfill procedures. Not all the waste management activities that the City inherited were legal or sanitary. The 2 461 km^2 footprint of the City allows for a various worms in the woodwork, some possibly still not identified.

The primary research was done through desk top studies of previous reports commissioned by the City. The 1st thorough survey of waste management facilities was by JC Brand during 1990: CPA Entrustment to the WC RSC. Refuse Dumps. (Report number 4). Various other studies were commissioned by Regional Councils and local government. The next valuable report was by Parsons and Associates on Waste Disposal in and around the Metropole, dated June1997. The list of historic landfills was growing with various names of private and public site discovered in the reports that were previously not identified. The research continued to the City archives holding the various Annual Reports by the City Engineers from 1952 onwards. Dumping

of rubble in vlei areas was a common practice as the “land was reclaimed”. Names of possible sites such as Floral Acres and Factreton were listed and but could not be identified.
The interest in the project grew and various persons connected with previous waste-, health- and engineering departments came forward and assisted with a stories, memories and occasionally facts. Liaison with the Provincial Department of Environmental Affairs and access to their data bank was very beneficial.

Prioritisation of the various sites in terms of the possible environmental risk that they pose was a challenge. Each site was visited and walked to provide a geographic overview, GPS readings and a brief estimation of surface and slope stability. The site detail in terms of ownership, zoning and use was determined and the data logged on GIS. The presence of surface water, ground water, stormwater drainage and biogas migration on surfaces were investigated. A matrix was developed where every site was physically evaluated as for a Permit to Closure compliance audit. The historic sites posing the highest possible environmental risk were highlighted and further investigated. More background information was sourced and in house biogas readings on the surface and in shallow sub soils were analysed. Reports from neighbours, local industry and even Geoscience contribute to the data.

A total of 77 historic sites were identified, private as well as municipal. The matrix identified the top 15 sites with a few new historic dumps emerging during evaluation process took place. Both Atlantis- and Ocean View historic landfills sites “emerged” during the evaluation process.

2. HISTORICAL SITES

2.1 Interesting Findings

The Atlantis site came to the foreground after the Sun newspaper ran an article in 2010 on a child who received a needlestick injury while playing on an “old medical waste dump”. The child was taken to the local Clinic and the CCT Environmental Health Practitioners contacted Disposal about the same time as the media. A site visit revealed an area of 35ha with various spots of excavated waste in the sandy vegetated soils, some excavations containing health care risk waste (HCRW). The illegal salvagers, many living on the toe of the landfill made a living by mining the metal waste from the old dump. The salvagers mined the site like moles, creating shallow subsurface tunnels and dumping the residue on the surface. This illegal salvaging practice was in operation for quite a while prior to the injury. The HCRW was thus excavated from below the immediate surface where it was illegally dumped in the old site that historically operated without management supervision or equipment.

The Ocean View historic site reached our desk when a community member wrote to the President as well as the Executive Mayor about the use of the “old dump” as a communal vegetable garden.

A few other interesting historic sites were identified such as “Harry se Gat”. “Harry” evaded us and it could not be traced. Eventually, one of the previous municipal engineers in the area indicated a parking area at a Bellville shopping centre and adjacent park as the previous “Gat”. Apparently Harry bought an old quarry and invited all and sundry to fill the “Gat”. Once the “Gat” was filled, the waste deposition moved to the Bellville municipal landfill which was then further developed. When viewing the “Gat”, a clear height difference between the brim of the hole and the current surface can be observed to the settlement of the waste.

A well-known local put-put course and adjacent, golf course were historic rubble dumps in the previous era.. The feedback we received when contacting the retired City engineers indicated that there were continual public complaints at that time concerning the fires and rodents in and around the “builder’s rubble dump”. The developer possibly kept the soil tests and stability findings “undercover” to enable the construction and subsequent sale of the property.

Another historic dump, the one at the airport industrial area next to the N2 freeway was known as the Durr dump. The “builders rubble dump” received all types and known brands of waste form private industry. Novel ways of classifying hazardous waste led to the dumping of hexavalent chrome waste from a tannery. This was one of the known evils that were identified. This site was closed by Water Affairs, excavated and transported to the Vissershok hazardous waste landfill, refilled and rehabilitated prior to the construction of the industrial area.

2.2 Presentation of Results

The results of the internal evaluation of the historic sites were presented to the management team and a list of priorities with possible budget implications was presented. The CCT list was compared to a list of sites

prepared by DEA&DP. The Western Cape Government list contained old sites that were already closed and rehabilitated, such as Faure and Brackenfell domestic waste landfills. Together, a final list was prepared and priorities listed.
Top of the list was the Atlantis Historic site with a possible pollution potential to the Atlantis aquifer and the implicated health risk to the illegal salvagers due to the HCRW discovered on the surface.
The 2nd historic site was Waterkloof, a site in Somerset West that became a hot potato due to public pressure and the continual arson occurring on the site, leading to massive veld fires during the dry season. All the other sites implicated as possible medium and high risks, operated or owned by CCT were listed for future rehabilitation. All the sites were annually monitored for biogas, erosion and possible negative impacts and will be in future continue even after final rehabilitation or decommissioning.

There also is an ongoing project with the Witsand historic landfill at Scarborough beach were the back dune is annually restructured to allow seepage from the mountain as well as rain water to divert to the vlei land instead of breaking through the old landfill surface, a few metres below the surface of the visible beach. Kommetjie Environmental Group (KEAG) and the CCT has a long history of co-operation where the City commits to annual funding of staff to plant dry brushwood in the dunes in an effort to stabilise the dunes. The City also annually reshapes the dune using heavy equipment under the guidance of the ERM Beach Management division. The “annual ground works” takes place before the rainy season every year. If a trench is cut through the waste pile to the sea in very heavy storm conditions (about every 5 years), internal staff re-engineer the site over and above the annual maintenance work.

3. DECOMMISSIONING OF HISTORIC LANDFILLS: TWO SITE STUDIES

3.1 The Atlantis Historic Landfill Site

The Atlantis historic landfill was operated for 21 years during the mid-1970’s to the mid-1980 on resident vacant land. The site is located 7 km along the Dassenberg Road (R307) located on farms Ca 3-333-1 Cape Farms; Ca1183-0 Atlantis Industrial and 81-2756 Westfleur, Atlantis. The landfill received mainly residential and industrial waste such as textiles, paper and cardboard (Parsons 1991). There is however no record of the waste types and quantities. The extent of the waste disposal area is approximately 22 ha and is situated on three erven. The Parsons Report also describes the area located south-east of the site as used for “uncontrolled and inconsistent” dumping. Upon closure the waste material was covered with soil, possibly by wind deposition and vegetation developed.

The application for the formal closure of the site was conducted via an Application for Decommissioning during 2012. (Jeffares & Green (Pty) Ltd, 2012) The Licence to Decommission the Site was issued in 2013, in terms of the National Environmental: Waste Act, Act 59 of 2008, (NEM:WA).

The Basic Assessment of the site including specialist botany, ground water and social studies:

3.1.1 Social Study

The landfill is salvaged by informal salvagers from a neighbouring community, the Dassenberg Informal Settlement, which is located within 500m of the site. The community has been established on the site for more than 30 years and comprises of approximately 70 households (100 residents). The community were originally wood-cutters in the area. The community has on-going concerns with the City due to landownership, service delivery and the liability of the illegal salvaging from the landfill. The City of Cape Town contracted a hazmat company to remove the medical waste from the site for incineration. Further investigations were conducted and no more medical waste was uncovered at the site. During further observations, asbestos cement products as unused bulk water pipes were found to be scattered on the surface. The pipes may be friable as the exposed crack and broken edges clearly indicated the asbestos bundles. As part of the medical waste clean-up the City conducted an educational program in December 2012 that informed the community about the dangers of the landfill site and the health impacts of the on-going illegal excavations on the site. The City also posted 18 signs and notices on 210 litre drums concreted into various strategic pathways on the site, warning the community about the dangers of/and in the site. However, members of the community still salvage material from the landfill as this is part of their livelihood.
The City is in close contact with the community leader. Housing and Environmental Health provided services as well as a crèche for small children to provide alternatives to playing on the landfill. Approved Beneficiaries of the Dassenberg community will move into the houses provided in Phase 1 of the Kanonkop Housing project, completed by March 2015. (Sakaza Communications, July 2013)

3.1.2 Botanical Assessment

There are several dunes on site. The possible disturbance of dunes triggered a botanical study in terms of NEMA (Act No. 107 of 1988 as amended 2006). Currently, the disturbed land between the most prominent dunes is overgrown with alien weed. Although some of the dunes are in good condition, species diversity is lower than expected (< 50 species recorded). The loss of the dunes and Cape Flats Dune Strandveld, would contribute to the loss of habitat within this VULNERABLE ecosystem in the resilient Cape Flats Dune Strandveld vegetation. Cape Flats Dune Strandveld (CFDS) is the dominant ecosystem or vegetation type of the area and is important and listed as an ENDANGERED ecosystem due to 66 threatened species and one endemic species. The extent of the dune-dominated ecosystem includes the entire study area and immediate surrounds. To the east, the vegetation changes to Atlantis Sand Fynbos, where the dunes give way to low-relief 'flats'. To the west lies the Witzand Aquifer Nature Reserve (WANR), a large, dune-dominated, landscape also extending in a north–south direction and westward to the West Coast Road (R27). From the botanical report it was accepted that the fill material for the site must be similar to the dunes and sourced form a proposed development immediately to the east. This action will negate the need to remove the existing dune systems within, and outside, the landfill. The Atlantis Historical Landfill in relation to Witzand Aquifer Nature Reserve (WANR) is of high importance in terms of the potential to consolidate adjacent portions of undeveloped land. All land to the west of Dassenberg Road (including the study area) is ideal for this purpose and important in terms of maintaining ecological processes. A systematic rehabilitation system is contracted to the landscape architect by limiting contact with the dunes and collecting seeds and bulbs in autumn and early winter for propagation. (MacDonald, 2012)

3.1.3 Geohydrological Assessment

The Atlantis area is underlain by a primary aquifer and until 2000 this was the sole source of water supply. As any contamination of this resource will be disastrous, the Divisional Council of the Cape initiated a ground water monitoring programme to monitor the possible groundwater pollution effects of the landfill on the aquifer. Until 1997, annual groundwater monitoring reviews by the CSIR indicated the presence of a pollution plume emanating from the site. The site is located on windblown sand deposits with a thickness up to 20m before the layer of impervious clay. The aquifer can be divided into 3 zones with the most productive zone in the lower parts of the aquifer where it is composed of coarse sand. The regional ground water flow is south-south-westerly in the area with continual fluctuations of levels due to the recharge and abstraction from two well fields. The 1997 indicated that the plume did not pose a direct threat to the ground water resources in the Witzand well field area due to attenuation mechanisms and being 6 km up-gradient form the artificial recharge facilities and Witzand well field. However, monitoring and tracking the plume remains important and a geohydrological report was required in terms of NEM:WA. The Licence request various studies to be done within a year, thus prior to February 2015. Resistivity was requested in the subsurface down gradient of the site to delineate the present exact extent of the ground water plume emanating from the facility. Also, at least 3 boreholes must be drilled the full aquifer depth to do a hydro chemical depth profile. Based on the findings a final design for the borehole monitoring network must be put in place with a regular water quality monitoring programme sampled on a quarterly basis for the next 30 years after closure. (Tredoux G, Ground Water Study: Decommissioning of the Atlantis Historic Site, 2013)

3.1.4 Finding the way forward

The site is in an environmentally sensitive area. The way forward with the physical rehabilitation will updated during the conference presentation.
The detailed design and tender documentation is currently being finalized and work should commence during the first quarter of 2015 and be completed approximately a year later. Essential details of the works are as follows:

- Search and rescue of selected indigenous vegetation
- Excavation of the uncontrolled dumping around the site and placing it on the existing waste body
- Backfilling and shaping of the excavated area to original contours
- Shaping the waste body to the approved final profile
- Placing the impermeable capping layer; this could be a natural (clay) or synthetic material
- Placing top soil over the capping layer
- Re-vegetation of the entire site
- Rehabilitation of access road
- Erection of security fencing and gates

Special care will be required to ensure adequate storm water runoff control and erosion protection, particularly prior to the establishment of the new vegetation. As the surrounding dune systems may not be disturbed, all fill and topsoil material will need to be imported.

3.2 The Waterkloof Historic Landfill Site

The 20 ha site initially accepted “local waste” from the Somerset West area. The Parsons report (1991) mentioned that the site was not close to the developed areas and the projected lifespan was until 2000, accepting 2000 ton per annum.

The Waterkloof landfill site is situated outside Somerset West and was established in 1970 to receive general waste from the Somerset West Residential and Industrial Areas. In 1994 the site was closed and covered, however no formal closure or rehabilitation was undertaken. The waste was not properly confined to the site and subsequently spilt into the adjacent private properties. There is an existing historic cemetery on the north eastern side of the landfill.

The primary issues of concern in this project are:

- The proximity of the wetland/stream to the site,
- Rezoning the site the appropriate zone,
- The extent of the contamination of the surrounding ground water system,
- The unknown composition of the waste and
- The management of the waste that has spilt onto the adjacent private land.

Various specialist studies were identified and requested by the Mott MacDonald PDN Environmental Consultants in consultation with DWA to form part of the Basic Assessment in the submission for the Licence Application for Decommissioning in terms of NEM:WA. Findings and recommendations from specialist reports are summarized as follows:

3.2.1 Waste Type Classification

Test pits were excavated to assess the waste profile and no putrescible waste was detected. The waste profile consisted mainly of soil, plastic material and building rubble. Glass bottles, non-ferrous metal and garden waste were also present in few locations. The analytical results of the collected samples indicated that the waste classifies as Type 3 waste which can be disposed on large gen3ral landfill in a water surplus area (GLB+) or Class C landfill and the biological oxygen demand to chemical oxygen demand (BOD:COD) ratios indicated well decomposed waste (< 0.6). (Golder and Associates (Pty) Ltd, 2014)

3.2.2 Geohydrological Assessment Phase A

Based on the data from the landfill excavations and the hydrocensus, it is evident that there are two a zone within which groundwater occurs. The upper zone, within the soil zone, contains groundwater during the wet winter months and it is quite likely that this zone dries up in the low rainfall summer months. The groundwater in the area is used by one land owner and it is the sole source of water. For this reason groundwater is important and it needs to be protected from any possible impacts of the dormant Waterkloof landfill. A background borehole will be required (i.e. the borehole must be up-gradient of any possible contamination sources, yet still within the Malmesbury Group), a second borehole immediately down-gradient of the graveyard and a third borehole between the landfill and the borehole of land owner. A phase 2 followed and will be discussed during the presentation. (GEOSS (Pty) Ltd, 2014)

3.2.3 Freshwater Ecosystems Assessment

The report focused on the surface freshwater ecosystems on and associated with the Waterkloof Landfill site. Active rehabilitation and management of a channelised seepage channel, entering into an excavated open water wetland and the broad wetland is however recommended. The water quality impacts of the landfill site in its current condition are of potential concern. More findings will be available at the time of the presentation. (Freshwater Consulting cc, 2014)

3.2.4 Gas Assessment

Methane was found in 2 on site test pits which are equivalent to 1.1% and 1.76% per volume air. Carbon dioxide (CO_2) and ammonia (NH_3) were also detected with the highest concentrations of 2.0% and 13 ppm respectively. The installation of landfill gas migration detection probes along the southern and south-western sides of the site, i.e. towards the residential areas was recommended. Progress from date of printing will be discussed during the presentation. (DDA, 2014)

3.2.5 Visual Impact Assessment

The visual impact indicates negative visual and landscape impacts during the rehabilitation phase of the Waterkloof Landfill site. The greatest visual impacts should be experienced within 2 km of the landfill as this is considered the area that will experience the greatest visual exposure. (i-scape, 2014)

3.2.6 Waterkloof Findings and Recommendations

- Additional boreholes will be installed to determine the geohydrological setting of the site.
- The analytical results of the water samples collected in the boreholes will be used to confirm whether the waste classifies as general waste. The Engineers will be informed subsequently on the liner design requirements for the appropriate landfill classification.
- Landfill gas migration detection probes will be installed to determine whether a gas ventilation system is required.
- The Solid Waste Management Department envisages the end use of the landfill as open space due the development constraints, i.e. adjacent cemetery, access to the area, etc. The impact on the visual resource is expected to be minimal and the Visual Impact Assessment report will be reviewed accordingly.
- Active rehabilitation and management of the channelised seepage channel, the excavated open water wetland and the broad wetland seep will be incorporated in the Engineering design.

After obtaining Environmental authorization and the Waste Management License, the City's objective is to remediate the former Waterkloof Landfill site and render the area safe, secure and fully compliant with the relevant environmental and other legislation.

It is envisaged that the remedial construction works will briefly entail the following:

- Reducing the existing steep side slopes of the landfill by filling in with imported material or cutting into the slope where there is a lack of space,
- Cut in areas where waste spilt into private properties and fill waste into available airspace in landfill boundary,
- Fill and re-establish vegetation in cleared areas,
- Shaping the landfill top surface at a constant slope to direct stormwater off the landfill,
- Minimise infiltration,
- Cover the landfill with a topsoil layer and revegatate by means of hydroseeding,
- Stabilise the slopes using biodegradable netting,
- Construct stormwater control channels,
- Install new fencing,
- Installing monitoring infrastructure and
- Monitor site according to permit conditions.

4. LICENCE FOR DECOMMISSIONING OF 11 OTHER HISTORIC LANDFILLS

Between 2007 and 2009, the Department of Environmental Affairs (DEA) conducted a study to identify all unlicensed waste disposal facilities in the country, and to develop a strategy to ensure that these sites are licensed for continued operation or closure. During the study it became apparent that many municipalities did not have adequate funding to license all of their unlicensed facilities, and a decision was taken by the Minister of Environmental Affairs that the DEA, together with the Provincial Departments of Environmental Affairs (as the relevant Competent Authorities), must develop an action plan for the licensing of such facilities. Numerous sites across the country have been licensed through this initiative, and the DEA has identified a current backlog of more than 100 municipal waste disposal facilities, including the site discussed below, that still need to be licensed by the end of 2013/14 financial year.

As part of this process, the City of Cape Town (CoCT) intends to formally decommission the eleven Historic Waste Disposal Site (the Site) in accordance with the requirements of the National Environmental Management: Waste Act 59 of 2008 (NEM:WA).
The BAs was completed and submitted to DEA&DP during April 2014. Comments in terms of a Record of Decisions for the sites are awaited from DWA by DEA&DP prior to issuing the Licences.

5. CONCLUSION

The City to date was very pro-active in approach and actions to legalise the existence of the sites and to mitigate environmental risk.
The identification of historic sites may be a continual process as the public occasionally report suspected historic "dumps". The current budget of the actual remediation of Atlantis and Waterkloof Historic Landfills runs into millions and place a strain on City resources.
The continual future monitoring and maintenance of the 11 historic landfills currently being licenced for decommissioning place an increased operational and financial burden on the City. The balance of the historic sites will frequently be evaluated in consultation with DEA&DP and may be decommissioned, if required.

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