



**ENVIRONMENTAL MANAGEMENT PLAN:
REHABILITATION OF THE WETLAND IN THE VICINITY OF THE
LAFARGE CEMENT FACTORY IN LICHTENBURG**

August 2022



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SYNOPSIS				
Measures to remediate the impacts on a wetland near Lichtenburg Lafarge Factory, including a specialist wetland survey and production of a wetland rehabilitation plan.				
KEY WORDS:				
Wetlands, Rehabilitation, Environmental Management Plan				
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1 INTRODUCTION AND BACKGROUND

The LafargeHolcim (“Lafarge”) cement factory located in Lichtenburg, North-West Province was served with a Notice of Intention to issue a Compliance Notice in regard to failure to comply with sections of the National Environmental Management Act (Act No. 107 of 1998 as amended) (NEMA). The factory has responded to the Notice by taking a number of stipulated actions including the appointment of a wetland specialist to assess the conditions at the site and to propose measures to remediate the impacts on the wetland which lies adjacent to the factory. JG Afrika (Pty) Ltd were appointed to undertake a wetland survey and to produce a wetland rehabilitation plan for the impacted area. A wetland rehabilitation report, outlining several options for rehabilitation was issued in April 2021 (JG Afrika, 2021). These options were then presented to the Client and the Department of Forestry, Fisheries and Environment (“DFFE”) in May 2021. Based on these discussions a management plan which is contained within this report has been produced.

1.1 Activities Undertaken by Lafarge

The pre-compliance notice dated 27 November 2020 from the DFFE indicates that Lafarge had unlawfully carried out the following activities in terms of regulations under NEMA without prior authorisation:

- Infilling of a watercourse, and or a wetland, with more than 10 cubic metres of material; and
- The clearing of indigenous vegetation.

The non-compliance was based on a time series of Google Earth images which are shown in **Annexure A**. At the time of a site visit by the specialist on 30 March 2021 it was observed that the area in question had indeed been used as a spoil site, and the progression of the infilling could be confirmed through the assessment of historical aerial imagery.

1.2 The Polluter Pays Principle

This principle provides for *“the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.”* The Polluter Pays Principle must be rigorously applied throughout the construction phase of this project.

1.3 Details of the Wetland Specialist

This plan has been produced by JG Afrika (Pty) Ltd. The details of the specialist are provided in **Table 1-1** below. The Curriculum Vitae of the specialist is provided in **Annexure B**.

Table 1-1 Details of the wetland specialist

Specialist	Qualifications and Affiliations	Experience	Contact Details
D.J. Alletson	BSc Biological Sciences BSc (Hons) Zoology IAIAsa (Reg No. 035) PrSciNat (Ecological Science. (Reg No 125697))	21 Years Natal Parks Board: Wetland and Conservation Scientist. 24 Years Consulting Ecologist.	JG Afrika (Pty) Ltd 033 3436700 alletsonj@jgafrika.com

1.4 DFFE Rehabilitation Requirements

The area identified as requiring rehabilitation, by the DFFE, is located adjacent to the Lafarge cement factory in Lichtenburg, North-west Province. See **Figure 1-1** and further detail in **Figure 2-1**. The DFFE components of the wetland rehabilitation were as follows:

- Clearance of alien vegetation from an area around the wetland as designated in a pre-compliance Notice issued by the DFFE;
- Removal of all cement factory wastes which have been dumped into the designated wetland area as apparent in historic aerial imagery.
- Re-establishment of soil profiles including a 30 m wide wetland channel which must be within the original wetland area;
- Re-establishment of indigenous vegetation in the affected areas defined by the Pre-compliance Notice issued to Lafarge on 27/11/2020 as well as a further area downstream toward the Manana Road; and
- Installation of a supplementary water supply to the wetland from a nearby disused mine pit.

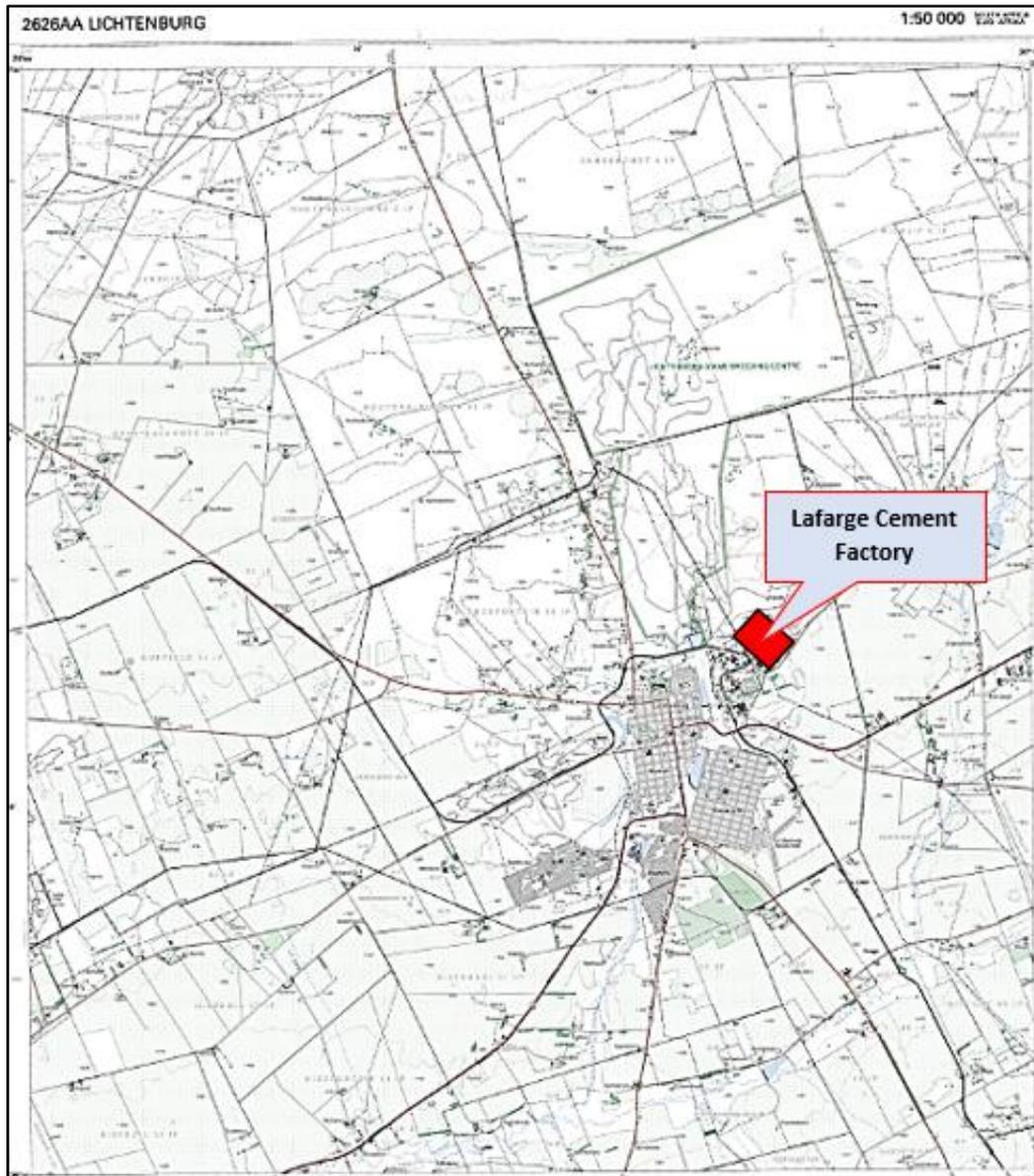


Figure 1-1 Locality of the cement factory in Lichtenburg

A meeting was held between the DFFE, Lafarge, and JG Afrika on 14 May 2021 and the following additional requirements were requested by the department based on discussions during this meeting:

- **Some understanding of the water source of the watercourse/wetland.** The geohydrological study undertaken on behalf of Lafarge (Tucana Solutions, 2017) indicates that the groundwater flow into the area is from down the slope to the north of the factory area, where wetland is apparent, and also from the west. The factory site is located to the west of the watercourse/wetland. Flows from the factory are to the north and south of the factory as indicated in Figure 2-1. To the north of the factory are old mine pits, which are now included in the NFEPA Wetland database but not in the SAIIE Wetland Map 5. Subterranean flows may be entering the area via those

pits, as presented in [Figure 1-2](#). However, the DFFE called for augmented water flows from the pits as a means of accelerating wetland restoration. At the surface level the pits are isolated by higher ground and this is taken into account as part of the wetland rehabilitation plan presented in [Section 2](#).

- **Classification of the materials dumped in the wetland area indicated by the Pre-compliance Notice issued by the DFFE.** An assessment of the waste material dumped in the wetland/watercourse area was undertaken (Enviroserv, 2021). The finding was that the material in this area is non-hazardous, as shown in [Table 1-2](#). The Enviroserv waste classification report has been included in [Annexure C](#) of this report for reference.
- **Width of the wetland rehabilitation strip through the affected area.** The strip of wetland to be rehabilitated will vary in width but all historic wetland exposed by the removal of infill material is to be rehabilitated and must be protected by appropriate buffers on either side.
- **Links between the NFEPA wetland and the watercourse/wetland which passes by the factory area were to be investigated.** This issue is covered by the geohydrological survey as above and as noted in the wetland rehabilitation plan presented in [Section 2](#).

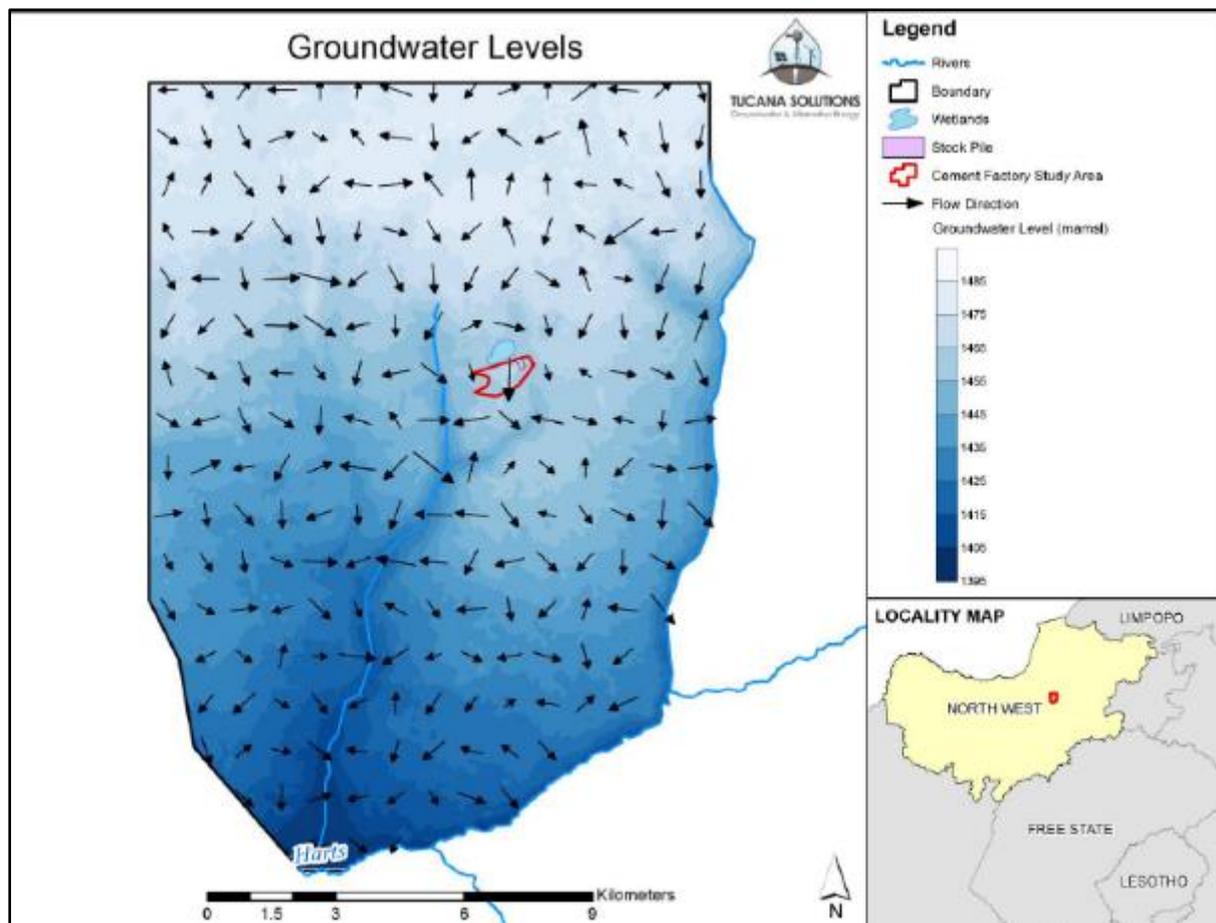


Figure 1-2 Groundwater levels in the factory area

Table 1-2 Result of the waste classification of the material in the wetland/watercourse

(ii) Waste with a moisture content of > 40% or that liberates moisture under pressure in landfill conditions, and which has not been stabilised by treatment	Sample is a dry solid
(r) Hazardous waste with a Calorific Value of:	
(i) > 25 MJ/kg	n/a
(ii) > 20 MJ/kg	n/a
(iii) > 10MJ/kg	n/a
(iv) > 6% TOC	n/a
(s) Brine or waste with a high salt content (TDS > 5%), and a leachable concentration for TDS of more than 100 000 mg/l	n/a
(t) Disposal of garden waste:	
(i) 25% diversion from the baseline at a particular landfill of separated garden waste	n/a
(ii) 50% diversion from the baseline at a particular landfill of separated garden waste	n/a
(u) Infectious animal carcasses and animal waste	n/a

There are no applicable landfill restrictions.

Conclusion:

1. Watercourse Area Material classifies as non-hazardous
2. An SDS is not required
3. The waste assesses as Type 3
4. Type 3 waste may be disposed at a licensed H:H or H:h landfill (equivalent to a Class A landfill) or a licensed GLB+ landfill (equivalent to a Class B or Class C landfill depending on the engineering)
5. There are no applicable landfill restrictions

2 REHABILITATION PLAN

The main objective of the wetland rehabilitation plan is for the restoration of water flows from the wetland area to the north of the factory area to the Klein Harts River and wetland system to south of the factory area. Further to this, it is also intended that wetland and terrestrial vegetation in the rehabilitated section of the factory wetland/watercourse system and surrounds will be restored.

For the purposes of this rehabilitation plan, the rehabilitation of the wetland area has been sub-divided into several phases. A description of these phases is presented in [Section 2.1](#). Engineering considerations for the rehabilitation activities are presented in [Section 2.2](#). This is followed by [Section 2.3](#), which presents the roles and responsibilities for each of the activities forming part of the rehabilitation.

2.1 Phased Rehabilitation Activities

The following section presents a phased approach to the proposed wetland rehabilitation:

Phase 1 – Removal of Alien Vegetation

Removal of any alien plant species should be undertaken for both the compliance notice area, as well as the area that has been classified as unimpacted by activities associated with Lafarge (i.e. both the red and green polygon areas presented in [Figure 2-1](#)). This should include the removal of all Eucalyptus (Gum) trees in the project area. The large gum trees in the area downstream of the area where infilling has occurred (i.e. the green polygon presented in [Figure 2-1](#)) are to be felled and the trunks and larger branches may be left in place provided that they do not obstruct the flow of water through the area. This recommendation is made in the interest of minimising compaction of the soil as a result of the movement of trucks or heavy machines over the un-impacted (largely natural) area as indicated in [Figure 2-1](#). The debris will not pose any threat and, through time, will provide habitat for wildlife as well as slowly releasing nutrients into the soil.

Phase 2 – Construction of Hydraulic Crossings (Culverts)

It is not possible to remove all rail and road embankments that have been constructed across the wetland area since some, including the Manana Road, are still in use. As presented in [Figure 2-1](#), this includes the roads upstream and downstream of the wetland area where culverts are required to ensure that there is no impediment to the natural flow of water through the wetland area. Based on a floodline study undertaken by JG Afrika in May 2021 (Job Number 5526, report titled “Lafarge Lichtenburg 1:50 and 1:100 Year Floodline Study”), the 1:50 year peak discharge rate for the drainage line of concern equated to 11.9 m³/s. In order to prevent flooding of the Lafarge infrastructure, the proposed dimensions of the culverts along the drainage line were based on the 1:50 year flood event.

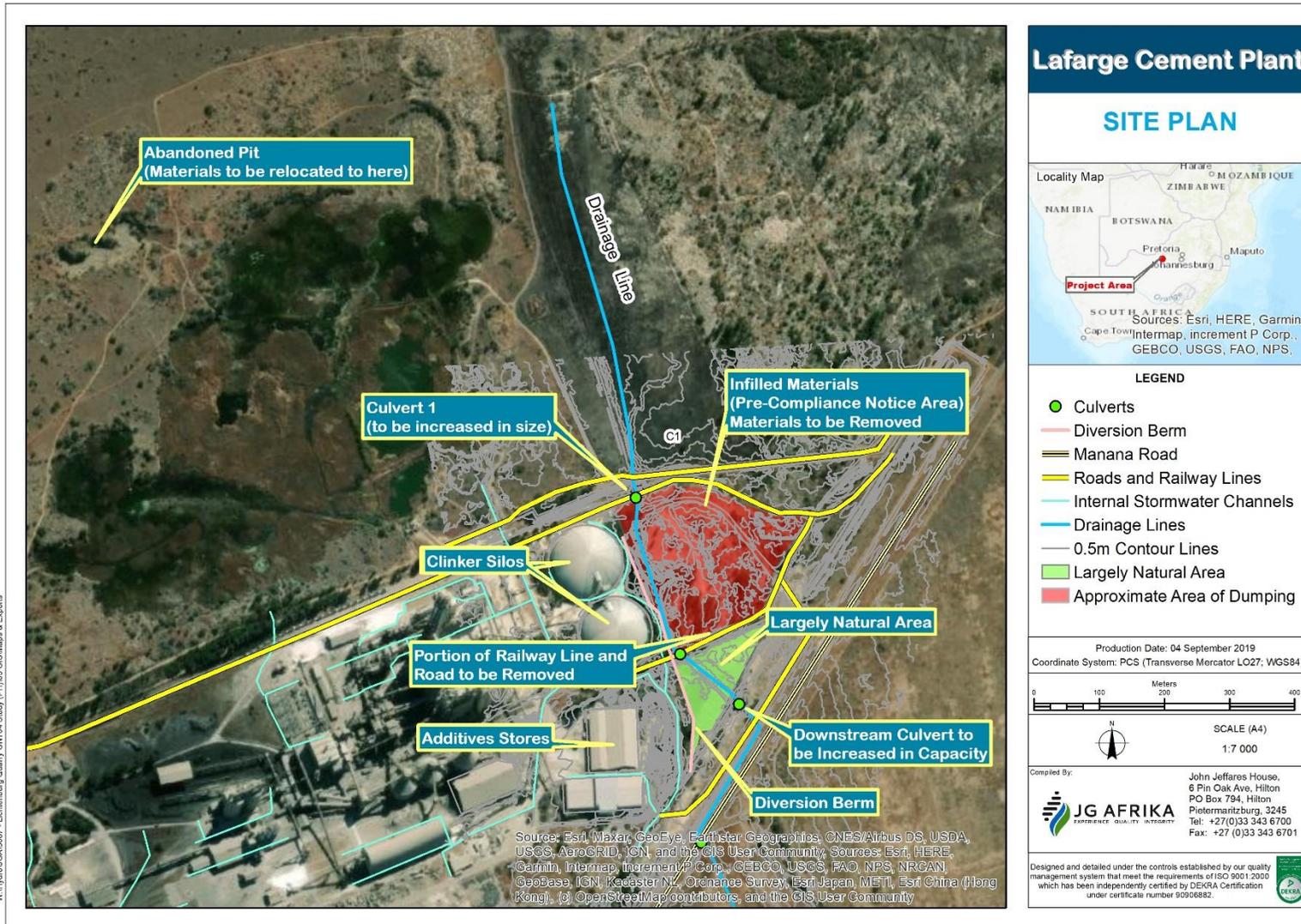


Figure 2-1 Lafarge Lichtenburg site plan for rehabilitation

The dimensions of the proposed Culverts are presented in **Table 2-1**. Engineering considerations for the construction of the proposed culverts is presented in **Section 2.2**.

Table 2-1 Proposed culvert dimensions

Culvert Name	Culvert Shape	Culvert Span (m)	Culvert Height (m)	Number of Openings	Approximate Culvert Capacity (m ³ /s)
Upstream Culvert (Culvert 1)	Box	1.5	0.6	8	12.3
Downstream Culvert	Box	1.5	0.6	8	12.3

Phase 3 – Removal of the Infill Material and Landscaping of the Wetland Area

With the intention to expose the original full wetland area, the infill materials are to be removed from all of the areas indicated in the Pre-compliance Notice, as presented in **Figure 2-1** (red polygon). In addition, some infill is also to be removed from a strip closer to the manana Road. This is to be undertaken only once authorisation has been obtained from the DFFE for relocation of the materials to the proposed site (i.e. upon approval of this rehabilitation plan). Based on information provided by Lafarge, the materials are intended to be relocated to an abandoned pit area located approximately 1 000 m (direct distance) to the north west of the rehabilitation area, as presented in **Figure 2-1**.

Clearing of materials is to be done down to the original soil surface, with care taken to ensure that as little as possible compaction to the original soils occurs. Ideally, as many old and unused road and rail embankments as possible should be removed so as to allow for smooth passage of water flows through the area.

It is necessary that a landscaped wetland strip is constructed within the rehabilitated wetland area. The width of the landscaped area should be at least 30 m and must be smoothed and slightly dished. Across the 30 m width the central and deepest part of the floor should be no more than 10 cm below the level of the edges so as to provide a slope of 1 in 150, which should be stable and not lead to erosion of channels. The slope from the upstream (northern) end of the wetland channel down to the downstream (southern) end of the wetland should be dictated by natural ground contours of the areas upstream and downstream of the wetland area. Care must be taken to ensure that there are no high points which will hold water back although the developing vegetation will promote percolation of water into the soil. The approximate length of the rehabilitation area is 250 m and the vertical drop over this distance is approximately 1 m and so careful finishing will be called for.

Phase 4 – Construction of Water Reintroduction Facility

The requirements from the DFFE call for water to be introduced to the rehabilitated wetland. This water may be obtained from the old mine pits located to the north of the factory.

However, these pits have become wetland pans, probably partly as a result of ingress of ground water, and partly with water from the factory stormwater management channels. They now have their own ecological value and so the water surface must not be drawn down excessively. Even at full surface level, the pans are below the upper part of the wetland and so the water from them will have to be pumped out. It is recommended that this be done by means of a solar powered pump which will only operate during daylight hours and that there is an automatic cutoff float switch which will de-activate the pump when the water reaches a low level (to be determined by Lafarge in consultation with the DFFE). The water will be delivered to the wetland by means of a 75 mm pipe and be discharged at a point a short distance downstream of the upstream culvert (Culvert 1 as presented in [Figure 2-1](#)). This discharge point is recommended since the water will be delivered directly to the rehabilitated area where it is most needed and with minimal losses to evaporation. In addition, the discharge must be a short distance below ground level (≈ 25 cm) so as to minimise immediate water losses to evaporation. A slotted or perforated wastewater spreader pipe at least 5 m long, or a similarly sized in situ brickwork box with open sides, may be used as a means of dispersal.

Phase 5 – Construction of the Diversion Berm

In line with General Notice 704 (GN704) of the National Water Act (Act 36 of 1998), it is proposed that a diversion berm is constructed along the boundary between the rehabilitated wetland area and the Lafarge internal stormwater management infrastructure. This berm will be close to, or over a drainage ditch which has been excavated in the area but which is to be filled in so as to reestablish a more natural ground surface level there. It is proposed that the diversion berm is a minimum height of 0.8 m. This berm will ensure that flood waters generated during the 1:50 year storm event will not inundate factory infrastructure and will ensure the separation of clean water (from the upstream catchment area) and potentially contaminated water (runoff from the factory site).

Phase 6 – Revegetation of the Wetland and Rehabilitation Area

It is hoped that the soil in the wetland rehabilitation area will be the original natural soil of the area. As a result, the wetland rehabilitation may be wider than 30 m in places. Where natural wetland soil is found, all that should be necessary will be to lightly rake the area with a spike harrow and then to introduce appropriate plant species. The entire area is to be grass seeded initially but some wetland plants may be introduced later. The latter plants may be taken (with appropriate permission) from the upstream and downstream areas of the wetland. They may be obtained with a corer of approximately 150 mm in diameter and be planted in holes of a similar size. Care must be taken to ensure that the corer lifts the root system of the plants and the recipient holes must be deep enough to accommodate the roots. The plant collection must be scattered over a large area so as not to open the donor sites to the risk of erosion.

The planting of the plugs will not seek to cover the entire rehabilitation area but will be done in transverse swathes which span the full width of the rehabilitation area and are approximately 60 cm to 100 cm deep. Planting should not be done immediately after establishment of the new wetland area but should be held back until there is evidence of wetness in the soil. Failure to do so will probably result in the introduced plants dying even if watered. Plantings may be done in any sequence and wherever wet conditions develop. Thus, areas which become wet first will be planted first. In this way the natural flow of the water through the soil will guide the rehabilitation process. For this reason, the revegetation process may take several months, or even more but, in the dry climate of the region and with the low topography profiles of the terrain, this is not considered to be problematic.

The banks of the wetland channel should be planted to natural variety of Kweek Grass (*Cynodon dactylon*) or other species, such as Witpluim-chloris Grass (*Chloris virgata*), if available. The soils should be lightly hand raked again after seeding, and a soil protection product such as biojute may be used along the lower areas so as to retain the seed. Seeding should be done at the start of the wet season but further watering may still be needed to promote the growth of the young plants.

The progress of recovery of the wetland will have to be monitored to meet requirements of the DFFE. It is anticipated that the process will take some time and possibly even several years. An ECO should be present during the initial removal and wetland rehabilitation and occasional inspections be done after that.

2.2 Engineering Considerations

The following engineering considerations are provided for the respective areas of rehabilitation. A drawing of the proposed engineering works is provided in **Annexure D** of this document.

2.2.1 Road Crossing No. 1: One Existing Gravel Road

The following refers to the access road along the northern boundary fence (near the lime silos). It is noted that there are currently no culverts at the intersection between the stream/wetland area and the access road. Since the terrain is so flat at the site it is probable that the construction of a crossing with included pipes or box culverts would entail placement of a new raised berm on either side of the channel area. Since the berm would constitute a obstruction to flows, it is recommended that a traditional drift crossing is implemented along the road where it intersects with the wetland area/drainage line. The drift crossing will be in the form of a concrete slab shaped along the gravel (as presented in **Detail 5** in the drawing in **Annexure D**).

2.2.2 Rail line 1: Removal, construction of a culvert structure and re-installation of approximately 280 m of existing rail line

The following refers to the northern rail line along which the carriages are shunted parallel with the northern boundary fence (upon which **Detail 4** is indicated in the drawing in **Annexure D**).

The elevation of the existing rail line relative to the natural ground level of the wetland, necessitates construction of a culvert to allow free flow water under the rail line and thereby link the wetland portions above and below the rail line respectively. The number of culvert openings and the dimensions of the culverts are based on the 1:50 year flood peak discharge rate. This is required to ensure that the risk of flooding of the Lafarge infrastructure (i.e. the Limestone Domes and Additives area) are not flooded during a 1:50 year flood event.

A concept design of the proposed culverts is illustrated in the drawing in Annexure A (see **Detail 4**). This includes precast concrete portal culverts to conform to rail loading, with inlet and outlet works comprising an apron slab and wingwalls. The downstream side is to be stabilised and to have flow energy reduction structures so as to prevent erosion of the soil surface at that place. Details and specification will need to be finalized during detailed design by a structural engineer. It is assumed that all construction work will be performed in accordance with Lafarge's Rail Safety Permit issued by the Rail Safety Regulator, and any additional permits and/ or notifications, if required, would be obtained by Lafarge Lichtenburg.

2.2.3 Rail Line 2: Upliftment and removal

The following refers to the central rail line, which is understood to no longer be in use by Lafarge (i.e. where the 120 m of removal of railway line is indicated in the drawing in **Annexure D**).

The upliftment and removal of approximately 120 m of existing rail line is recommended to allow for linkage of the wetland water bodies above and below this portion of rail. It is assumed that construction work regarding upliftment and removal of Rail Line 2 to allow for free flow passage of wetland water would be performed in accordance with Lafarge's Rail Safety Permit issued by the Rail Safety Regulator, and any additional permits and/ or notifications, if required, would be obtained by Lafarge Lichtenburg.

2.2.4 Culvert No. 2: Gravel road

The following refers to the southern railway line and access road along the southern boundary fence (i.e. where Culvert no. 2 is indicated in the drawing in **Annexure D**). As illustrated in this drawing (Drawing 5529-WR-200), Culvert no. 2 includes for 8 x (1.5 m x 0.6 m) pre-cast concrete, portal culverts (manufactured in accordance with SANS 986) with inlet and outlet works comprising concrete apron slab and wingwalls. Similar to the upstream culvert, the

number of openings and dimensions of the culvert have been determined based on the 1:50 year flood event and is required to ensure that the risk of flooding of the Lafarge infrastructure (Additives area) and mixing of clean and dirty stormwater runoff is avoided.

Final details of the culvert would be confirmed by a structural engineer during detailed design phase.

2.2.5 Removal of infill material

In order to minimize compaction of the in-situ soils underneath the infill during the construction activities and removal of infilled materials, the Contractor should ensure that machinery is only allowed to move on infill material (i.e. not directly on cleared areas where the in-situ soils have been exposed). This can only be achievable with detailed planning of tasks and resources by the contractor beforehand. This highlights the importance of method statements to be submitted by the Contractor prior to commencement with each construction activity, as prescribed below.

2.3 Roles, Responsibilities and Method Statements for the Rehabilitation Plan and EMP

2.3.1 Role-players

The rehabilitation plan provides guidelines for the rehabilitation of the wetland which was infilled with waste material from the factory. It is to be noted that, for most activities, the contractor, or contractors, are to provide method statements which will be assessed by the Client and by an Environmental Control Officer (ECO). These method statements are called for to allow liaison between the client and the contractors, and to provide an understanding of the operations by the people who will be most closely involved.

The implementation of this wetland rehabilitation plan and EMP requires the involvement of several stakeholders, each fulfilling a different, but vital role to ensure sound environmental management during the rehabilitation process. The key stakeholders include the following:

- ***Department of Forestry, Fisheries and Environment***

The DFFE is the designated authority responsible for authorising the EMP related to the project. It has overall responsibility for ensuring that the Applicant acts within the conditions of the pre-compliance Notice.

- ***Lafarge Holcim***

Lafarge is the owner of the cement factory at which the illegal infilling of the wetland area was undertaken. Under South African environmental legislation, the company is accountable for the corrective measures that are to be undertaken. It therefore has

overall environmental responsibility to ensure that the implementation of this EMP complies with the relevant legislation and the requirements of the DFFE.

- ***Environmental Control Officer***

An appointed independent ECO will monitor and review the on-site environmental management and implementation of this EMP by the contractor throughout the project. This will be done by conducting site audits and issuing monthly audit reports to the Applicant and DFFE Compliance Monitoring and Enforcement Section, as applicable.

The DFFE requires that the ECO be at the forefront of all environmental management issues.

- ***Contractor(s)***

This term refers to the main contractor(s) appointed by Lafarge for the implementation of the rehabilitation project, or a portion of the project. The main contractor(s) will be responsible for complying with the EMP commitments and any other legislative requirements, as applicable to the contractors' appointment for the proposed development.

The contractor(s) will also be responsible for drafting method statements appropriate to activities under their control.

Each contractor must ensure that all employees under their appointment receive appropriate training prior to the commencement of operations, taking cognisance of this EMP and the environmental guidelines within it.

- ***Environmental Manager***

The contractor will appoint an environmental manager to oversee environmental matters at the various work sites. The environmental manager, or his appointee, will conduct daily inspections of the site to identify potential non-compliances and potential negative impacts to the environment. The inspections will take the form of an inspection sheet and will be kept as a record. Findings thereof will be made available to the ECO and be raised in project meetings for mitigation or avoidance measures.

2.3.2 Method Statements

Method Statements are written submissions by the contractor to the ECO in response to the requirements of this EMP, or to a request by the ECO. The contractor shall be required to prepare Method Statements for several specific activities and/or environmental management aspects.

The contractor shall not commence the activity for which a Method Statement is required until the ECO and Lafarge has approved the relevant Method Statement.

Method Statements must be submitted at least 10 - 15 working days prior to the date on which approval is required to the ECO. The ECO must in turn accept or reject the Method Statement within 5 working days of receipt.

Failure to submit a Method Statement may result in suspension of the activity concerned until such time as a Method Statement has been submitted and approved.

An accepted Method Statement shall not absolve the contractor from any of his obligations or responsibilities in terms of the contract. However, any damage caused to the environment through activities undertaken without an approved Method Statement shall be rehabilitated at the contractor's expense.

The Method Statements shall cover relevant details with regards to:

- Construction procedures and location of the site / camp;
- Start date and duration of construction;
- Materials, equipment and labour to be used;
- How materials, equipment and labour would be moved to and from the site, as well as on site during operations;
- Undertaking of individual components of the rehabilitation process;
- Emergency procedures in case of any reasonably potential accident / incident which would occur during construction; and
- Compliance/non-compliance with any Pre-Compliance Notice specification and motivation if non-compliant.

2.3.3 Non-Compliances

The contractor shall comply with the environmental specifications and requirements on an on-going basis and any failure on his part to do so will entitle the ECO to impose a penalty.

In the event of non-compliance, the following recommended process can be followed:

- The ECO shall issue a notice of non-compliance to the contractor, stating the nature and magnitude of the contravention.
- The contractor shall act to correct the non-conformance within 24 hours of receipt of the notice, or within a period that may be specified within the notice.
- The contractor shall provide the ECO with a written statement describing the actions taken to discontinue the non-conformance, the actions taken to mitigate its effects and the expected results of the actions.
- In the case of the contractor failing to remedy the situation within the predetermined timeframe, the ECO shall refer the matter to Lafarge, who:
 - ✓ Has the right to stop work and/or certain activities on site in the case of non-compliance or failure to implement remediation measures; and / or
 - ✓ Impose a monetary penalty based on the conditions of contract (if applicable).

- In the case of a non-compliance giving rise to physical environmental damage or destruction, Lafarge shall be entitled to undertake, or to cause to be undertaken, such remedial works as may be required to make good such damage and to recover from the contractor the full costs incurred in doing so.
- In the event of a dispute or difference of opinion between any parties arising out of the interpretation of the conditions of the EMP, or a disagreement regarding the implementation or method of implementation of conditions of the EMP, any party shall be entitled to require that the issue be referred to specialists for arbitration.

2.3.4 Indicative List of Transgressions

Where the Contractor and/or his/her Sub-contractor(s) inflicts non-repairable damage upon the environment, or fails to comply with any of the environmental specifications, he/she shall be liable to pay a penalty fine over and above any other contractual consequences.

The contractor is deemed not to have complied with this EMP if:

- Within the boundaries of the site, site extensions and haul/access roads there is evidence of contravention;
- Environmental damage ensues due to negligence on the contractor's and/or his/her sub-contractor's part;
- The contractor and/or his/her sub-contractor fail to comply with the corrective or other instructions issued by the EM within a specific time; or
- The contractor and/or his/her sub-contractor fail to respond adequately to complaints from the public.

Payment of any fines in terms of the contract shall not absolve the offender from being liable from prosecution in terms of any law.

2.3.5 Environmental Awareness Training

The contractor shall ensure that adequate environmental awareness training of senior site personnel takes place and that all site workers receive an induction presentation on the importance and implications of the EMP and Conditions of the Non-Compliance Notice.

The training/presentation shall be conducted, as far as possible, in the employees' language of choice.

As a minimum, training shall include:

- Explanation of the importance of complying with the EMP;
- Discussion of the potential environmental impacts of, and environmental risks presented by, operational activities;
- Employees' roles and responsibilities, including emergency preparedness;

- Explanation of the mitigation measures that must be implemented when carrying out their activities; and
- Explanation of the management structure of individuals responsible for matters pertaining to the EMP.

The contractor shall keep records of all environmental training sessions, including names, dates and the information presented. These records will be presented to the ECO on request during his/her audits.

2.3.6 Method and Frequency of Monitoring

Prior to the start of the project, it is recommended that the appointed ECO, Lafarge, and the wetland specialist hold a meeting (remote meeting) to set out the monitoring details and programme. The following procedures are to be followed:

- An independent, external ECO must audit the site during the construction phase of the project, on a monthly basis or shorter period, unless otherwise specified by the DFFE;
- A monthly project Environmental Audit Report is to be drafted by the ECO and submitted to the DFFE and Lafarge for review and implementation prior to the following site audit.

2.3.7 Actions and Responsibilities

The actions and responsibilities for key stakeholders for each of the activities associated with the proposed rehabilitation activities are presented in **Table 2-2** to **Table 2-9**. This includes the following:

- Establishment of baseline conditions (**Table 2-2**),
- Construction of culverts to allow for free flow of water (**Table 2-3**),
- Removal of vegetation from the infill area (**Table 2-4**),
- Demolition of culverts and old roads/rail lines (**Table 2-5**),
- Removal of the infill material (**Table 2-6**),
- Shaping of the wetland/watercourse channel and surrounds (**Table 2-7**),
- Re-establishment of indigenous vegetation (**Table 2-8**),
- Supplementary water flows for the wetland (**Table 2-9**) and
- Monitoring actions (**Table 2-10**)

Table 2-2 Establishment of baseline conditions

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> The contractor must prepare a Construction Site Development Plan to be approved by the ECO prior to establishment on site. This plan must indicate: <ul style="list-style-type: none"> ✓ The boundaries of the site that encompass all construction related activities; ✓ Vehicle and pedestrian access points and routes; ✓ Haulage roads, powerlines and pipelines must be identified and clearly demarcated; and ✓ Offices, stockpile areas, storage areas, etc. 	Reduction of impacts on the receiving environment	Contractor, Lafarge, ECO	ECO
<ul style="list-style-type: none"> An Emergency Method Statement must be drafted and submitted to the ECO detailing fire, accidental leaks and spillage procedures, as well as emergency contact numbers. 	Site safety	Contractor	ECO
<ul style="list-style-type: none"> All fuel and other hydrocarbons must be stored under at least a sun cover and on an impervious floor in a bunded space which encloses at least 110% of the anticipated storage volumes. 	Site safety and spill protection	Contractor	ECO
<ul style="list-style-type: none"> Refuelling of machines and vehicles must be done over a spill tray. Any soil contaminated in a spill must be collected and be held in a sealable container prior to being removed to an approved disposal site. 	Environmental protection	Contractor	ECO
<ul style="list-style-type: none"> Adequate spill kits and containers for spilled and contaminated material must be provided. 	Site safety	Contractor	ECO
<ul style="list-style-type: none"> Waste bins with lids must be provided on site must be provided for labourers during the operational phase. 	Site cleanliness	Contractor	ECO
<ul style="list-style-type: none"> No wastes of any sort may be disposed of or burned on site but must be taken to an approved landfill or other disposal site. 	Site cleanliness	Contractor	ECO
<ul style="list-style-type: none"> Hazardous materials/dangerous goods should be stored in a clearly marked, lockable, designated storage area; 	Environmental protection	Contractor	ECO
<ul style="list-style-type: none"> An appropriate number of chemical, portable, toilets (1 toilet for every 20 workers). These must be maintained in a satisfactory condition and be located 100m away from any water resources at a minimum, or outside of the 1:100 year floodline; 	Site hygiene	Contractor	ECO
<ul style="list-style-type: none"> An Incidents Register must be maintained and kept at the site camp. 	Safety record	Contractor	ECO

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> Temporary stormwater control measures must be established so as to prevent sediment being washed into the wetland downstream of the factory during the operational phase. 	Environmental protection	Contractor	ECO
<ul style="list-style-type: none"> Environmental training must be held to ensure all site personnel are aware of the provisions contained in the EMP. A record of environmental training undertaken must be kept at the site camp. 	Staff training	Contractor, Lafarge, ECO	ECO

Table 2-3 Construction of culverts to allow for free flow of water

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> The contractor must prepare a Construction Method Statement to be approved by Lafarge and ECO prior to establishment on site. 	Reduction of impacts on the receiving environment	Contractor, Lafarge, ECO	ECO
<ul style="list-style-type: none"> The construction of the culverts is to be done in accordance with all the requirements listed for construction operations. 	Site safety		

Table 2-4 Removal of vegetation from the infill area

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> A Method Statement is to be prepared, which will provide the details of how site vegetation clearing will be executed in accordance with the following: 	Reduction of impacts on the receiving environment	Contractor, Lafarge, ECO	ECO
<ul style="list-style-type: none"> The areas which are to be rehabilitated are to be clearly demarcated by means of hazard tape or some other visible barrier. 	Environmental protection	Contractor, ECO	ECO
<ul style="list-style-type: none"> Indigenous vegetation which is to be retained must be clearly demarcated by means of hazard tape or some other visible barrier. 	Environmental protection	Contractor, ECO	ECO
<ul style="list-style-type: none"> The removal of alien vegetation must be done prior to infill material being removed. 	The reason for this requirement is that of minimising machine/vehicle movement on the natural soil surface and so compacting it.	Contractor, ECO	ECO
<ul style="list-style-type: none"> Low vegetation (small trees and bushes) which is to be removed is to be either felled at ground level or be uprooted. The plant material must then be removed immediately for destruction. It may then be burned and this will ideally be done in the site where the infill material is to be later spoiled. 	Disposal of alien weed material	Contractor, ECO	ECO

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> The large gum trees in the area south of the infill area will ideally be felled and waste slash be removed along the old road or rail routes prior to these structures being demolished. It is to be noted that the roots of large trees serve to stabilise soil and so the stumps may be left in place. They must, however, be treated with a herbicide so as to kill them off. 	The reason for this requirement is that of minimising machine/vehicle movement on the natural soil surface and so compacting it.	Contractor, ECO	ECO
<ul style="list-style-type: none"> Large gum tree trunks and branches may be retained either for timber purposes or for use as a fuel in the factory. If not required they must be removed to the infill material spoil site but need not be burned. 	Disposal of large gum trees	Contractor, ECO	ECO

Table 2-5 Demolition of culverts and old roads/rail lines

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> A Method Statement is to be prepared, which will provide the details of how structure demolition will be executed in accordance with the following. 	Reduction of impacts on the receiving environment	Contractor, Lafarge, ECO	ECO
<ul style="list-style-type: none"> As far as possible the demolition is to be started at the factory end so that the structure itself may be used as an access route. 	Environmental protection	Contractor, ECO	ECO
<ul style="list-style-type: none"> The material must be removed down to the level of the natural topsoil. 		Contractor, ECO	ECO
<ul style="list-style-type: none"> The material will ideally be taken directly to the final spoil site and not be stockpiled as an interim measure. 		Contractor, ECO	ECO

Table 2-6 Remove of the infill material

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> A Method Statement is to be prepared, which will provide the details of how site clearing will be executed in accordance with the following. 	Reduction of impacts on the receiving environment	Contractor, Lafarge, ECO	ECO
<ul style="list-style-type: none"> Areas which are to be rehabilitated are to be clearly demarcated by means of hazard tape or some other visible barrier. 	Environmental protection	Contractor, ECO	ECO
<ul style="list-style-type: none"> Indigenous vegetation which is to be retained must be clearly demarcated by means of hazard tape or some other visible barrier. 	Environmental protection	Contractor, ECO	ECO
<ul style="list-style-type: none"> The infill material must be removed to just the level of the underlying soil surface. As little as possible of the natural soil must be removed or disturbed and as far as is practical, the underlying soil contours must be maintained. 	Soil conservation and protection	Contractor, ECO	ECO

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> The infill material must be removed from the lower (western) side first and then be cleared progressively toward the boundary fence. 	Reduction of vehicle and machine traffic over exposed natural soil	Contractor, ECO	ECO
<ul style="list-style-type: none"> The material will ideally be taken directly to the designated final spoil site and not be stockpiled as an interim measure. 		Contractor, ECO	ECO

Table 2-7 Shaping of the wetland/watercourse channel and surrounds

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> The contractor must prepare a Method Statement to be approved by the ECO prior to establishment on site. 		Contractor, Lafarge, ECO	ECO
<ul style="list-style-type: none"> All components in the infill clearance area, including the wider wetland area and the 30m wide channel within the wetland area stormwater management channel must be surveyed and pegged out. 			
<ul style="list-style-type: none"> The first component to be shaped must be the stormwater control channel which will service the northern part of the factory area. To the greatest possible extent, the work on the channel and its associated berm and bank which will separate it from the wetland/watercourse channel should be done from the factory side. The following items are critical: <ul style="list-style-type: none"> ✓ The bank on the wetland side of the channel will extend as far south as necessary to separate the stormwater channel from the wetland. ✓ The bank must be as narrow as possible but must be stable. ✓ If need be, retaining structures such as stone packed gabion baskets must be used. 	The reason for this requirement is that of minimising machine/vehicle movement on the natural soil surface and so compacting it.	Contractor, ECO	ECO
<ul style="list-style-type: none"> The 30 m wide wetland channel must match the upstream and downstream ground surfaces so that water is able to flow through the area without obstruction. 	Free passage of water through the wetland area.	Contractor, ECO	ECO
<ul style="list-style-type: none"> Across the channel width the soil must be shaped to a very shallow dished profile. The dish need be no more than 0.1 m to 0.15 m deep. 	Limited concentration of water so as to keep the channel centre wetted.		
<ul style="list-style-type: none"> The slope on the eastern side of the channel must grade smoothly into the channel without a distinct step. The overall slope will be dictated by the natural terrain contours but should not be steeper than 1 in 5 at any place. 			

Table 2-8 Re-establishment of indigenous vegetation

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> The contractor must prepare a Method Statement to be approved by the ECO prior to starting on the re-establishment of indigenous vegetation. 		Contractor, ECO	ECO
<ul style="list-style-type: none"> Residual patches of indigenous vegetation must be kept as nuclei which will aid recolonisation of plant diversity. Such vegetation must be representative of the wider wetland area. 		Contractor, ECO	ECO
<ul style="list-style-type: none"> The soil surface in both the wetland area and the adjacent banks must be broken to a depth of approximately 100 mm to 150 mm by means of a harrow or similar implement which will break down soil clods. 		Contractor, ECO	ECO
<ul style="list-style-type: none"> As an interim measure, the entire area must be lightly planted with a grass such as Kweek (<i>Cynodon dactylon</i>) or Witpluim (<i>Chloris virgata</i>). After planting the area must be lightly raked over to cover the seed and so prevent it from blowing away. 	Other grass species which may be used if available: <i>Eragrostis curvula</i> , <i>E. superba</i> , <i>E.nindensis</i> , <i>Tristacya leucothrix</i> . These may be mixed in with Kweek grass.	Contractor, ECO	ECO
<ul style="list-style-type: none"> Since growth of the young grass plants may be slow, the following actions may be necessary: <ul style="list-style-type: none"> ✓ Planting must be done early in the rain season so that the young plants will have optimal growth conditions. ✓ Covering sensitive (steeper) areas with biojute or a similar mesh to hold the soil and seedlings. ✓ Watering may be necessary to sustain the young plants. 	Encouragement of seedling growth and protection.	Contractor, ECO	ECO
<ul style="list-style-type: none"> Once the newly formed wetland area starts to show signs of wetness then plugs of wetland vegetation collected from the upstream wetland may be planted in loose rows across the wetter parts of the channel. As applicable, vegetation from the seasonal and temporary wetland zones must also be included. This activity should be sustained as the area of wetness spreads. 	Initiation of wetland vegetation development.	Contractor, ECO	ECO
<ul style="list-style-type: none"> In addition to the grass planting, young Karee trees may be collected and be planted at the site but only on the eastern side. The trees must be planted in a square hole of approximately 75 cm x 75 cm and 60 cm deep. Some grass mulch may be placed at the bottom of the hole and the upper surface may be a shallow depression which will collect any rainwater available. 	Vegetation diversity. Encouragement of tree growth.		

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> A weed control programme must be set in place to ensure that alien species do not colonise the area. 	Prevention of alien species invasion.	Contractor, ECO	

Table 2-9 Supplementary water flows for the wetland

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> The DFFE called for additional water to be supplied from the mine pits to the wetland. In order to achieve this, it is suggested that a pump delivers water to the head of the wetland at a point just downstream of the present railway line crossing. It is suggested that the pump be solar powered and that the water be delivered only when the level in the pit allows for it. 	<p>The sustainable abstraction from the mine pit remains to be determined.</p> <p>The cutoff water level in the old mine pit remains to be determined.</p>	Contractor, Lafarge ECO	ECO
<ul style="list-style-type: none"> The water must be delivered into a structure which will allow a sub-surface discharge as this will prevent immediate losses to evaporation. A 5 m section of slotted drainage pipe with blocked ends, or similar, will serve the purpose. 	The water should be released approximately 25 cm to 40 cm below the soil surface.	Contractor, Lafarge ECO	ECO

Table 2-10 Monitoring actions

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> Prior to the start of site works, Lafarge is to appoint an Environmental Control Officer, and the appointed lead contractor is to appoint an Environmental Manager. 	These two key role players must be appointed at an early stage and must familiarize themselves with the site.	Lafarge, Contractor	
<ul style="list-style-type: none"> Prior to the start of the project, Lafarge, the appointed contractor with the Environmental Manager, and the wetland specialist are to meet to set out monitoring details and a monitoring programme. At least the following will be considered: <ul style="list-style-type: none"> ✓ Construction camp management. ✓ Techniques to be used including those for initial infill material removal and spoiling. ✓ Channel reconstruction and other earthworks. ✓ Removal of alien plants. ✓ Revegetation of the site. 	The monitoring requirements are to be explained to those who will be working on site and who will be doing the bulk of the monitoring work.	Contractor, Lafarge, ECO, Wetland Specialist	

MANAGEMENT ACTIONS	MANAGEMENT CAUTIONS	RESPONSIBILITY	MONITORING
<ul style="list-style-type: none"> ✓ Rewetting of the channel. 			
<ul style="list-style-type: none"> ● Monitoring reporting is to follow strict procedures and schedules. The following are recommended: <ul style="list-style-type: none"> ✓ The Environmental Manager will conduct a daily site inspection or inspections and provide daily feedback to the contractor or site manager. In addition, any problems should be conveyed to the ECO for discussion and appropriate action. ✓ The ECO will be on site for the first week of works and at least once a month thereafter. ✓ There will be a weekly meeting and status update between the contractor, Lafarge, and the ECO although such meetings may be called more frequently if circumstances require them. ✓ The ECO will prepare a monthly report after his/her site visit and submit it to Lafarge. Lafarge will then be responsible for submission of the report to the DFFE. 	<p>Frequency of site inspection/monitoring reports.</p> <p>Channels for submission of the reports.</p>	Eco, Lafarge	

3 ENVIRONMENTAL MANAGEMENT PLAN ACKNOWLEDGEMENT FORM

REHABILITATION OF THE LICHTENBURG LAFARGE CEMENT FACTORY WETLAND AREA

Record of signatures providing acknowledgment of being aware of, and committed to complying with the contents of this Environmental Management Plan (EMP), which relates to the environmental management, mitigation and rehabilitation measures for the project operations outlined above, and for the environmental conditions contained in the civil and other project contract documents.

APPLICANT / EMPLOYER:

Signed: Date:

IMPLEMENTING AGENT:

Signed: Date:

CONTRACTOR:

Signed: Date:

SUB - CONTRACTOR:

Signed: Date:

4 BIBLIOGRAPHY

ENVIROSERV, 2021. Waste classification and landfill assessment of watercourse area material generated by Lafarge Industries – Lichtenburg. www.enviroserv.co.za

JG AFRIKA, 2021. Assessment of the wetlands in the vicinity of the Lafarge Cement Factory in Lichtenburg together with management recommendations. JG Afrika. Pietermaritzburg. pietermaritzburg@jgafrika.com

TUCANA SOLUTIONS, 2017. Lafarge Lichtenburg Cement Plant and Tswana Quarry: Geohydrological Report. Tucana Solutions, groundwater and Alternative Energy.

ANNEXURE A – NON-COMPLIANCE NOTICE FIGURES

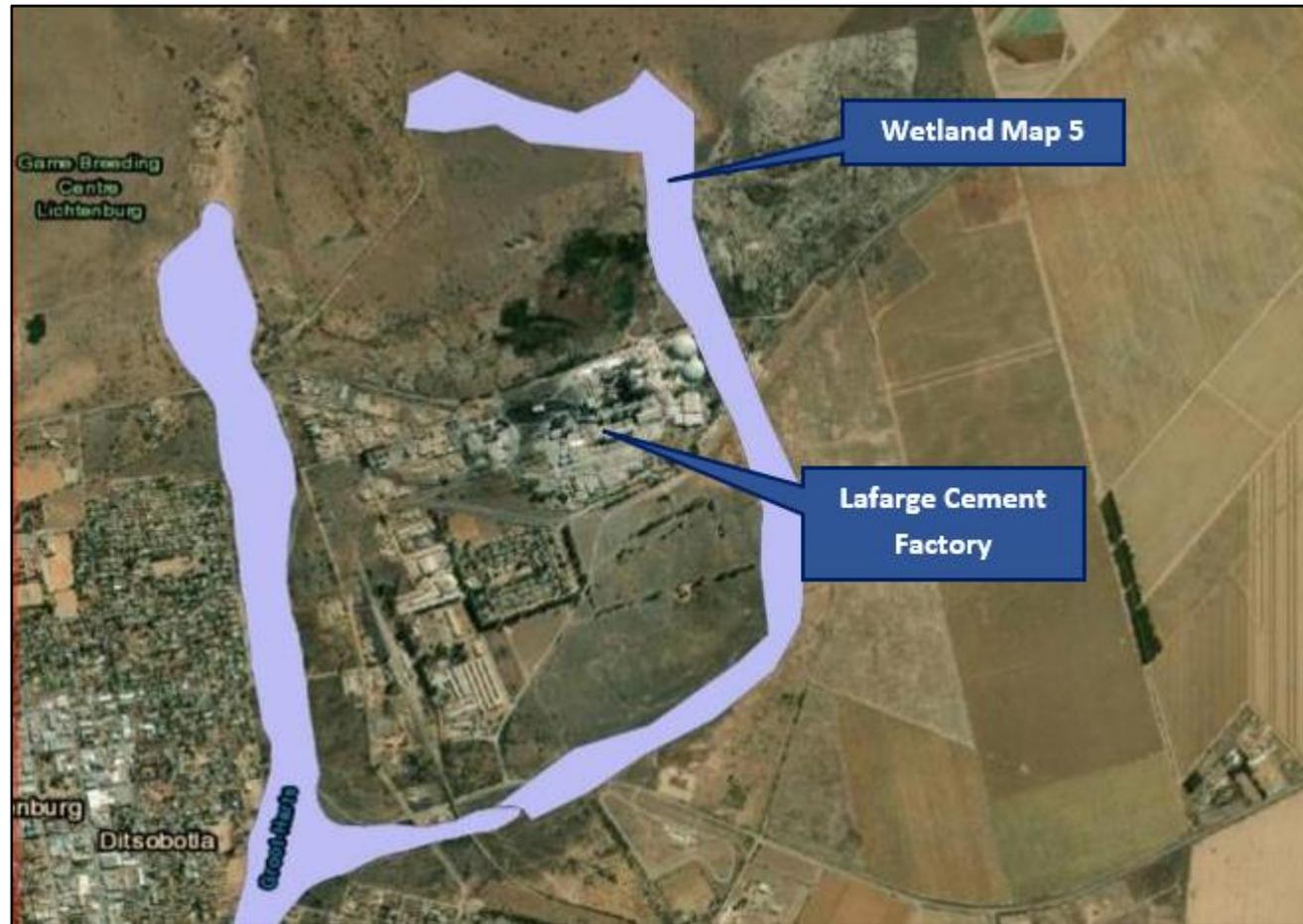


Figure A 1 Lafarge cement factory showing the proximity of the National Wetland Map 5 system



Figure A 2 Lafarge Infill Site: October 2003



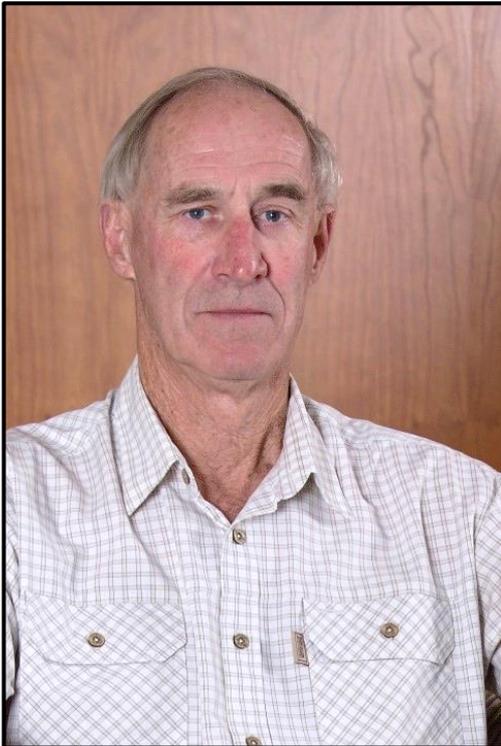
Figure A 3 Lafarge Infill Site: July 2008



Figure A 4 Lafarge Infill Site: November 2019

ANNEXURE B - CV OF MR D.J. ALLETSON DACRE

JAMES ALLETSON



Profession	ENVIRONMENTAL SCIENTIST
Position in Firm	Wetland and Biodiversity Specialist
Area of Specialisation	PRELIMINARY ENVIRONMENTAL ASSESSMENT, TERRESTRIAL FAUNA AND FLORA SURVEYS, AQUATIC BIODIVERSITY SURVEYS, WETLAND DELINEATION AND ASSESSMENT, ENVIRONMENTAL CONTROL OFFICER DUTIES; ENVIRONMENTAL MANAGEMENT PROGRAMMES, ENVIRONMENTAL IMPACT ASSESSMENTS, SCOPING REPORTS
Qualifications	BSc, BSc (Hons)
Years of Experience	50
Years with Firm	10

SUMMARY OF EXPERIENCE

Mr Alletson has long experience in the fields of conservation and management of the natural environment and has specialised in aquatic species and systems. After graduating he was employed at the Oceanographic Research Institute in Durban where he worked on a number of projects in both the estuarine and marine environments. In 1975 he joined to the Natal Parks Board where he served for 21 years in a number of positions. His activities in this time included research and management of certain fish species, management of a trout hatchery, provision of an extension service relating to wetlands and rivers, and participation in management of game and nature reserves, including drafting of management plans. From 1984 onwards he served as the Board's river and wetland specialist ecologist and was involved in wetland-related research and management activities.

In 1997 he formed Alletson Ecologicals, an environmental consultancy and has undertaken a wide variety of environmental investigation and monitoring programmes. Amongst these are some 100 Environmental Impact Assessments which ranged from developments such as timber planting permits, gravel pits, and irrigation dams, through to coal mines, large state dams, housing schemes, private property developments, and pipelines.

Mr Alletson has also taken part in regional planning studies for the Town and Regional Planning Commission and has contributed toward integrated management plans for conservation areas and projects.

Since 2012 Mr Alletson has worked with JG Afrika (previously Jeffares & Green (Pty) Ltd) and has, amongst other activities undertaken numerous wetland delineations and assessments, and also aquatic surveys for river health assessments and Water Use Licence applications. He also undertakes terrestrial biodiversity surveys as components of impact assessments, planning projects, and monitoring programmes.

EDUCATION

Date (from – to):	1966-1969
Degree/Institution:	BSc – Biological Sciences (University of Natal – now University of KwaZulu-Natal)
Date (from – to):	1972
Degree/Institution:	B.Sc Honours – Zoology (Rhodes University)
Other Training:	<p>1974: Basic Business Management - Durban Technical College</p> <p>1983: Public Speaking and Visual Aid Preparation - Natal Parks Board.</p> <p>1985: Grassland Management and Assessment - Natal Parks Board.</p> <p>1998: SASS Biomonitoring Procedure for Assessment of River Health - Umgeni Water.</p> <p>1970: Small Craft Skipper’s Certificate, and Port of Durban Operators Certificate.</p> <p>2015: Wetland Buffer Determination Course – Water Research Commission.</p> <p>2018: Biodiversity Offset Training Course – South African National Biodiversity Institute.</p>

EMPLOYMENT RECORD

Date (from – to)	1966 - 1968
Location	Durban, South Africa
Employer	Oceanographic Research Institute
Position(s)	Student Assistant/Intern during university vacations
Description	Assistant on marine and estuarine research programmes.
Date (from – to)	1969 - 1971
Location	Durban, South Africa
Employer	Oceanographic Research Institute
Position(s)	Research Technician
Description	Provision of technical assistance on marine and estuarine research programmes. Also took part in collection of live specimens for display in the Durban Oceanarium.

Date (from – to)	1972
Location	Rhodes University, Grahamstown, South Africa
Position(s)	Student
Description	BSc Honours
Date (from – to)	1973 - 1975
Location	Durban, South Africa
Employer	Oceanographic Research Institute
Position(s)	Research Officer
Description	Conducted research on commercially exploited deep sea crustaceans and assisted with other marine research programmes.
Date (from – to)	1975 – 1996
Location	KwaZulu-Natal, South Africa
Employer	Natal Parks Board
Position(s)	Research Officer
Description	Research and management relating to conservation of rivers, wetlands, and aquatic species. Contribution relevant inputs to an extension programme for landowners, and to management of aquatic systems in game and nature reserves. Also undertook conservation planning and developed the KwaZulu-Natal Environmental Atlas.
Date (from – to)	1997 – present
Location	Pietermaritzburg, KwaZulu-Natal, South Africa
Employer	Alletson Ecologicals
Position(s)	Environmental Scientist
Description	The consultancy has undertaken many environmental consulting projects for various clients, and provides almost full time biodiversity- related service to JG Afrika (Pty) Ltd

SPECIFIC EXPERIENCE

Biodiversity and Wetland Assessment Projects

Name of Project:	Desktop wetland screening and classification assessment on various properties within the Umdloti, Tongaat and Umhlali Catchment Areas for suitability to meet offsite wetland mitigation obligations for Dube Tradezone 2, Agrizone 2, Support Zone 2 And Tradezone 3
Client:	Dube TradePort Corporation
Project duration/date:	2020 to 2021. Ongoing
Job Title and Duties:	Wetland and Biodiversity Specialist

	Screening of three wetland sites for possible use in offsetting wetland loss at the Dube TradePort Complex and then putting forward selection recommendations.
Name of Project:	Watercourse and wetland survey done in regard to the rehabilitation of the Camps Drift Canal in Pietermaritzburg by means of dredging
Client:	Henwood and Nxumalo Consulting Engineers
Project duration/date:	June – August 2021
Job Title and Duties:	<p>Wetland and Biodiversity Specialist.</p> <p>The Camps Drift Weir and Canal are important features in Pietermaritzburg. This study assesses the possible impacts on the aquatic systems as a result of deepening the system through dredging of accumulated sediment. It then puts forward a series of management recommendations.</p>
Name of Project:	Assessment of the wetlands in the vicinity of the Lafarge Cement Factory in Lichtenburg together with management recommendations
Client:	Greenmined Environmental
Project duration/date:	January April 2021
Job Title and Duties:	<p>Wetland and Biodiversity Specialist</p> <p>A section of wetland that has been infilled is to be rehabilitated or the damage repaired. The findings of a survey and management recommendations are put forward.</p>
Name of Project:	Consideration of the possible risks to wetlands and watercourses along the routes of the bulk pipelines of the proposed Gunjana Community Water Scheme upgrade
Client:	JG Afrika (Pty) Ltd
Project duration/date:	June to July 2020
Job Title and Duties:	<p>Wetland Specialist</p> <p>Construction and upgrade of a rural potable water scheme near Pomeroy, KwaZulu-Natal, is planned. In terms of the National Water Act, 1998 (Act No. 36 of 1998) attention must be given to wetlands and watercourses as a Water Use Licence may be necessary. This study assesses the watercourse crossings and the risks posed to the aquatic</p>

	systems. It then puts forward a series of management recommendations.
Name of Project:	Phalanndwa Coal Mine Biodiversity and Wetland Assessment
Client:	uKhozi Environmentalists
Project duration/date:	September 2017
Job Title and Duties:	Wetland and Biodiversity Specialist Undertaking the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the Phalanndwa Coal Mine Expansion near Delmas.
Name of Project:	Lephalale Coal Mine Biodiversity and Wetland Assessment
Client:	Kongiwe Environmental Consultants
Project duration/date:	April to August 2017
Job Title and Duties:	Wetland and Biodiversity Specialist Undertaking the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the Lephalale Coal Mine near Lephalale.
Name of Project:	Riversdale Coal Mine Wetland Assessment
Client:	Nzingwe Consultancy
Project duration/date:	May 2017
Job Title and Duties:	Wetland Specialist Undertaking the wetland specialist study in support of the Application for Environmental Authorisation and the Water Use Licence Application for the Riversdale Coal Mine near Vryheid.
Name of Project:	SAPPI Saiccor Wetland Assessment
Client:	WSP Environmental

Project duration/date:	August 2017
Job Title and Duties:	Wetland Specialist Undertaking the wetland specialist study in support of the Application for Environmental Authorisation for the construction of flood protection measures associated with the SAPPI Saiccor Mill, uMkomaas.
Name of Project:	Southport Housing Project Vegetation and Estuarine Survey
Client:	Private landowner
Project duration/date:	2019
Job Title and Duties:	Wetland and Vegetation Specialist. The vegetation at the site of a proposed housing project, as well as a nearby stream and the Umhlangamkulu River Estuary were surveyed and assessed. Management recommendations were put forward.
Name of Project:	Provision of Housing for Military Veterans
Client:	Umsunduze Local Municipality
Project duration/date:	2019
Job Title and Duties:	Wetland and Biodiversity Specialist. Four sites which are under consideration for housing for military veterans were visited in order to survey any wetlands and the biodiversity at each. Management recommendations were put forward.
Name of Project:	Rocabar Project Roads Assessment.
Client:	Private landowner
Project duration/date:	2019
Job Title and Duties:	Wetland and Biodiversity Specialist. The area around the proposed Rocabar commercial development in Kokstad was considered in relation to the impacts of access roads on wetlands. Management recommendations were put forward.
Name of Project:	Comrie Dam
Client:	WSP Consulting

Project duration/date:	2017 - present
Job Title and Duties:	The nGudwini River downstream of the Comrie dam near Bulwer is being monitored in compliance with the conditions of the Water Use Licence. It has been found that the river has recovered to a certain extent but that the fish populations are permanently affected.
Name of Project:	Road R61 Upgrade
Client:	SANRAL SOC
Project duration/date:	2019
Job Title and Duties:	Wetland and Biodiversity Specialist. The rivers, wetlands, and vegetation along a 24 km section of Road R61 were surveyed and assessed together with a vegetation specialist. Especial attention was given to the larger rivers as their nearby estuaries are of high importance. Management recommendations were put forward.
Name of Project:	Upgrade of Roads P2 and R389
Client:	Henwood and Nxumalo Consulting Engineers
Project duration/date:	2019
Job Title and Duties:	Wetland Specialist. Two roads in northern KwaZulu-Natal, and which are to be upgraded, were examined and the wetlands and watercourse crossings were assessed. Management recommendations were put forward.
Name of Project:	Ntuzuma Transit Housing Project
Client:	eThekwinini Human Settlements: Housing Engineering
Project duration/date:	2019
Job Title and Duties:	Wetland Specialist. The sites proposed for temporary transit housing were visited and assessed in regard to potential impacts on nearby streams and watercourses. Management recommendations were put forward.

Name of Project:	Assessment of the terrestrial biodiversity in relation to the upgrade of a treatment works and a new potable water pipeline near Moyeni/Zwelisha, Kwazulu-Natal
Client:	JG Afrika (Pty) Ltd
Project duration/date:	April 2021
Job Title and Duties:	Biodiversity and Wetland Specialist The terrestrial and aquatic biodiversity in the vicinity of a water treatment works and along a new bulk main pipeline have been assessed and management recommendations are put forward.
Name of Project:	eThekwini Pedestrian Bridges
Client:	eThekwini Metropole
Project duration/date:	2018 - 2019
Job Title and Duties:	Wetland and River Specialist. Seven bridges for pedestrians were under consideration by the municipality. All the sites were visited and the aquatic systems there were assessed and modelled as was relevant. One site was not supported but management recommendations were put forward for the others.
Name of Project:	Assessment of the Stream and Wetland Areas in the vicinity of the Ecoguard Biosciences Plant in Merrivale, Kwazulu-Natal
Client:	Ecoguard Biosciences (Pty) Ltd
Project duration/date:	2018 - 2019
Job Title and Duties:	Wetland Specialist. The possible impacts from a herbicide factory on a stream and wetland were considered. The system was found to be severely degraded but preventative management recommendations were put forward.
Name of Project:	Consideration of Impacts, and Determination of a Possible Offset Area, in Relation to the Proposed Sokhulu Agricultural Project
Client:	Department of Rural Development and Land Affairs
Project duration/date:	2018

Job Title and Duties:	Wetland Specialist. Surveys of wetlands on the Mfolozi/Umsunduze rivers floodplain were undertaken in relation to rehabilitation of an old agricultural project. Management recommendations were prepared and wetlands offsets were proposed.
Name of Project:	Biodiversity, River and Wetland Assessments associated with the proposed upgrade of housing and services in Ngwelezane, KwaZulu-Natal
Client:	City of Mhlatuze
Project duration/date:	2018
Job Title and Duties:	Wetland and Biodiversity Specialist. Surveys were done on the wetlands and river in the vicinity of Ngwelezane in relation to the provision of new housing and municipal infrastructure.
Name of Project:	N2 – Mt Edgecombe Interchange Wetland and Biodiversity Assessment
Client:	South African National Roads Agency Limited
Project duration/date:	December 2012
Job Title and Duties:	Wetland and Biodiversity Specialist. Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the N2 – Mt Edgecombe Interchange, Durban.
Name of Project:	Biodiversity and Wetland Survey for a Bulk Water Supply Upgrade for the Estcourt Industrial Area
Client:	uThukela District Municipality
Project duration/date:	2017 - 2018
Job Title and Duties:	Wetland and Biodiversity Specialist. Conducted surveys along the routes of several pipelines. The wetlands were assessed, and management recommendations were put forward.

Name of Project:	Wetlands Search and Delineation Along the Route of a Proposed New Bulk Raw Water Supply Pipeline from Spioenkop Dam to Ladysmith Water Treatment Works
Client:	uThukela District Municipality
Project duration/date:	2015
Job Title and Duties:	Wetland Specialist. Searches for wetlands along the proposed pipeline route were undertaken and the systems found were delineated and assessed. Terrestrial biodiversity surveys were also undertaken at the same time.
Name of Project:	Bhangazi Community Tented Camp Wetland and Biodiversity Assessment
Client:	Environmental Resources Management
Project duration/date:	March 2017
Job Title and Duties:	Wetland and Biodiversity Specialist. Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the establishment of the Bhangazi Community Tented Camp in the isiMangoliso Wetland Park, St. Lucia.
Name of Project:	Water Use Licence Applications
Client:	Various
Project duration/date:	Various
Job Title and Duties:	Wetland Specialist. Wetland surveys and assessments have been undertaken for numerous Water Use Licence Applications.
Name of Project:	ESKOM 22 kVA Lines Vegetation Assessments
Client:	ESKOM Soc
Project duration/date:	Various
Job Title and Duties:	Vegetation Specialist

	Undertaking of vegetation assessments for the establishment of various 22kVA electrification lines in KwaZulu-Natal.
Name of Project:	Delineation of Wetlands (Multiple Projects)
Client:	Various
Project duration/date:	1997 - present
Job Title and Duties:	Acted as specialist wetland ecologist for numerous projects (including roads, powerlines, municipal infrastructure, housing, dams, timber plantations) requiring identification and delineation of wetlands.
Name of Project:	Biodiversity Assessment – Proposed New Durban Dig-out Container Port
Client:	Transnet SOC
Project duration/date:	2013 - 2013
Job Title and Duties:	Survey Team Leader. Assembled a team of biodiversity specialist to undertake surveys of the biodiversity at the site of the old Durban Airport in relation to the proposed excavation of a new container shipping terminal. Also undertook wetland and biodiversity surveys and much of the final data compilation and reporting.

CONTINUED PROFESSIONAL DEVELOPMENT

Courses, Conferences & Workshops

- 2019 (October)** - IAIA Biodiversity Offsets Workshop
2018 (November) - Biodiversity Offset Training (Course)
2015 (April) - Wetland Buffer Determination (Workshop)

PERSONAL DETAILS

Nationality – South African

Date of Birth – 10 April 1948

Domicile – Hilton, KwaZulu-Natal, South Africa

Languages

Language	reading	speaking	writing
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Fair	Poor
Zulu	Nil	Communication	Nil

Professional Registration and Society Membership:

South African Council for Natural Scientific Professionals. Registration No. 125697. Ecological Science.

International Association of Impact Assessors – South Africa Suite, Membership Number 035.

Water Research Commission. Certified SASS Practitioner.

ANNEXURE C – ENVIROSERVE WASTE CLASSIFICATION REPORT



Waste Classification and Landfill Assessment of Watercourse Area Material generated by Lafarge Industries - Lichtenburg

August 2021

RAISING THE WASTE GAME



Customer Care Line 0800 192 783 clientservices@enviroserv.co.za Tel +2711 456 5660 www.enviroserv.co.za

Registered Address EnviroServ Waste Management (Pty) Ltd Brickfield Road, Meadowdale, Germiston PO Box 1547, Bedfordview, 2008

Gauteng Regional Office +2711 456 5400 / +2787 086 8400 KwaZulu Natal Regional Office +2787 086 8401 Western Cape Regional Office +2787 086 8402 Eastern Cape Regional Office +2711 456 5497 / +2787 086 8403
Directors C.L.A. Coppings, E. Gombault, S. Jwili, D.F.N. Krugel, D. Lavarinhas, D.L. Thompson (CEO), N.S. Vermeulen, C.L.A. Coppings (Company Secretary) Reg No 2008/021152/07



Customer: Lafarge Industries South Africa

Waste Type: Watercourse Area Material

WIR No: D12554-01

Reference No: 266160

Physical Nature: Solid

Introduction:

Lafarge South Africa, one of the major cement companies in Southern Africa, manufactures and markets cement, ready-mix concrete, aggregates and Gypsum products.

Lafarge is a leading producer of building materials in South Africa. Lafarge products include cement, concrete, aggregates (sand and gravel) and gypsum.

Lafarge Lichtenburg has requested EnviroServ Waste Management to compile a waste classification and landfill assessment on a waste stream identified as "Watercourse Area Material".

This waste is a stockpile of waste that was generated in the plant.

Scope of Work:

The classification and landfill assessment was conducted by applying the following:

1. National Environmental Management: Waste Act, 2008
 - 1.1 Waste Classification and Management Regulations, GN R634
 - 1.2 National Norms and Standards for the Assessment of Waste for Landfill Disposal, GN R635
 - 1.3 National Norms and Standards for Disposal of Waste to Landfill, GN R636
2. National Environmental Management: Waste Amendment Act, 2014
3. SANS 10234:2008 Edition 1.1

Ten (10) samples were collected by the EnviroServ consultant at various points within the watercourse study area as indicated in Figure 1 below.

The customer specifically requested the 10 x samples be composited and a composite sample analysed. An equal mass composite was made and analysed.

The composited sample was analysed at Element Materials Technology for inorganic elements and organic compounds

RAISING THE WASTE GAME



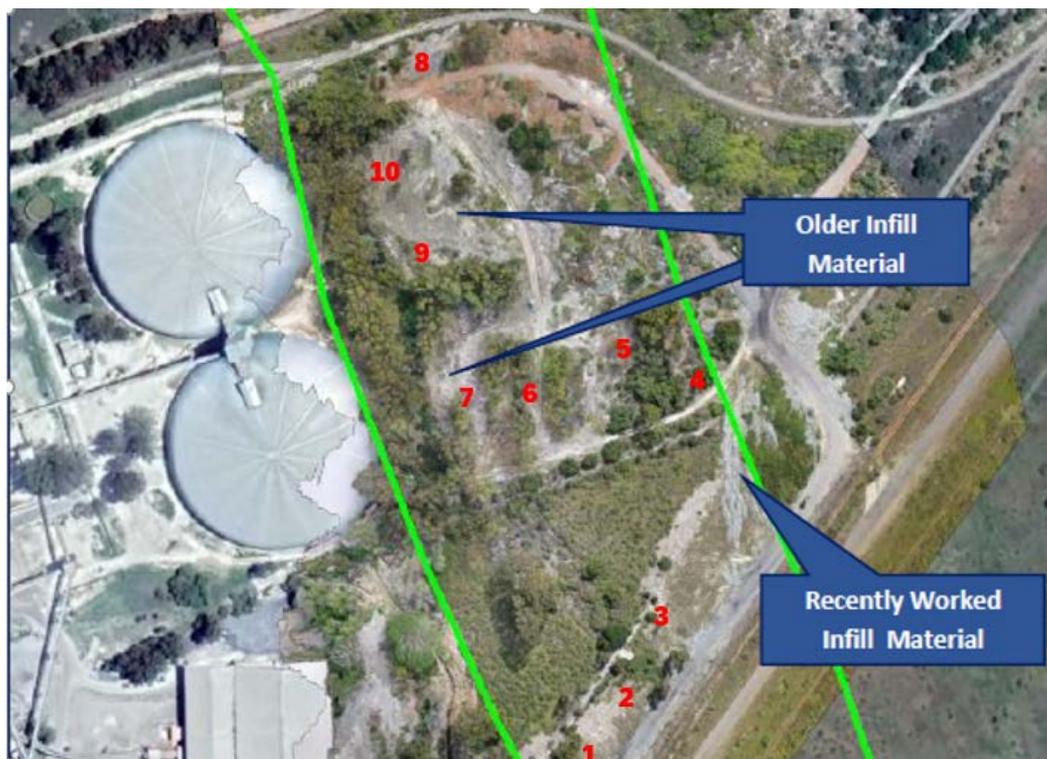
Customer Care Line 0800 192 783 clientservices@enviroserv.co.za Tel +2711 456 5660 www.enviroserv.co.za

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Gauteng Regional Office +2711 456 5400 / +2787 086 8400 KwaZulu Natal Regional Office +2787 086 8401 Western Cape Regional Office +2787 086 8402 Eastern Cape Regional Office +2711 456 5497 / +2787 086 8403

Directors C.L.A. Coppings, E. Gombault, S. Jwili, D.F.N. Krugel, D. Lavarinhas, D.L. Thompson (CEO), N.S. Vermeulen, C.L.A. Coppings (Company Secretary) Reg No 2008/021152/07

Figure 1: Sampling Points



Classification:

The **National Environmental Management: Waste Amendment Act (Act No. 26 of 2014)**, has listed 'Wastes from thermal processes – waste from the manufacture of cement' under **Category A: Hazardous Waste** and **Category B: General Waste**.

SANS 10234 2008 Edition 1.1 was applied to determine the classification.

The concentrations of the risk elements/compounds were compared against the cut-off values of the hazard classes – see Figure 2.

Figure 2: SANS 10234:2008 Edition 1.1 Hazard Class Cut-off Values

Table 2 — Cut-off values/concentration limits for hazard classes

1	2
Hazard class	Cut-off value (concentration limit) %
Acute toxicity	≥ 1,0
Skin corrosion	≥ 1,0
Skin irritation	≥ 1,0
Serious damage to eyes	≥ 1,0
Eye irritation	≥ 1,0
Respiratory sensitisation	≥ 1,0
Skin sensitisation	≥ 1,0
Mutagenicity:	
Category 1	≥ 0,1
Category 2	≥ 1,0
Carcinogenicity	≥ 0,1
Reproductive toxicity	≥ 0,1
Target organ systemic toxicity	
Single exposure	≥ 1,0
Repeat exposure	≥ 1,0
Hazardous to the aquatic environment	≥ 1,0

The analysis found there were no elements or compounds that exceeded the 1.0% and 0.1% hazard threshold.

The pH was tested on an aqueous extract of the sample. The pH was determined to be 9.02, which is within the SANS 10234:2008 Edition 1.1 limit of 2 < pH < 11.5 for Skin Corrosion. This implies that the waste will not pose a skin corrosion risk.

1	2	3
Properties of the ingredient	Cut-off values/concentration limits that trigger classification of the mixture %	Classification of mixture as hazardous to skin
Acid with pH ≤ 2	≥ 1	Category 1
Alkali with pH ≥ 11,5	≥ 1	Category 1



Therefore, the waste classifies as non-hazardous

A Safety Data Sheet (SDS) will be not required for storage, transport and disposal.

Landfill Assessment:

A landfill assessment was conducted based on the National Norms and Standards for the Assessment of Waste for Landfill Disposal and National Norms and Standards for Disposal of Waste to Landfill

These concentrations were compared against the thresholds listed in the Standard.

Figure 3: Landfill Assessment Thresholds

		TCT 0 mg/kg	TCT 1 mg/kg	TCT 2 mg/kg	LCT 0 mg/l	LCT 1 mg/l	LCT 2 mg/l	LCT 3 mg/l
Arsenic	As	5.8	500	2000	0.01	0.5	1	4
Antimony	Sb	10	75	300	0.02	1	2	8
Barium	Ba	62.5	6250	25000	0.7	35	70	280
Boron	B	150	15000	60000	0.5	25	50	200
Cadmium	Cd	7.5	260	1040	0.003	0.15	0.3	1.2
Chromium (VI)	Cr6	6.5	500	2000	0.05	2.5	5	20
Chromium Total	Cr Total	46000	800000	N/A	0.1	5	10	40
Cobalt	Co	50	5000	20000	0.5	25	50	200
Copper	Cu	16	19500	78000	2	100	200	800
Lead	Pb	20	1900	7600	0.01	0.5	1	4
Manganese	Mn	1000	25000	100000	0.5	25	50	200
Mercury	Hg	0.9	160	640	0.006	0.3	0.6	2.4
Molybdenum	Mo	40	1000	4000	0.07	3.5	7	28
Nickel	Ni	91	10600	42400	0.07	3.5	7	28
Selenium	Se	10	50	200	0.01	0.5	1	4
Vanadium	V	150	2680	10720	0.2	10	20	80
Zinc	Zn	240	160000	640000	5	250	500	2000
Chloride		N/A	N/A	N/A	300	15000	30000	120000
Cyanide Total	CN-Total	14	10500	42000	0.07	3.5	7	28
Fluoride	F	100	10000	40000	1.5	75	150	600
Nitrate-N	NO3 as N	N/A	N/A	N/A	11	550	1100	4400
Sulphate		N/A	N/A	N/A	250	12500	25000	100000
TDS		N/A	N/A	N/A	1000	12500	25000	100000



ENVIROSERV

WASTE MANAGEMENT

		TCT 0 mg/kg	TCT 1 mg/kg	TCT 2 mg/kg	LCT 0 mg/l	LCT 1 mg/l	LCT 2 mg/l	LCT 3 mg/l
1,1,1,2-Tetrachloroethane		N/A	400	1600	N/A	5	10	40
1,1,1-Trichloroethane		N/A	1200	4800	N/A	15	30	120
1,1,2,2-Tetrachloroethane		N/A	5	20	N/A	0.65	1.3	5.3
1,1,2-Trichloroethane		N/A	48	192	N/A	0.6	1	4
1,1-Dichloroethylene (1,1-Dichloroethene)		N/A	150	600	N/A	0.35	0.7	2.8
1,2-Dichlorobenzene		N/A	31900	127600	N/A	5	10	40
1,2-Dichloroethane		N/A	3.7	14.8	N/A	1.5	3	12
1,2-Dichloroethylene (1,2-Dichloroethene)		N/A	3750	15000	N/A	2.5	5	20
1,4-Dichlorobenzene		N/A	18400	73600	N/A	15	30	120
2,4,6-Trichlorophenol		N/A	1770	7080	N/A	10	20	80
2,4-Dichlorophenol		N/A	800	3200	N/A	10	20	80
2,4-Dinitrotoluene		N/A	5.2	20.8	N/A	0.065	0.13	0.52
2-Chlorophenol		N/A	2100	8400	N/A	15	30	120
Benzene		N/A	10	40	N/A	0.01	0.02	0.08
Benzo-a-pyrene		N/A	1.7	6.8	N/A	0.035	0.07	0.28
Carbon tetrachloride	CCl4	N/A	4	16	N/A	0.2	0.4	1.6
Chlorobenzene		N/A	8800	35200	N/A	5	10	40
Chloroform		N/A	700	2800	N/A	15	30	120
Di-2-ethylhexyl-phthalate (Bis-2-ethylhexyl-phthalate)		N/A	40	160	N/A	0.5	1	4
Dichloromethane		N/A	16	64	N/A	0.25	0.5	2
Ethylbenzene		N/A	540	2160	N/A	3.5	7	28
Formaldehyde		N/A	2000	8000	N/A	25	50	200
Hexachlorobutadiene		N/A	2.8	5.4	N/A	0.03	0.06	0.24
Methyl ethyl ketone		N/A	8000	32000	N/A	100	200	800
Methyl t-butyl ether	MTBE	N/A	1435	5740	N/A	2.5	5	20
Nitrobenzene		N/A	45	180	N/A	1	2	8
PAHs Total		N/A	50	200	N/A	N/A	N/A	N/A
Petroleum Hydrocarbons	C6 to C9	N/A	650	2600	N/A	N/A	N/A	N/A
Petroleum Hydrocarbons	C10 to C36	N/A	10000	40000	N/A	N/A	N/A	N/A
Phenols (total, non-halogenated)		N/A	560	2240	N/A	7	14	56
Polychlorinated biphenyls	PCBs	N/A	12	48	N/A	0.025	0.05	0.2
Styrene		N/A	120	480	N/A	1	2	8
Tetrachloroethylene (Tetrachloroethene)		N/A	200	800	N/A	0.25	0.5	2
Toluene		N/A	1150	4600	N/A	35	70	280
Trichlorobenzenes (total)		N/A	3300	13200	N/A	3.5	7	28
Trichloroethylene		N/A	11600	46400	N/A	0.25	2	8
Vinyl chloride		N/A	1.5	6	N/A	0.015	0.03	0.12
Xylenes (total)		N/A	890	3560	N/A	25	50	200
2,4-D		0.05	120	480		1.5	3	3
Aldrin + Dieldrin		0.05	1.2	4.8		0.015	0.03	0.03
Chlordane		0.05	4	16		0.05	0.1	0.1
DDT + DDD + DDE		0.05	50	200		1	2	2
Heptachlor		0.05	1.2	4.8		0.015	0.03	0.03



The results indicated all elements and compounds listed in GN R635 that were analysed were below the LCT1 thresholds.

Therefore, the waste assesses as Type 3. Type 3 waste may be disposed at a licensed H:H or H:h landfill (equivalent to a Class A landfill) or a licensed GLB+ landfill (equivalent to a Class B or Class C landfill depending on the engineering).

Landfill Restrictions:

Waste Restricted or Prohibited in terms of Disposal	Watercourse Area Material
(a) Waste which, in the conditions of a landfill, is explosive, corrosive, oxidising (according to SANS 10234 or SANS 10228)	n/a
(b) Waste with a pH < 6 or > 12	9.02
(c) Flammable waste with closed cup flash point of lower than 61° Celsius	> 61°C
(d) Reactive waste that may react with water, air, acids or components of the waste, or that could generate unacceptable amounts of toxic gases within the landfill	Is not reactive
(e) Waste compressed gases (according to SANS 10234 or SANS 10228)	n/a
(f) Untreated Health Care Risk Waste (HCRW)	n/a
(g) (i) POP's pesticides listed under the Stockholm Convention	n/a
(ii) Other waste pesticides	n/a
(h) Lead acid batteries	n/a
(i) Other batteries	n/a
(j) Re-usable, recoverable or recyclable used lubricating mineral oils, as well as oil filters, but excluding other oil containing wastes	n/a
(k) Re-usable, recoverable or recyclable used or spent solvents	n/a
(l) PCB containing wastes (> 50mg/kg or 50ppm)	n/a
(m) Hazardous Waste Electric and Electronic Equipment (WEEE) - Lamps	n/a
(n) Hazardous Waste Electric and Electronic Equipment (WEEE) - Other	n/a
(o) Waste tyres: Whole	n/a
(p) Waste tyres: Quartered	n/a
(q) Liquid Waste -	
(i) Waste which has an angle of repose of less than 5 degrees, or becomes free-flowing at or below 61°C, or when it is transported, or is not generally capable of being picked up by a spade or shovel; or	Sample is a dry solid



(ii) Waste with a moisture content of > 40% or that liberates moisture under pressure in landfill conditions, and which has not been stabilised by treatment	Sample is a dry solid
(r) Hazardous waste with a Calorific Value of:	
(i) > 25 MJ/kg	n/a
(ii) > 20 MJ/kg	n/a
(iii) > 10MJ/kg	n/a
(iv) > 6% TOC	n/a
(s) Brine or waste with a high salt content (TDS > 5%), and a leachable concentration for TDS of more than 100 000 mg/l	n/a
(t) Disposal of garden waste:	n/a
(i) 25% diversion from the baseline at a particular landfill of separated garden waste	n/a
(ii) 50% diversion from the baseline at a particular landfill of separated garden waste	n/a
(u) Infectious animal carcasses and animal waste	n/a

There are no applicable landfill restrictions.

Conclusion:

1. Watercourse Area Material classifies as non-hazardous
2. An SDS is not required
3. The waste assesses as Type 3
4. Type 3 waste may be disposed at a licensed H:H or H:h landfill (equivalent to a Class A landfill) or a licensed GLB+ landfill (equivalent to a Class B or Class C landfill depending on the engineering)
5. There are no applicable landfill restrictions

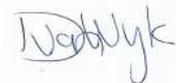
Enviroserv Waste Management
3 Brickfield Road
Meadowdale
Germiston
Gauteng

Attention : Sarisha Dasrath
Date : 25th August, 2021
Your reference : Enviroserv Waste Analysis
Our reference : Test Report 21/642 Batch 1
Location :
Date samples received : 16th August, 2021
Status : Final report
Issue : 1

One sample was received for analysis on 16th August, 2021 and was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Debbie van Wyk

Organics Laboratory:



Greg Ondrejko
Technical Supervisor

Inorganics Laboratory:



Greg Ondrejko
Technical Supervisor

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 21/642

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

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REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 21/642

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
NONE	No Method Code	SA_PM80	A 20:1 ratio of leaching fluid to as received soil, is leached for 18 hours. The client can choose to use any of the following leaching fluids a) deionised water b) pH5 c) pH 5/pH2.9 depending on pH of sample d) pH9.2			AR	No
NONE	No Method Code	SA_PM88	A 20:1 ratio of deionised water to as received soil, is leached for 18 hours with zero headspace.				No
SA_PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	SA_PM0	No preparation is required.			AR	
SA_TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds by Headspace GC-MS.	SA_PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
SA_TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds by Headspace GC-MS.	SA_PM88	A 20:1 ratio of deionised water to as received soil, is leached for 18 hours with zero headspace.			AR	No
SA_TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
SA_TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	SA_PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
SA_TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
SA_TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	SA_PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
SA_TM19	Determination of pH by bench pH meter	SA_PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.			AR	No

EMT Job No: 21/642

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_TM20	Modified BS 1377-3: 1990 Gravimetric determination of Total Dissolved Solids	SA_PM80	A 20:1 ratio of leaching fluid to as received soil, is leached for 18 hours. The client can choose to use any of the following leaching fluids a) deionised water b) pH5 c) pH 5/pH2.9 depending on pH of sample d) pH9.2			AR	No
SA_TM27	Major ions by Ion Chromatography	SA_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using an orbital shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using an orbital shaker.			AD	Yes
SA_TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12, MTBE and BTEX by headspace GC-FID.	SA_PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
SA_TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12, MTBE and BTEX by headspace GC-FID.	SA_PM88	A 20:1 ratio of deionised water to as received soil, is leached for 18 hours with zero headspace.			AR	No
SA_TM42	Modified US EPA method 8270. Pesticides and herbicides by GC-MS	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
SA_TM42	Modified US EPA method 8270. Pesticides and herbicides by GC-MS	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
SA_TM42	Modified US EPA method 8270. Pesticides and herbicides by GC-MS	SA_PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
SA_TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
SA_TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	SA_PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
SA_TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	SA_PM0	No preparation is required.				

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Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_TM51	Formaldehyde determination by reaction with Ammonium Ions and acetylacetone which is analysed spectrophotometrically.	SA_PM112	As received soils are extracted with deionised water in a 4:1 ratio			AR	Yes
UK_TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	UK_PM0	No preparation is required.				No
UK_TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	UK_PM0	No preparation is required.				No
UK_TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	UK_PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.				Yes
UK_TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	UK_PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				No
UK_TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	UK_PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.				Yes
UK_TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	UK_PM0	No preparation is required.				No
UK_TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	UK_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.				Yes
UK_TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	UK_PM0	No preparation is required.				No
UK_TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	UK_PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.				Yes

ANNEXURE D – WETLAND REHABILITATION ENGINEERING DRAWING

