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**BASIC ASSESSMENT FOR PROPOSED GENERAL
LANDFILL EXPANSION AT NAMAKWA SANDS MSP
NEAR KOEKENAAP, WESTERN CAPE: VEGETATION
COMPONENT**

Prepared for: Savannah Environmental (Pty.) Ltd., Johannesburg

Client: Exxaro (Pty) Ltd.

13 December 2010

EXECUTIVE SUMMARY

This botanical basic assessment was requested in order to help inform decisions regarding the proposed extension of an existing general landfill at the Exxaro Namakwa Sands Mineral Separation Plant (MSP) near Koekenaap (Western Cape). The study area of approximately 1.3ha lies about 1km east of the MSP. No alternative layouts were presented for assessment.

The study area falls within the Namaqualand coastal region of the Cape Floristic Region, and lies within the Succulent Karoo biome (Mucina & Rutherford 2006). The original natural vegetation type in the study area and immediate surrounds is categorised as Namaqualand Strandveld. This is an extremely widespread vegetation type along the west coast, and is regarded as a Least Threatened vegetation type in terms of the NSBA (Rouget et al 2004), with over 90% of its original extent still intact. About 70% of the original natural vegetation in the study area has been lost due to disturbance associated with the existing landfill, and thus less than 0.4ha of natural vegetation remains on site. The remaining vegetation within the study area is generally in poor to moderate condition, and is of Medium botanical sensitivity at a regional scale. Species diversity is likely to be fairly low, and no plant Species of Conservation Concern are likely to be present in significant numbers within the proposed development area.

The following negative impacts on the vegetation in the proposed development area have been identified:

- Direct loss of vegetation (about 0.4ha) at the construction phase.
- Indirect ecological impacts at the operational phase (further fragmentation of natural habitat in area and associated ecological impacts).

No positive ecological impact has been identified.

The primary negative impacts are the result of the direct factors. These impacts cannot be easily avoided or reduced.

Indirect impacts are often difficult to quantify and avoid. The indirect botanical impacts of the proposed development are likely to be negligible in relation to the impacts associated with the existing and ongoing MSP operations nearby.

Cumulative effects are in many respects regional effects, and the impacts of this type of development will be significantly less than for various existing and ongoing mining and agricultural operations in the region, and are regarded as being of Very Low significance.

Overall the proposed landfill expansion is likely to have an acceptable **Low negative** regional scale negative impact on the vegetation on site, prior to mitigation. This can not be reduced in any meaningful way without either relocating to an area that consists entirely of disturbed vegetation, or by reducing the scale of the project. The very limited mitigation requirements are outlined.

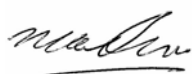
TABLE OF CONTENTS

Introduction	1
Limitations & Assumptions	2
Terms of Reference	3
Methodology	4
Description of the Affected Environment	5
Methodology for determining the significance of impacts	7
Identification of likely impacts	9
Impact Assessment	10
Impact statement and summary table	12
Rehabilitation and EMP requirements	13
Conclusions	14
Recommended site-specific mitigation	14
References	14

DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae.

I, N.A. Helme, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own.



NA Helme

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Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been the Sole Proprietor of Nick Helme Botanical Surveys.

A selection of recent, relevant projects undertaken in the region include:

- Scoping and Impact Assessment of proposed Exxaro Wind Energy Facility near Brand se Baai (Savannah Environmental 2010)
- Scoping study of proposed Wind Energy Facility near Britannia Bay (Savannah Environmental 2010)
- Botanical assessment of five proposed limestone prospecting areas in the Knersvlakte (Osho Mining 2010)
- Basic Assessment of proposed landfill sites for Maskam Municipality (Abel Blygnaut Environmental Consultants 2010)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Bitterfontein (DJ Environmental 2010)
- Scoping study of proposed Wind Energy Facility near Vredendal (DJ Environmental 2010)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Hopefield (Savannah Environmental 2008 & 2009)
- Scoping study of Proposed Wind Energy Facility near Vredendal (DJ Environmental 2009)
- Scoping study of Proposed Wind Energy Facility west of Bitterfontein (DJ Environmental 2009)
- Botanical Scoping and Impact Assessment of proposed St Helena Hills development (DJ Environmental 2009)
- Botanical Impact Assessment of Portion 4 of Farm 560, Yzerfontein (EnviroLogic 2009)
- Botanical Impact Assessment of Portion 9 of Farm 957, Saldanha (EnviroLogic 2008)
- Botanical Impact Assessment of proposed development on Portion 87 of the Farm Witteklip 123, Vredenburg (CCA Environmental 2008)
- Botanical Sensitivity study of Portion 4 of Farm Yzerfontein 560 (De Villiers family 2008)
- Botanical Scoping and Impact Assessment of proposed overnight sites in the West Coast National Park (SANParks 2008 & 2010)
- Fine Scale Vegetation Mapping for Saldanha Municipality (CapeNature 2007)

1. INTRODUCTION

This botanical basic assessment was requested in order to help inform decisions regarding the proposed expansion of an existing general landfill at the Exxaro Mineral Separation Plant (MSP) near Koekenaap (Western Cape; Figure 1). The proposed expansion will cover about 1.33ha, at least half of which has been previously disturbed by excavations.



Figure 1: Map showing proposed location and extent of proposed landfill expansion (yellow hatched area). The coloured areas to the south are leachate and water treatment ponds.



Figure 2: Detail showing proposed landfill extension area.

2. LIMITATIONS AND ASSUMPTIONS

No specific field visit was undertaken for this project, as the area was previously visited and assessed as part of a project undertaken in 2003 (Desmet & Helme 2003a). The author is also familiar with large parts of the adjacent and nearby areas, as a result of fieldwork undertaken for the Namakwa Sands expansion Scoping report (Desmet and Helme 2003b), for the recent application to install a wind energy facility at Brand se Baai (Helme 2010), and for various other projects. No photographs of the site are included in this report.

Conservation value and sensitivity of habitats are a product of diversity, rarity of habitat, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats. The confidence level in the botanical sensitivity mapping is regarded as high. A site visit is unlikely to have significantly increased the accuracy of the findings.

It is assumed that the development area as provided by the applicant (see Figure 2) is at least 90% spatially accurate, and it is assumed that this entire area will be developed at some stage. No additional infrastructure or alternative sites were assessed.

3. TERMS OF REFERENCE

Terms of reference (TOR) were the standard TOR as proposed by CapeNature, and DEA&DP's guidelines for biodiversity assessment (Brownlie 2005) were also adhered to. The CapeNature TOR are as follows:

- Produce a baseline analysis of the botanical attributes of the property as a whole.
- This report should clearly indicate any constraints that would need to be taken into account in considering the development proposals further.
- The baseline report must include a map of the identified sensitive areas as well as indications of important constraints on the property. It must also:
 - Describe the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.
 - In terms of biodiversity pattern, identify or describe:

Community and ecosystem level

- a. The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- b. The types of plant communities that occur in the vicinity of the site
- c. Threatened or vulnerable ecosystems (*cf. new SA vegetation map/National Spatial Biodiversity Assessment, etc.*)

Species level

- d. The presence of any plant Species of Conservation Concern (SCC)
- e. The viability of and estimated population size of the plant SCC present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- f. The likelihood of other SCC occurring in the vicinity (include degree of confidence).

Other pattern issues

- g. Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- h. The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).

- i. The condition of the site in terms of current or previous land uses.
 - j. In terms of **biodiversity process**, identify or describe:
 - k. The key ecological “drivers” of ecosystems on the site and in the vicinity, such as fire.
 - l. Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
 - m. Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
 - n. Would the conservation of the site lead to greater viability of the adjacent ecosystem?
- Would the site potentially contribute to meeting regional conservation targets for both biodiversity pattern and ecological processes?
 - Is this a potential candidate site for conservation stewardship?
 - What is the significance of the potential impact of the proposed project – with and without mitigation – on biodiversity pattern and process at the site, landscape, and regional scales? Include comment on cumulative impacts.
 - Provide a map, at suitable scale, of key conservation areas and corridors.
 - Recommend actions that should be taken to prevent or mitigate impacts. Indicate how these should be scheduled to ensure long-term protection, management and restoration of affected ecosystems and biodiversity.
 - Indicate limitations and assumptions, particularly in relation to seasonality.

4. METHODOLOGY

The study approach was partly informed by the guidelines prepared by Brownlie (2005), and also by the TOR. Vegetation types used are as defined in the SA vegetation map (Mucina & Rutherford 2006), and ecosystem status is as per the National Spatial Biodiversity Assessment (Rouget et al 2004) and the subsequent Draft National List of Threatened Ecosystems (DEA 2009). Red List status of plant species is according to Raimondo et al (2009). Reference was made to extensive, detailed work done in the area by Desmet and Helme (2003).

5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 Regional context and ecological drivers

Namaqualand Strandveld would originally have covered the entire proposed development area (Mucina & Rutherford 2004), but various sources of disturbance (roads and excavations) have resulted in the total loss of natural vegetation in about 70% of the proposed site (this can be seen in Figure 2).

Namaqualand Strandveld is an extremely widespread vegetation type, especially in the context of the Cape Floristic Region, of which it is a part. This vegetation type extends from the Doringbaai area, some 20km south of the Olifants river mouth, up the west coast for about 300km, to the Hondeklipbaai area, and is thus formally part of the Succulent Karoo biome. The vegetation type typically occurs in a band from 1 to 30km inland, on deep sands, which are often grey, red, brown or orange. Namaqualand Strandveld is regarded as Least Threatened vegetation type in terms of the National Spatial Biodiversity Assessment (NSBA; Rouget et al 2004) and Draft List of Threatened Ecosystems (DEA 2009), with 92% of its original extent still intact. Although large areas of Namaqualand Strandveld, 358 000ha (Rouget et al 2004) remain on the west coast, where it is used primarily for small stock grazing, it should be remembered that the NSBA is based on 1996 data, and is thus now 14 years out of date, with significant subsequent habitat losses having occurred in various mining areas, including in the Namakwa Sands mining area (up to 40 000ha; pers.obs.). Furthermore, Namaqualand Strandveld is significantly under-conserved in formal conservation areas, with less than 1% of the national target of 26% under some sort of conservation management (although this has probably closer to 5% now), and it is thus vulnerable to future transformation. A portion of this vegetation type (perhaps as much as an additional 4%, making a total of 9%) is protected within the recently acquired portion of the Namaqua National Park in the area between the Groen and the Spoeg Rivers (pers.obs.). Agriculture typically occurs on the edges of this vegetation type where there is more clay in the soil.

Desmet and Helme (2003) classified the vegetation in the area as Inland Tall Strandveld. They noted that this plant community is the most extensive of the Strandveld community types encountered along the Namaqualand coast occurring in many different variants between the Olifants and just north of the Holgat Rivers, and from the primary coastal ridge (approximately the 100m contour) inland to the western edge of the Sandveld such as here at the MSP.

Species common in this vegetation community include shrubby species such as *Asparagus capensis*, *Manochlamys albicans*, *Lycium ferocissimum* (muisbos), *Tetragonia fruticosa* (kinkelbos), *Drosanthemum hispidum*, *Didelta carnosa*, *Berkheya fruticosa*, *Trachyandra falcata* (veldkool), *Salsola zeyheri* (ganna), *Aridaria noctiflora*, *Stoeberia frutescens*, *Cephalophyllum caespitosum*, *Hoplophyllum ferox*, *Calobota multiflora*, *Ruschia subpaniculata*, *Ruschia carollii*, *Euphorbia burmannii* (steenbokmelkbos), *Euphorbia mauritanica* (melkbos), *Euphorbia hamata*, *Stoeberia utilis* (asbos) and *Lampranthus watermeyeri*. Bulbs and annuals can be fairly common in winter and spring.

Fire is neither a feature nor a driver of Namaqualand Strandveld dynamics (De Villiers 2005). The primary determinant of vegetation pattern on site is soil type, notably the proportion of sand and clay. No exposed rock occurs on site, and no wetlands or drainage lines are found within the proposed development area.

Areas of exposed rock are typically the most important indicator of habitat sensitivity in the region, as many of the rare and localised plant species are restricted to rocky outcrops, such as on the MSP property (Desmet & Helme 2003).

5.2 Plant Species of Conservation Concern

No significant populations of plant Species of Conservation Concern are likely to be located within the proposed development area, as this habitat is not known to support many such species, and most importantly because at least 70% of the site has been previously disturbed.

5.3 Botanical Sensitivity

The disturbed areas are of Low botanical sensitivity, and cover about 70% of the site (see Figure 3). The remainder of the site (about 0.4ha) is of Medium sensitivity, and there are two patches of Medium sensitivity, separated by a road.



Figure 3: Botanical Sensitivity map of the site. Most of the area is of Low botanical sensitivity, and the two patches of Medium sensitivity are indicated.

6. METHODOLOGY FOR DETERMINING SIGNIFICANCE OF IMPACTS

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified, are assessed in terms of the following criteria:

- » The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- » The **extent**, where it will be indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score between 1 and 5 will be assigned as appropriate (with a score of 1 being low (site only) and a score of 5 being high (national or international extent)).
- » The **duration**, where it will be indicated whether:
 - * the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - * the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
 - * medium-term (5–15 years) – assigned a score of 3;
 - * long term (> 15 years) - assigned a score of 4; or
 - * permanent - assigned a score of 5.

- » The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
 - * 0 is small and will have no effect on the environment;
 - * 2 is minor and will not result in an impact on processes;
 - * 4 is low and will cause a slight impact on processes;
 - * 6 is moderate and will result in processes continuing but in a modified way;
 - * 8 is high (processes are altered to the extent that they temporarily cease); and
 - * 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- » The **probability of occurrence**, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
 - * Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
 - * Assigned a score of 2 is improbable (some possibility, but low likelihood);
 - * Assigned a score of 3 is probable (distinct possibility);
 - * Assigned a score of 4 is highly probable (most likely); and
 - * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- » the **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- » the **status**, which will be described as either positive, negative or neutral.
- » the *degree* to which the impact can be *reversed*.
- » the *degree* to which the impact may cause *irreplaceable loss of resources*.
- » the *degree* to which the impact can be *mitigated*.

The **significance** is determined by combining the criteria in the following formula:

$S=(E+D+M)P$; where

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

- » < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),

- » 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- » > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

7. IDENTIFICATION OF LIKELY BOTANICAL IMPACTS

Impacts may be both direct and indirect, with the former occurring mostly at the construction stage and the latter mostly at the operational stage. Direct impacts will be mainly permanent.

In the case of this project the primary direct impact is loss of natural vegetation (Namaqualand Strandveld) within part of the development footprint. All hard infrastructure located within natural vegetation will result in the permanent loss of that vegetation, and it is estimated that about 0.4ha of currently natural or partly natural vegetation will be lost.

Indirect impacts are most likely to be a result of habitat fragmentation and its associated ecological impacts (loss of ecological connectivity, reduction in total regional populations of plant species).

8. IMPACT ASSESSMENT

Impacts may be both direct and indirect, with the former occurring mostly at the construction stage and the latter mostly at the operational stage.

In the case of this project the primary impacts are direct impacts. The main direct impact is loss of about 0.4ha of natural vegetation within the proposed development footprint. All hard infrastructure located within or partly within natural vegetation will result in the permanent loss of that vegetation.

The indirect, negative botanical impacts are not likely to be important for this project, but may include a small degree of habitat fragmentation and associated ecological impacts.

8.1 Direct Impact: Permanent loss of natural vegetation

The proposed development footprint will impact on existing natural vegetation (Namaqualand Strandveld) of Medium regional sensitivity, and on areas of Low sensitivity that support no natural vegetation. Namaqualand Strandveld is regarded as being a Least threatened vegetation type (Rouget et al 2004), and is

widespread on the Cape west coast. It is estimated that about 0.4ha of poor to medium quality Namaqualand Strandveld will be lost within the development footprint.

No direct impacts on plant Species of Conservation Concern are likely within the development footprint.

Table 1:

Nature: Permanent loss of vegetation in development footprint (about 0.4ha)				
	Without mitigation	Score	With Mitigation	Score
Extent	Local	1	Local	1
Duration	Permanent	5	Permanent	5
Magnitude	Minor	2	Minor	2
Probability	Definite	5	Definite	5
Significance	Medium *	40	Medium *	40
Status	Negative		Negative	
Is impact reversible?	No		No	
Irreplaceable loss of vegetation?	No		No	
Can impacts be mitigated?	No		No	
Mitigation: None possible				
Cumulative impacts: Negligible to Very Low negative				
Residual impacts: Very minor at a regional scale.				

* Note: This assessment is deemed artificially high, and is a product of the use of a formula, and the high rating for a definite probability. A more realistic overall assessment would be Low negative.

8.2 Indirect impacts

Indirect ecological impacts are often difficult to identify, and even more difficult to quantify. Accurate measurement of the indirect impacts would require extensive observation prior to the development occurring, and a comparison with measurements taken after the development.

The effects of **habitat fragmentation** may be of very minor importance, and the proposed development should not result in significant further fragmentation of the natural habitat in this site. The proposed landfill extension is merely an extension of an existing landfill, and does not intrude significantly into any ecological corridors or undisturbed areas.

Table 2:

Nature: Various indirect impacts: mainly minor habitat fragmentation.				
	Without mitigation	Score	With Mitigation	Score
Extent	Local	1	Local	1
Duration	Long term to Permanent	4	Long term to Permanent	4
Magnitude	Minor	2	Minor	2
Probability	Probable	3	Probable	3
Significance	Low	21	Low	21
Status	Negative		Negative	
Is impact reversible?	Not really		Not really	
Irreplaceable loss of vegetation?	No		No	
Can impacts be mitigated?	Not really		Not really	
Mitigation: None				
Cumulative impacts: Very Low				
Residual impacts: Very minor at a regional scale.				

8.3 Cumulative impacts

To some extent a cumulative impact is a regional impact, rather than the local site scale impact, *i.e.* if something has a regional impact it also has a cumulative impact.

The impacts of this type of development will be significantly less than for various existing and ongoing agricultural and mining operations in the region.

The proposed landfill extension is thus likely to have a Very Low negative cumulative impact in the region.

9. IMPACT STATEMENT AND SUMMARY TABLE

Overall the proposed expansion of the existing landfill is likely to have a Low local (site scale; 1.3ha site) and Very Low regional (central west coast; <200 000ha) negative impact on the vegetation on site, prior to mitigation. This will not change after mitigation, as no mitigation is proposed.

The primary negative impacts on the vegetation on site are the result of direct impacts, notably the permanent loss of natural vegetation (<0.4ha) in the development footprint. No threatened plant species are likely to be impacted by the proposed development. Most of these impacts cannot be avoided or further reduced (without moving the development to an entirely disturbed area or reducing the scale of the development).

Indirect botanical impacts are likely to be Very Low negative at the regional scale.

No positive botanical impacts have been identified.

Table 3: Overall summary table of proposed landfill extension impacts on vegetation on site (regional scale)

Nature: Permanent loss of 0.4ha of vegetation, as well as minor disruption of ecological processes				
	Without mitigation	Score	With Mitigation	Score
Extent	Local	1	Local	1
Duration	Permanent	5	Permanent	5
Magnitude	Low	2	Low	2
Probability	Definite	5	Definite	5
Significance	Medium*	40	Medium*	40
Status	Negative		Negative	
Is impact reversible?	No		No	
Irreplaceable loss of vegetation?	No		No	
Can impacts be mitigated?	No		No	
Mitigation: None proposed				
Cumulative impacts: Very Low negative				

Residual impacts: Very minor at a regional scale
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* **Note:** This assessment is deemed artificially high, and is a product of the use of a formula, and the high rating for probability. A more realistic overall assessment would be **Low negative**.

10. REHABILITATION GUIDELINES AND CEMP & OEMP REQUIREMENTS

Areas requiring rehabilitation will include all areas of natural vegetation disturbed during the construction phase that are not required for regular maintenance operations, plus final rehabilitation of the landfill once the facility is closed (unknown lifespan).

Rehabilitation should only commence once all construction related disturbance associated with the project has been completed. Natural (unassisted) rehabilitation is the primary recommended form of rehabilitation, as there is abundant natural vegetation surrounding the proposed development area, which will provide an adequate and appropriate seed source for rehabilitation of the disturbed areas.

Requirements for the Construction Phase Environmental Management Plan (CEMP) are as follows:

- 1) The full extent of the authorised development area should be fenced off prior to any development taking place.
- 2) No dumping or temporary storage of any materials may take place outside designated and demarcated laydown areas.
- 3) Topsoil from the two Medium sensitivity areas should be removed (minimum of 400mm deep) prior to development and set aside for use as a capping at the decommissioning phase. This topsoil must be covered with black shadecloth weighted down at all edges.

Operational Phase EMP Requirements:

- 3) No exotic or invasive species should be used for rehabilitation, and this includes commonly used invasive grass species such as ryegrass (*Lolium* species).
- 4) At least 400mm of local topsoil should be used to cap the landfill at the decommissioning phase.

11. CONCLUSIONS

- There is a single natural vegetation type on site (Namaqualand Strandveld), which is a very widespread vegetation type and which is regarded as Least Threatened on a national basis. About 70% of the proposed development site is heavily disturbed and supports no natural vegetation (Low sensitivity area), and the remainder (about 0.4ha) supports natural vegetation of Medium sensitivity. No plant Species of Conservation Concern are likely to occur in significant numbers within the proposed development area.
- Overall the proposed landfill extension is likely to have a Low negative regional (central west coast; <200 000ha) impact on the vegetation on site, prior to mitigation. As no major mitigation is proposed or required the post-mitigation significance is also **Low negative** (at a regional scale).

12. RECOMMENDED SITE SPECIFIC MITIGATION

- No layout changes need to be made.
- No dumping or temporary storage of any materials may take place outside the authorised development area.
- A CEMP and OEMP should be drawn up, which must outline management requirements for the site. See Section 10 for guidelines.

13. REFERENCES

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