APPENDIX E:

SPECIALISTS REPORTS

APPENDIX E1:

AIR QUALITY

uMN014-08

Specialist Study 1

Air Quality Impact Assessment

QUALITATIVE AIR QUALITY IMPACT FOR THE UPGRADE OF THE TRANSNET RAILWAY LINE FROM HOTAZEL TO ASSESSMENT

Version 2

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LIST OF ABBREVIATONS

ASTDR	Agency for Toxic Substances and Disease Control
BMDL	Lower level of the Benchmark Dose, i.e. the lowest amount of a chemical at which an effect may occur.
DEAT	The Department of Environmental Affairs and Tourism
mtpa	Million tons per annum
NOAEL	No observed adverse effects level
PM_{10}	Particulate matter with a diameter of 10 µm or less
TSP	Total suspended particulates, i.e. a diameter of 100 µm or less
µm	Micrometer, 1 µm = 0.0000001 m
WHO	World Health Organisation

ANNEX B:

AIR QUALITY

Section 1: Introduction

The scope and objectives of the quantitative air quality specialist study are to:

i. Describe the baseline condition of the study area in terms of ambient air quality;
ii. Describe the legislation, policies and guidelines that are applicable to air quality;
iii. Assess of potential air quality impacts associated with construction and operational activities;
iv. Describe relevant and implementable mitigation measures to reduce, avoid, or minimise the negative impacts and enhance positive impacts;
v. Identify information gaps, uncertainties, study limitations and the underlying assumptions; and
vi. Recommend possible monitoring studies.

Section 2: Approach and methodology

Description of the baseline

The description of the baseline air quality status along the route uses available ambient air quality information contained in the Initial State of the Air Report for South Africa (DEAT, 2006) as well as information on significant emission sources. The baseline description is also informed by the results of a short ambient air monitoring campaign at Rosmead. The monitoring campaign is designed to test the hypothesis that manganese dust is liberated from the moving freight trains and is present in the ambient air near the freight line, and is deposited in the soil adjacent to the line.

The current capacity of the railway line between Hotazel, the Port of Ngqura and Port Elizabeth for manganese is 4.2 mtpa (2 trains) and 3 trains per day per direction for containers. The proposed upgrade will facilitate an increase to approximately 6 mtpa (3 trains) of manganese ore in 2009 and thereafter to 8 mtpa (4 trains), 10 mtpa (5 trains) and 12 mtpa (6 trains) at different stages in the future. The container trains will increase to 9 trains per day per direction.

An active air quality sampler was located at Rosmead from 25 August 2008 to 8 September 2008, sampling for 24-hours every second day. Rosmead was selected as the monitoring site for two reasons. Firstly, the manganese ore is sprayed when on the freight cars prior to departure to dampen dust. By the time the freight train reaches Rosmead the ore will have dried somewhat thereby increasing the likelihood of dust being blown from the cars. Secondly, Rosmede provided a monitoring location close to the railway line within the station area that provided security, electricity and personnel on site to change

sampler filters. Monitoring was conducted at one station only to obtain an indication of whether dust from the freight cars presented a potential risk.

In active sampling ambient air is pumped through the sampler and particulate matter in the air is collected on a filter. The filter is analysed for manganese. The concentration of manganese in the air is then derived with knowledge of the volume of air passing through the filter. Total suspended particulates (TSP) were sampled rather than PM_{10} as coarse particulates are expected to be emitted from the freight cars as a result of the movement of the ore. Soil samples were collected from the immediate vicinity of the freight line and at increasing distances from the line to establish firstly whether that manganese is blown from the freight cars and is deposited next to the line, and secondly to establish a deposition gradient.

Legislation, policies and guidelines

South African ambient air quality standards (DEAT, 2007) for particulate matter and the World Health Organisation ambient air quality guidelines for manganese (WHO, 2000) are used as benchmarks to assess whether ambient concentrations of particulates and manganese pose a risk to human health. Information on background concentrations of manganese in soil (ASTDR, 2000) are also used are used to inform the assessment of any deviation from typical conditions.

Impact assessment

An impact on human health from inhalation of air pollutants occurs where individuals are exposed to concentrations that exceed health guidelines or standards. Information on the proximity of human settlements (or social receptors) to the freight line was gathered during a field survey in August 2008 and during the high level screening exercise (ERM, 2008). This information provides information on community areas that are potentially exposed to manganese and particulates from the freight line construction and operational activities.

The nature of the construction activity and the resultant emissions are considered in assessing the nature and significance of impacts from particulate emissions. Baseline ambient concentrations of manganese from the monitoring campaign are compared with guidelines to assess the nature and significance of any impacts.

Key assumptions

- Information on ambient air quality at places along the freight line is representative of the entire freight line;
- The ambient concentrations of manganese measured during the monitoring campaign represent typical conditions;

- Normal freight operating conditions occurred during the monitoring campaign.

Limitations and uncertainties

- A dearth ambient air quality data along the freight line is a limitation to this assessment, i.e. the limited existing data and data from a short monitoring campaign are assumed to represent air quality along the entire line at all times. The line generally passes through rural or sparsely populated areas and the potential emission of manganese dust from the train is therefore small. The data limitation does not impact dramatically on the outcomes of this assessment.

Section 3: Aspects of the project within the scope of the study

Two aspects of the project that could potentially be the root cause of impacts to the surrounding communities are:

- Dust generated by the construction activities and resulting in potential nuisance impacts, and
- Manganese dust blown from the ore on the moving freight cars resulting in ambient concentrations of manganese in adjacent communities that poses a risk to human health.

Section 4: Description of the affected environment

The current manganese ore railway line extends from Coega in the Eastern Cape to Sishen, near Hotazel, in the Northern Cape Province. It covers a distance of approximately 1 100km. The proposed upgrades and expansions of the current rail infrastructure lie between Coega and De Aar, covering a distance of approximately 500 km.

The passenger railway service on the freight line no longer serves the small agricultural communities between Coega and De Aar so most of the stations are no longer in use. As a result only a few households remain in some cases otherwise the associated communities have disappeared. The high-level screening study (ERM, 2008) and observations made by University of Pretoria (Pers. comm., Johan Nel, Archaic Heritage Project Management) identified inhabited settlements in relative close proximity to the stations selected for upgrade, expansion and development at Barkly Bridge, Golden Valley, Visrivier, Rosmead and Bletterman, comprising two or three households. None were however directly adjacent to any of the proposed upgrades, expansions and developments. Further details on the social receptors are contained in Appendix A of the high-level screening study (ERM, 2008).

Generally ambient air quality monitoring stations are located to monitor exposure in populated areas, or to measure background ambient concentrations. Ambient air quality monitoring in the Eastern Cape has is therefore been concentrated in the Nelson Mandela Metropolitan Municipality in Port Elizabeth and Coega (DEAT, 2006). The only ambient monitoring in the Northern Cape occurs in the mining area near Kuruman.

An ambient monitoring campaign was therefore conducted at Rosmead to provide some measure of existing ambient air quality for this study. This monitoring campaign was unfortunately interrupted due technical difficulties and a continuous record was not obtained. The available data is however reliable and the results confirm that ambient concentrations of manganese are very low compared with the WHO guideline at Rosmead and less than 0.0001 $\mu g/m^3$, which is the detection limit of the analytical instrumentation.

Manganese is a natural component of the environment and natural levels of manganese in soils range between 40 and 900 ppm (ATSDR, 2000). Analysis of soil samples collected at increasing distances from the railway at Rosmead indicates a gradient away from the freight line. The relatively high Mn concentrations in the soil at the interchange are attributed to Mn dust either falling through the cars as a result of vibrations at the interchange, or dust blowing from the cars and depositing close to the railway line.

Manganese concentrations are within the natural range, except at the interchange where they just exceed the upper limit (Table 5.1).

Table 5.1 ***Manganese concentration in soil near Rosmead at increasing distance from the line***

Site	Description	Concentration (ppm)
1	At the interchange, about 2m away from the railway line	980
2	1m from the main freight line after the interchange	160 to 180
3	10 m from the main freight line after the interchange	430
4	50 m from the main freight line after the interchange	370
4	100 m from the main freight line after the interchange	220

There are no major sources of air pollution such as industrial stacks, large numbers of motor vehicles or large communities along the route. The only source of air pollution along the route is dust from agricultural activities such as ploughing or naturally wind blown dust from denuded surfaces. Despite there being no monitoring along the route, the air quality is therefore classed as good.

Section 5: Identification of applicable policies, legislation, standards and guidelines

Particulate matter

Dust fallout refers to the deposition of dust in the ambient environment and different standards apply in residential and industrial areas. Target, action and alert thresholds are presented in Tables 5.2 and 5.3.

Total suspended particulates (TSP) refer to relatively coarse particles with a diameter of less than 100 µm. TSP is mostly associated with nuisance effects such deposition and soiling. These particulates are either exhaled or trapped in the upper areas of the respiratory system and expelled. The South African Ambient Air Quality Standard for TSP is shown in Table 5.4.

Table 5.2 *South African four band scale for dust deposition*

Band	Band description	Dust fall rate (D) mg/m²/day, 30-day averaging period	Comment
1	Residential	D < 600	Permissible for residential and light commercial
2	Industrial	600 < D < 1200	Permissible for heavy commercial and industrial
3	Action	1200 < D < 2400	Requires investigation and remediation if 2 sequential months lie in this band, or more than 3 occur in a year
4	Alert	2400 < D	Immediate action and remediation required following the first incidence of dust fall rate being exceeded. Incidents reported to be submitted to the relevant authority

Table 5.3 *South African target, action and alert threshold for dust deposition*

Category	Dust Fallout Rate	Averaging Period	Permissible Frequency of Exceedance
Target	< 300 mg/m²/day	Annual	
Residential	< 600 mg/m²/day	30 days	3 within a year, no 2 sequential months
Industrial	600 – 1200mg/m²/day	30 days	3 within a year, no sequential months
Action	1200 – 2400 mg/m²/day	30 days	
Alert	> 2400 mg/m²/day	30 days	None

PM_{10} refers to particulate matter with a diameter of 10 µm or less is also referred to as inhalable particulates. PM_{10} is inhalable and either clings to protective mucous and is removed or lodges in the lung capillaries and alveoli and may result in health impacts. The South African Ambient Air Quality Standard for PM_{10} is shown in Table 5.4.

Table 5.4 *South African ambient air quality standards for TSP and PM_{10}. The number of permitted exceedances is in brackets*

	24-hour Average	Annual Average	Compliance date
TSP	300 µg/m³	100 µg/m³	Immediate
PM_{10}	180	60	Immediate
	127 (4)	50 (0)	2012
	100 (2)	45 (0)	2017
	75 (1)	40 (0)	2022

Manganese

In urban and rural areas without significant manganese pollution, annual averages are mainly in the range of 0.01–0.07 µg/m³; near foundries the level can rise to an annual average of 0.2–0.3 µg/m³ and, where ferro- and silico-

manganese industries are present, to more than 0.5 µg/m³, with individual 24-hour concentrations sometimes exceeding 10 µg/m³ (WHO, 2005).
The toxicity of manganese varies according to the route of exposure. By ingestion, manganese has relatively low toxicity at typical exposure levels and is considered a nutritionally essential trace element. By inhalation, however, manganese has been known to be toxic to workers (WHO, 2000). Manganism is characterised by various psychiatric and movement disorders, with some general resemblance to Parkinson's disease in terms of difficulties in the fine control of some movements, lack of facial expression, and involvement of underlying neuroanatomical (extrapyramidal) and neurochemical (dopaminergic) systems (Roels, 1992; Mergler, 1994). Respiratory effects such as pneumonitis and pneumonia and reproductive dysfunction such as reduced libido are also frequently reported features of occupational manganese intoxication. The available evidence is inadequate to determine whether or not manganese is carcinogenic; some reports suggest that it may even be protective against cancer. Based on this evidence, the US Environmental Protection Agency has concluded that manganese is not classifiable as to human carcinogenicity (IRIS, 1988)

Based on neurotoxic effects observed in occupationally exposed workers and using the benchmark approach, an estimated No Observed Adverse Effect Level (NOAEL) (the lower 95% confidence limit of the BMDL5) of 30 µg/m³ is provided by the WHO (2000). The BMDL is the lowest amount of a chemical at which an effect may occur. BMDL5 is the 5% level.

No ambient air quality standards or guidelines exist for manganese. An ambient annual guideline value for manganese of 0.15 µg/m³ is derived by dividing by a factor of 4.2 to adjust for continuous exposure and an uncertainty factor of 50 (WHO, 2000). The adjustment for continuous exposure is considered sufficient to account for long-term exposure based on knowledge of the half-time of manganese in the brain.

Table 5.5: *World Health Organisation ambient air quality guideline for Mn (WHO, 2000)*

Averaging Period	Concentration (µg/m³)
Annual average	0.15

Permitting and licensing

There are no permitting or licensing requirements for ambient air relating to the control of emissions of manganese dust from rail freight cars.

Section 6: Specification of relevant thresholds

The relevant threshold values for compliance with ambient air quality are the South African ambient air quality standards for TSP and PM_{10} (Table 5.4).

Without a standard for manganese the WHO ambient air quality guideline for manganese of 0.15 $\mu g.m^3$ (Table 5.5) is used .

Section 7: Key issues and impact pathways

Key issues and concerns associated with the proposed project are:

- An increase in dust deposition in the surrounding environment due to the construction activities; and
- Impacts on health in communities situated adjacent to the freight line associated with an increase in airborne manganese dust due to an increase in the amount of ore being freighted.

Section 8: Scenarios considered in the impact assessment

Construction

A number of activities in the construction of the approximately 28 loops between Port Elizabeth and De Aar are potential sources of dust and impacts in the ambient environment. These include:

- Land clearance for site facilities;
- Clearing of land and removal of topsoil inside the rail reserve where banks and cuttings are to be widened;
- Clearing of land and removal of topsoil outside the rail reserve where new roads and level crossings are to be constructed;
- Construction of new roads and level crossings ;
- Excavation of cuttings, placement and compaction of soil material where banks and cuttings are to be widened;
- Excavation of borrow pits on or outside the rail reserve;
- Blasting to widen cuttings;
- Operation of a crushing plant on site to crush available rock to be used in the construction; and
- Movement of vehicles on site and on unpaved surface off site.

Freight cars

Manganese ore is transported in open freight cars. The ore is sprayed with water before leaving the mine to suppress dust. As the ore dries on route and agitation between ore chunks occurs the potential exists for manganese dust to be generated and blown from the moving freight cars and result in potential impacts in the ambient environment.

Section 9: Impact assessment

Construction dust

Dust will be generated during the construction of the freight line and the loops as a result of the excavation activities, the handling of spoil and through entrainment by vehicle movement. This dust will subsequently be deposited

in the surrounding environment. Such dust is typically coarse (diameter > 10 µm). It therefore does not pose a health risk. The impacts associated with dust from construction are therefore likely to be of a nuisance nature only.

The area where dust is likely to be deposited will be limited to the area immediately surrounding the construction sites. The heaviest dust deposition will occur on the construction sites and be limited to a few hundred metres only. The impact will be of a short duration, i.e. only for the construction period. Generally the areas surrounding the construction sites are sparsely populate so the nuisance will be to a few people for a relatively short period. The significance of the impact associated with the construction activities is therefore considered to be low (Table 5.6). Management measures to control dust during construction will further reduce any potential impact.

Manganese dust from freight cars

Dust is likely to be blown from the manganese ore on the freight cars as they move along the freight line. Manganese dust is therefore likely to exist in the ambient air before being deposited. Dust that results from the agitation of larger ore pieces is typically coarse (diameter > 10 µm) and is therefore unlikely to pose a health risk.

The measured ambient concentration of respireable manganese (diameter < 10 µm) of 0.0001 $\mu m/m^3$ at Rosmead is well below the WHO ambient guideline value of 0.15 $\mu m/m^3$. The impacts associated with dust from the freight cars are therefore highly unlikely to have any health impact. Rather the potential impact will be nuisance only.

Measurements of manganese in the soil alongside the freight line indicted that the effect of manganese dust deposition is limited to the area immediately adjacent to the line only. Within 50 m of the freight line the concentrations of manganese in the soil are within natural limits. Generally the areas immediately alongside the freight line are uninhabited or very sparsely populated. Considering this and the localised nature of the deposition the significance of the impact associated with manganese dust being liberated from the freight cars is considered to be negligible (Table 5.6).

Section 10: Recommendations for management actions and alternatives not yet considered

Dust will be generated from a number of construction activities relating to the freight line and the loops. While the impact is expected to be low it will result in nuisance impacts near the construction sites. It is necessary therefore to implement dust control measured through the Environmental Management Plan (EMP) for the construction phase. These measures should include the following:

- The removal of vegetation must be limited to the construction areas only;
- Dust must be contained on the construction sites, stockpiles and spoil piles by the implementation of an ongoing spraying programme. Spraying must ensure that surfaces remain sufficiently wet to prevent dust entrainment by vehicle movement and wind erosion.
- Speed restrictions must be implemented on construction sites and access roads to limit dust entrainment by vehicles.
- Verges, cuttings, lay-down areas and construction camps must be re-vegetated as soon as the construction activity is completed at each of the respective site.

It is possible that some dust is generated in the freight cars with the agitation of ore pieces. It is necessary that the current practice of ore wetting continues once the freight cars are loaded continues.

Section 11: Recommendations for monitoring

Monitoring of dust fallout during construction is not considered to be necessary. Similarly, it is not deemed to be necessary to monitor manganese dust anywhere along the freight line.

Table 5.6: Assessment of the air quality impacts associated with the construction and operations of the upgrade of the freight line from Hotazel to Coega.

Impact criteria	Construction dust	Dust from freight cars
Nature	Dust emissions from construction activities are likely to result in a direct negative impact of a nuisance nature only.	Mn dust emissions from the freight cars are likely to result in a direct negative impact of a nuisance nature only.
Extent	The extent of the impact is likely to be on-site or local as it is unlikely to impact beyond the construction sites.	The extent of the impact is likely to be limited to the immediate area along the length freight line, i.e. a local effect.
Duration	The duration of the construction activities is regarded as short-term as it would only occur for the construction period.	The duration of the impact will be for the operational life of the freight line.
Intensity	Dust from construction is unlikely to cause a major nuisance impact or impact on human health. As such the intensity will be low.	Mn dust from the freight cars is unlikely to cause a major nuisance impact or impact on human health. As such the intensity will be low.
Probability	There will be site clearing, earthworks and vehicle movement during construction. The probability of occurrence is definite.	Agitation of larger pieces of Mn in the freight cars will generate dust which can be blown from the moving freight cars. The probability of occurrence is probable.
Degree of confidence	Specialist familiarity with construction activities provides a moderate degree of confidence in the prediction.	Ambient monitoring data from alongside the freight line provides a moderate degree of confidence in the prediction.
Significance	Pre-mitigation: Low. Post-mitigation: Negligible.	Pre-mitigation: Low. Post mitigation: Negligible.

Nature: *Positive/negative and direct/indirect*
Extent: *Description of the scale of the impact, i.e. local (specific construction site), the district, national, international*
Duration: *Prediction of the lifetime of the project, i.e., temporary are of short duration or intermittent; short term to last for the duration of construction; long-term for the life time of the project; permanent effects last beyond the life of the project*
Intensity: *The magnitude or size of the impact, i.e. low or negligible if ambient air quality standards are not exceeded anywhere; medium if air quality standards are exceeded at times beyond the project sites; high if ambient air quality standards are continually exceeded outside the project sites.*
Probability of occurrence: *Description of the probability of the impact occurring, i.e. improbable (low likelihood); probable (distinct possibility); highly probable (most likely)*
Degree of confidence in the predictions based on the availability of information and specialist knowledge.
Significance: Low for an impact for which no mitigation is necessary; medium for an impact that requires effective mitigation; high for an impact, which if not mitigated, could stop the project from proceeding.
Status: *Positive (a benefit) or negative (a cost).*

Section 12: References

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APPENDIX E2:

HERITAGE IMPACT ASSESSMENT

Transnet Capital Projects
Ngqura 16 MTPA

Phase 1 Heritage Impact Assessment - Borrow Pit areas between Kimberley to De Aar

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Sensitivity Maps

1. Introduction

The Phase 1 Heritage Impact Assessment (HIA) focused upon the description and assessment of the proposed borrow pit areas at Heuningneskloof and Belmont (Figures 13 and 14). The purpose of this Phase 1 HIA report is to determine if and where heritage resources are positioned within the proposed development footprint.

The gathering of information will allow for the buffering of sensitive areas, and the creation of and the delineation of no-go sites. The Phase 1 HIA will inform the South African Heritage Resources Agency (SAHRA) what the development entails, any areas of concern and issues that require legal input from SAHRA's statutory body.

The purpose of the heritage resources impact report is to provide Ngwao Boswa Kapa Bokoni (Northern Cape Provincial Heritage Resources Agency) and the South African Heritage Resources Agency (SAHRA) with a background in terms of the type of works that are proposed at the borrow pit areas and to provide suggestions regarding mitigation procedures.

2. Background

The proposed Ngqura 16 Mtpa railway upgrade stretches across 1100km from Hotazel in the Northern Cape to the Port of Ngqura in the Eastern Cape. To allow for a manageable Phase 1 Heritage Impact Assessment to be completed, it was decided to divide the scope of work into three different areas that are listed as follows:

- Area 1: Hotazel to Kimberley
- Area 2: Kimberley to De Aar
- Area 3: De Aar to Port of Ngqura

Areas 1 and 3 are managed within a current Environmental Impact Assessment process, meaning that the Phase 1 HIA forms part of a specialist study period. Area 2 has already been authorised by the Department of Environmental Affairs in 2009 and as a result no further environmental studies are required in this specific area.

In 2008 a Phase 1 HIA undertaken by Archaic formed part of the Environmental Impact Assessment process and identified a range of stone age, rock art and historical sites. The Phase 1 HIA report included all three sections identified by the proposed scope of works. The National Department of Environmental Affairs (DEA), as the competent authority, authorised the project prior to receiving comments from SAHRA who subsequently indicated shortcomings in the assessment which needed to be addressed for the borrow pits. The 2008 Phase 1 HIA was reviewed to identify areas of concern at Heuningneskloof and Belmont.

The 2008 Phase 1 indicated that Rock Art Engravings were situated 6km north of Belmont and 7km south of Belmont (Archaic, 2008). Both of these sites fall outside of the proposed development footprint.

A Phase 1 HIA field investigation was completed during 2012 that identified heritage resources that are of significance and situated within the railway reserve areas. The Phase 1 HIA provided insight into the heritage resources areas that may be under threat and could be disturbed if any type of development occurs. The Phase 1 HIA was used to guide the decision making process in terms of the placement of proposed borrow pits. It was emphasised that areas that are already disturbed should be used for the excavation of borrow pit material rather than new areas to prevent the unnecessary loss of heritage artefacts that are situated in situ. A list of coordinates were placed on a Google map indicating sites that have been recorded during a 2009 study and also during 2012. The Hatch engineering team has decided on the location of borrow pit areas by liaising with the professional archaeologist to ensure that these development sites are placed away from sensitive heritage resources.

In terms of the SAHRA regulations borrow pit applications must be lodged on the SAHRIS system separately from the other EIA applications. This report will be attached to the Environmental Management Plan prepared for the borrow pit areas at Heuningneskloof and Belmont.

3. Project Scope

The information below provides a summary of the proposed works at the various sections to upgrade the existing line to support 200 wagon trains. The areas are divided into three different sections namely Hotazel to Kimberley, Kimberley to De Aar and De Aar to Port of Ngqura. The focus of this report is to determine the impact that the proposed borrow pit development may have on heritage resources that may be located at Heuningneskloof and Belmont.

The purpose of borrow pits is to obtain suitable material to be used for earthworks construction. The Belmont borrow pit is required for earthworks material for construction of railway formations, construction of level crossing ramps and use in the formation subsidence repair between Modderrivier and Heuningneskloof whereas the Heuningneskloof borrow pit is required for earthworks material for the formation subsidence repair of the lines between the Modderrivier and Heuningneskloof crossing stations.

The section below describes the type of engineering work that is required to upgrade the proposed Ngqura 16 Mtpa railway line.

3.1 Proposed Borrow Pit Activities

The type of activities associated with the development of borrow pit area are inclusive of the following:

- Staking out of the borrow pit area before vegetation clearance from the site
- Topsoil will be removed to a depth of 200 mm and stockpiled separately from the other soil layers
- Excavation of materials by ripping and loading with the excavator directly onto the haul vehicle
- Transportation of the excavated material along the existing gravel road that is located alongside the existing railway line

- Material that is not suitable to be used as borrow pit material will be stockpiled separately and used for rehabilitation of the site.

3.1.1 The Size and Footprint of the Proposed Borrow Pit Sites

The expected borrow pit dimensions for the Heuningneskloof borrow pit are as follows:

- Footprint in hectares: 4ha
- Maximum depth in metres: 5m
- Anticipated volume in cubic metres: 156 000m³

The expected borrow pit dimensions for the Belmont borrow pit are as follows:

- Footprint in hectares: 1.5ha
- Maximum depth in metres: 5m
- Anticipated volume in cubic metres: 53 000 m³

3.1.2 Phases Associated with Borrow Pit Developments

- The construction phase that is associated with vegetation clearance and removal of topsoil to an approximate depth of 200mm
- The operation phase involves the excavation, stockpiling and removal of the borrow pit material
- Rehabilitation and closure that is aimed at restoration of the disturbed area.

3.1.3 Location of the Borrow Pit Sites

The proposed borrow pit sites are located at the areas described below.

3.1.3.1 Heuningneskloof

The Heuningneskloof borrow pit area is situated on the Farm Honig Nest Kloof 123 that is adjacent to the existing Kimberley to De Aar railway line. An existing borrow pit occurs at Heuningneskloof, but it was indicated that additional private land is required. The neighbouring sites that may be affected are subsections 1 and 4 of Witkoplaagte.

Heuningneskloof borrow pit area is an open surface area positioned within 20 metres of the railway line.

The location of the proposed borrow pit site is: 29°11'50.78"S 24°32'29.77"E

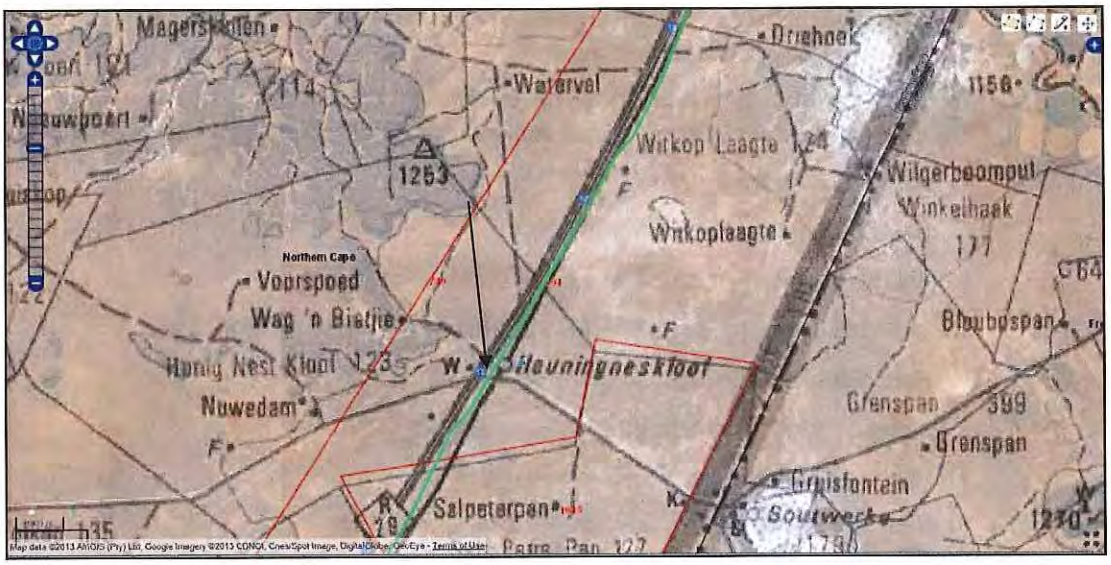

Figure 1: Heuningneskloof borrow pit area (SAHRIS, 2013)

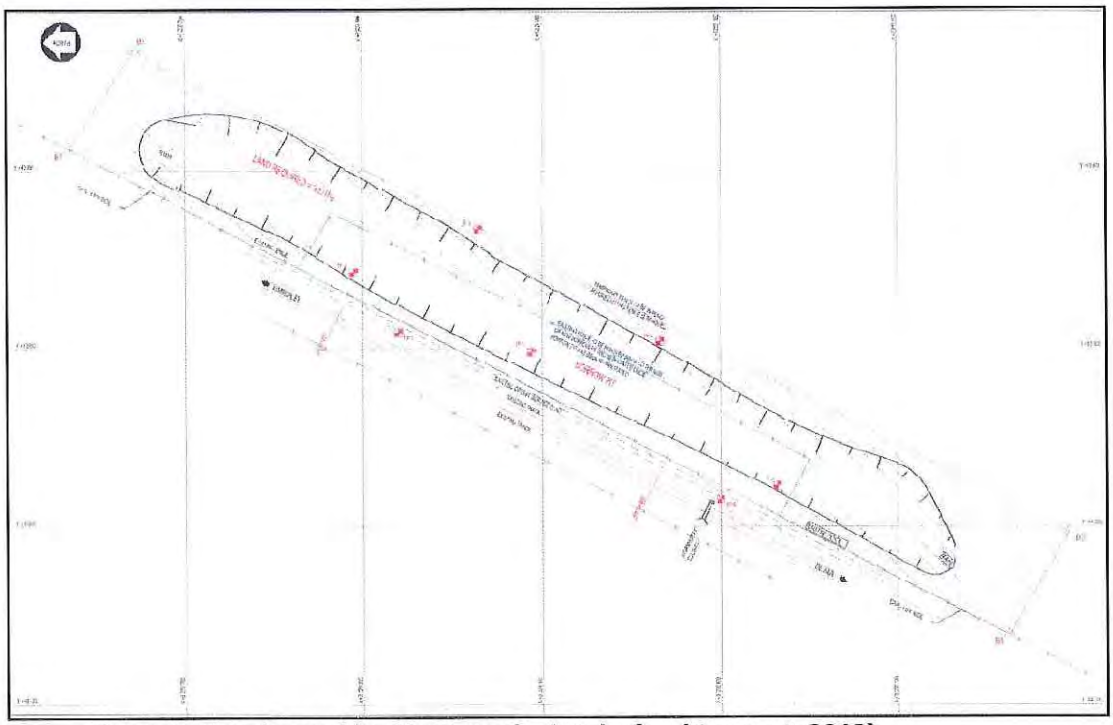

Figure 2: Heuningneskloof borrow pit sketch plan (Transnet, 2012)

Figure 3: Aerial view of the Heuningneskloof borrow pit area (SAHRIS, 2013)

3.1.3.2 Belmont

The proposed borrow pit area is situated on the farm Belmont 191 and is located within the railway reserve that is owned by Transnet. The proposed development site is situated within a 100 to 200 metres of the existing railway reserve line. The existing borrow pit will be used and no additional private land will be required.

The location of the proposed borrow pit site is: 29°25'7.32"S 24°21'51.71"E

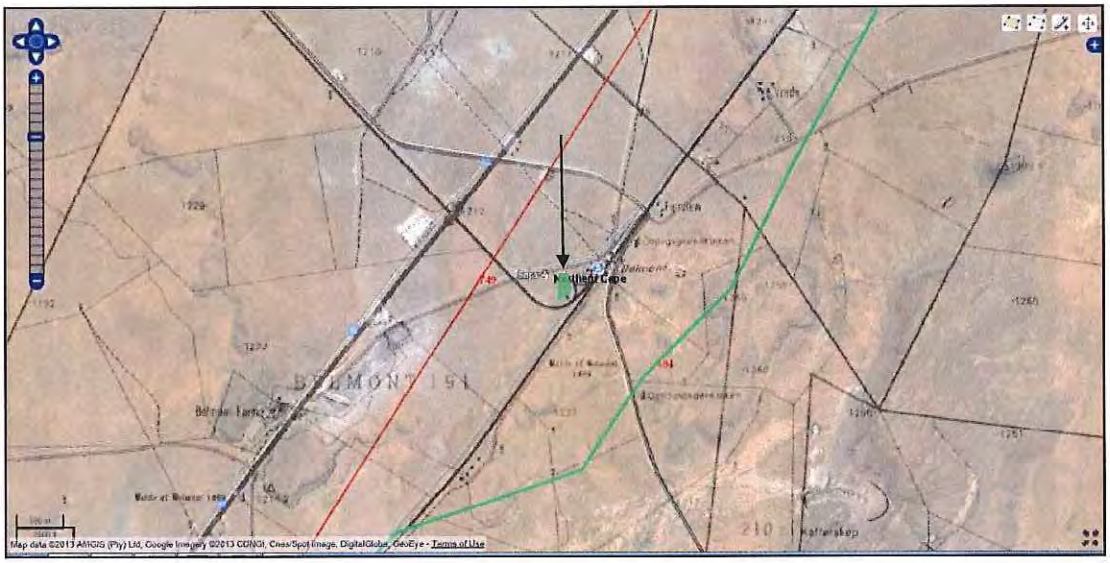

Figure 4: Belmont borrow pit area (SAHRIS, 2013)

Figure 5: Aerial view of the Belmont borrow pit area (SAHRIS, 2013)

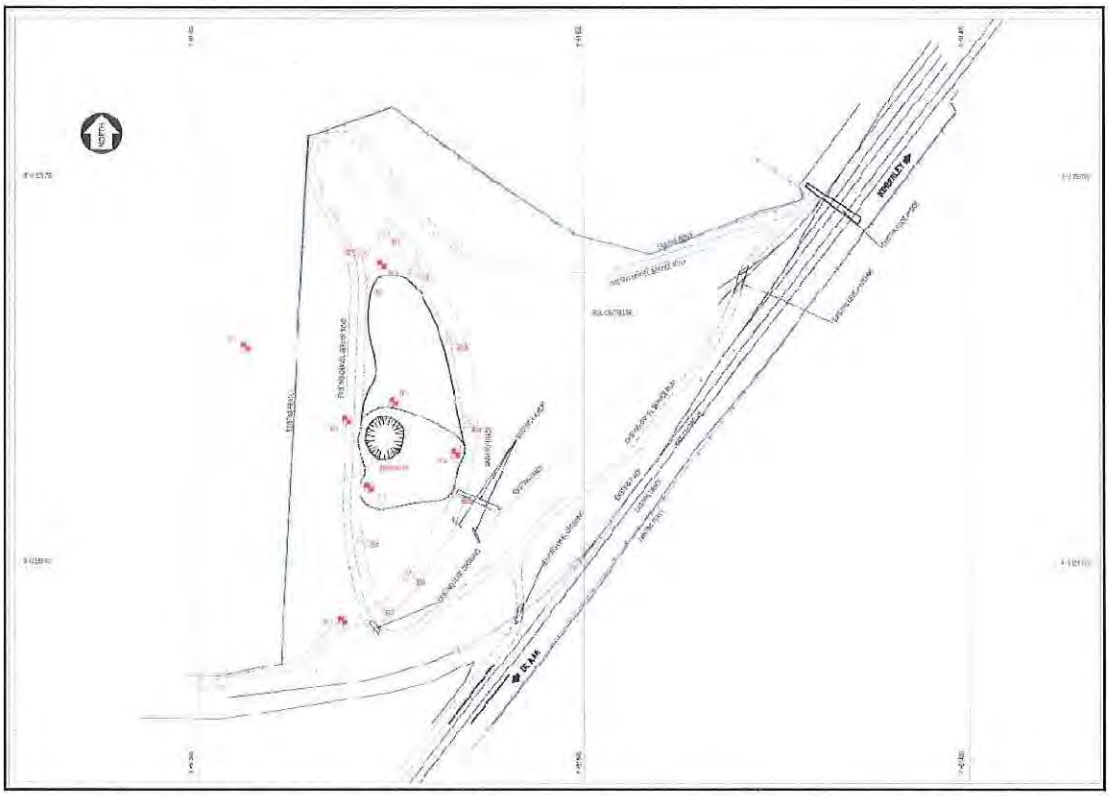

Figure 6: Sketch plan of Belmont Station borrow pit on Farm Belmont 191 (Transnet, 2012)

4. Approach

This section summarises the approach in determining potential heritage concerns at the borrow pit areas situated at Heuningneskloof and Belmont with construction likely to commence in the first quarter of 2013.

4.1.1 Terms of Reference

The specific terms of reference for the heritage impact assessment are as follows:

- Provide a description of the archaeology and cultural heritage of the project development route and identify / map any sites of archaeological and cultural significance that may be impacted by the proposed borrow pit development

- Undertake an archaeological reconnaissance survey [1] to assess the sensitivity and conservation significance of any sites of archaeological and cultural heritage significance affected by the proposed borrow pit development
- Make practical recommendations for the protection and maintenance of any identified and significant archaeological and cultural heritage sites that may be affected
- Provide guidance for the requirement of any permits from SAHRA and the Provincial Heritage Resources Authority (Ngwao Boswa Kapa Bokoni) that might be needed.

4.1.2 Project Objectives

The specific project objectives are as follows:

- Identify major heritage resources issues that may result in a risk to the project or may be a potential fatal flaw
- Minimise the adverse impacts on heritage resources that are positioned on the surface or placed in situ
- Identify the areas where permanent removal of tangible as well as intangible heritage resources needs to be undertaken within a controlled environment and if such activity has an impact on the cultural characteristics of local traditional communities, that they will be compensated
- Avoid impacts on communities of Indigenous Peoples or minimise the impact as far as possible
- Respect and conserve the practices of Indigenous Peoples.

4.2 Legislation and Guidelines

SAHRA is a statutory organisation established in terms of the National Heritage Resources Act (No. 25 of 1999) as the national body responsible for the protection of South Africa's cultural heritage resources. SAHRA' manages the administration of permits for:

- Destruction, alteration or demolition of structures older than sixty years
- Needs and desirability permits linked to development activities
- Sampling permits that allow the removal of heritage objects for research purposes or rescue archaeology
- Rock art documentation permits
- Grave exhumation and removal permits
- Archaeological excavation permits.

[1] Archaeological reconnaissance is the attempt to locate, identify and record the distribution of archaeological sites on the surface and against the natural geographic as well as environmental background.

The need for input with respect to heritage resources is primarily triggered through statutory requirements, the nature and degree of the potential impact's significance, and concerns raised during the stakeholder consultation process (Provincial Government Western Cape, 2005).

It is the legal responsibility of the client to ensure that the cultural heritage, archaeological resources and paleontological sites that have been identified during the reconnaissance survey are protected and that the mitigation procedures are implemented. It is also the responsibility of the client to ensure that competent professionals are available to assist with the identification and protection of heritage resources.

5. Assumptions and Limitations

The following assumptions and limitations must be taken into consideration when reading this report.

5.1 Assumptions

The following assumptions are applicable based on the engineering scope of works:

- All work will stop until further advised by a professional archaeologist, in the event that heritage resources are uncovered during vegetation clearance and construction
- A professional archaeologist will be informed in the event that heritage objects are uncovered during earthmoving operations
- Monitoring will occur during construction to ensure that no heritage objects will be removed without properly recorded and transported to the heritage resources provincial recording institution that is McGregor Museum in this regard
- Stakeholder engagement will occur with the local authorities, property owners, museums, universities and interests groups.

6. Project Methodology

The methodology includes the following:

- Review of previous reports produced during the 2008 Phase 1 HIA study
- During the Phase 1 HIA, the area within the railway reserve areas and the immediate land was assessed to determine if any heritage resources may be affected by the proposed development
- Provision of a sensitivity map that will indicate the tangible and intangible heritage resources positioned alongside and within the proposed development area. The sensitivity map was developed based on the information gathered during the site visit as well as other reports
- Document, calculate and analyse the heritage resources identified during the reconnaissance survey to determine what constitutes a significant resource and how this can be managed
- List recommendations to inform the decision-making process

- Consult with local community members, authorities, museums, academic institutions and historical associations on a regular basis.

This is supported by the identification of previous heritage impact assessment reports completed in the past. The documents are reviewed to determine if any archaeological sites of importance or specific cultural landscapes have been discovered in the neighbouring areas that must be investigated. The coordinates identified in the heritage impact assessment reports are transferred to Google Earth Maps to establish if the identified heritage resources are positioned in the borrow pit development areas.

The background information stipulated above was used to determine which areas needed to be assessed and visited by undertaking a reconnaissance survey.

7. What is Cultural Heritage?

Cultural heritage resources are characterised by two different sub-disciplines which represent intangible and tangible heritage resources that define the field of heritage resources management. Tangible heritage resources can be documented using a quantitative method and intangible heritage resources are documented using a qualitative method. The list of heritage resources that are protected in terms of the National Heritage Act (No. 25 of 1999) is inclusive of the following:

- Tangible moveable and immovable objects
- Property sites, structures, or groups of structures older than sixty years
- Palaeontological sites and objects
- Archaeological sites and objects
- Physical landscape features for example sacred rocks, lakes and waterfalls
- Places of historic, cultural, artistic and religious value
- Unique natural features
- Intangible forms of culture that are inclusive of cultural knowledge, innovations and traditional lifestyles
- Cultural landscapes developed as a result of interactions between nature and man, are illustrative of the relationship that people / communities have with the natural environment (France_UNESCO cooperation agreement, 2006) Cultural landscapes are a combination of trees, forest, rocks, hilltops and associations with sacred natural features. Cultural landscapes are also associated with areas linked to events of bravery, survival and remarkable human events.

7.1 Archaeological Time Periods

Heritage resources and cultural landscapes are linked to specific time periods. In summary the various eras are as follows:

- The Iron Age and farmer period occurred in southern Africa from Common Era (2000 years ago to 1950) to historical periods. The definition is divided between Early Iron Age (c. 200 CE to c. 1400 CE) and Late Iron Age (c. 1400 CE to 1800's (Archaic, 2008) The historical period indicate dates from 1500s to present (Swanepoel N, Esterhuysen A and Bonner P, 2007). The Iron Age is defined as a time period that occurred during c. 200 to c. 1000 Common Era named as the early period and c. 1000 to 1800's Common Era (Archaic, 2008)
- The Stone Age time period is divided between three different time periods, namely:
  - Early: c. 2 500 000 to 150 000 Before Common Era
  - Middle: c. 150 000 to 30 000 Before Common Era
  - Late: c. 30 000 Before Common Era until the historical time periods commenced

8. Archaeological, Historical and Living Heritage Background of the Kimberley to De Aar Section

The purpose of the section below is to provide an overview of the historical – archaeological background of the proposed borrow pit areas.

8.1 South Africa's Railway History

South Africa's railway system dates back to the 1860's and is one of the largest on the African continent. The few lines originated in the 1870's to 1880's that was part of the historical time period associated with the finding of gold and diamonds. The various railway administrations and departments originated during the development of colonies as well as the Boer republics. These systems were combined in 1910 to develop one railway map (De Jong R C, 2002).

The historical railway infrastructure played an extensive role during the South African War specifically related to the transport of wounded soldiers between Magersfontein, Heuningneskloof Graspan, Belmont and De Aar (Marais J J, 1977). The school at De Aar was changed into a hospital of where soldiers were treated (Marais J J, 1977).

8.2 The South African War

The battle of Magersfontein was one of the three major British defeats that occurred during the South African War. Lord Methuen, with a 10 000 strong army left his camps at the Orange River on the 11th of November 1899 to march north along the railway line towards Kimberley (History of War, 2007).

Two victories occurred during this time at Belmont and Rooilaagte during 1899. The British had suffered during the Modderrivier battle that occurred on the 28th of November even if the Boers retreated from the position (History of War, 2007). Methuen decided to allow his men to rest and wait for reinforcements. This resulted in the Boers having to defend a position at Spytfontein closer to Kimberley (History of War, 2007). The Boers also wanted to block the railway between Modderrivier Bridge and Kimberley.

9. Summary of Findings

The following section provides a summary regarding the type of heritage resources that have been identified in the vicinity of the borrow pit areas.

Belmont and Heuningneskloof are cultural landscape sites where significant South African War battles occurred from 1899 to 1902. Blockhouses, mounds and ditches occurred alongside the existing railway line during the South African War. These features do not occur at the proposed development areas, but they have been highlighted to explain the type of cultural landscape that surrounds the railway infrastructure.

Although most of the battles occurred at the hilltop areas, it is possible that artefacts related to this time period could be uncovered when earthmoving operations commence. Significant historical battlefield activity occurred next to the railway lines and bridges and during earthmoving operations heritage objects may be exposed.

9.1 Heuningneskloof

No heritage resources of significance were identified at the proposed borrow pit area. Historical structures occur at the railway station, but they will not be impacted by the proposed development.

Figure 7: Historical structures are located west from the existing railway line at Heuningneskloof, but they will not be impacted by the proposed borrow pit development

Figure 8: Typical cultural landscape associated with the Heuningneskloof railway line and station area. The cultural landscape is inclusive of the natural environment, the historical railway line and the intangible heritage resources associated with the South African War events

9.2 Belmont

No heritage resources of significance have been identified at the existing borrow pit area. Belmont station has evidence of various historical railway structures, but they will not be impacted by the proposed development.

Figure 9: Area situated west from the existing railway line at Belmont. Belmont Post Office is situated on the left side of this photograph

Figure 10: Old railway structures are situated west from the existing railway line, but they will not be impacted by the proposed borrow pit development

Figure 11: The cultural landscape that surrounds the Belmont station area. The cultural landscape is inclusive of the natural environment, the historical railway line and the symbolic association with the South African War events

Figure 12: Old railway structures are located at Belmont station, but they will not be impacted by the proposed borrow pit development

10. Recommendations

The following recommendations are proposed to minimise the impact on potential heritage resources that may be discovered during commissioning of the borrow pit areas.

An Environmental Officer (EO) should monitor the sites during construction. In the event that any potential artefacts are uncovered, the EO should issue an instruction to halt the activities until a professional archaeologist has inspected the potential artefacts and has given the instruction to proceed.

- In the event that heritage objects need to be rescued from construction areas, a permit application must be completed and forwarded to SAHRA for approval to do so. If a permit is granted, sampling must be undertaken as soon as practicable.

  Should heritage objects be uncovered during construction activities these activities must cease in the affected area. A professional archaeologist must be consulted to determine further actions to enable construction activities to proceed. The archaeologist is responsible for complying with the heritage resources legislation and must record the type of heritage objects uncovered and notify the relevant heritage resources authorities as may be required.

- Heritage Resources education and training must be provided to the Transnet EO to enable this individual to identify the potential heritage resources known in the area.

11. Conclusion

In summary both borrow pit areas have been placed away from sensitive heritage resources sites and continuous liaison will occur between the engineering team and the EO. The historical structures that are situated within the railway reserve areas, will not be impacted by the proposed development. Monitoring will occur during construction to ensure that if in situ archaeological material are uncovered, the artefacts are recorded within according to SAHRA's minimum standards.

12. Bibliography

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Sensitivity Maps

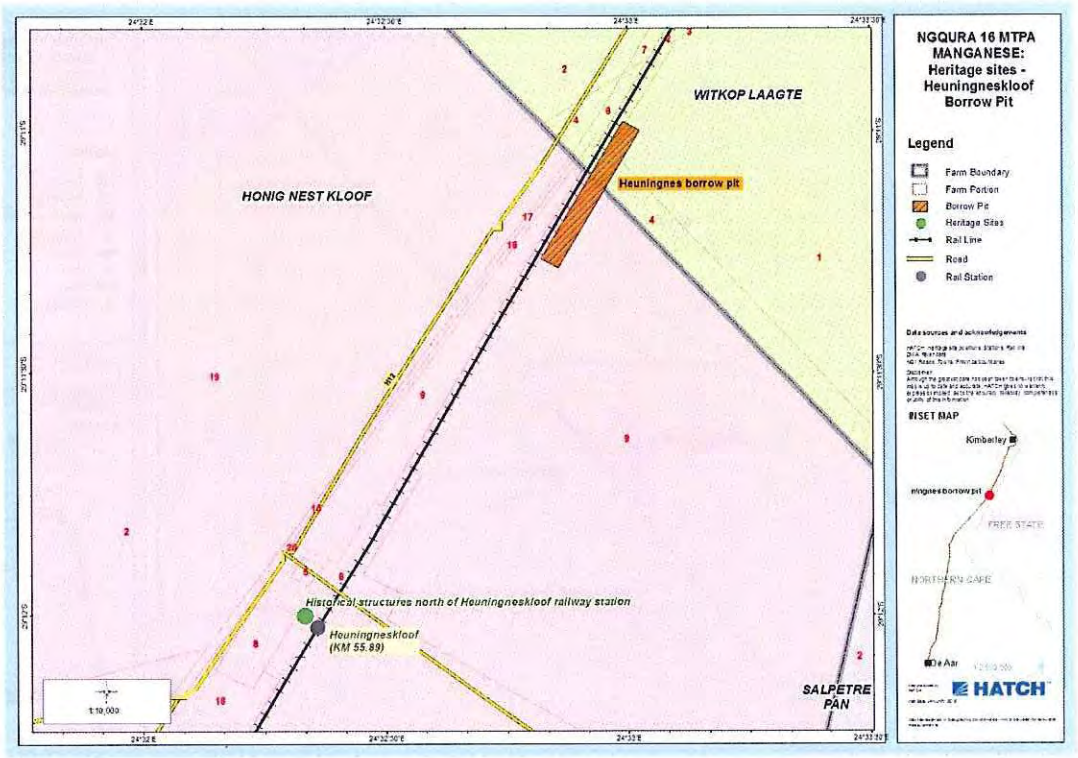

Figure 13: Heritage Sites – Heuningneskloof Borrow Pit

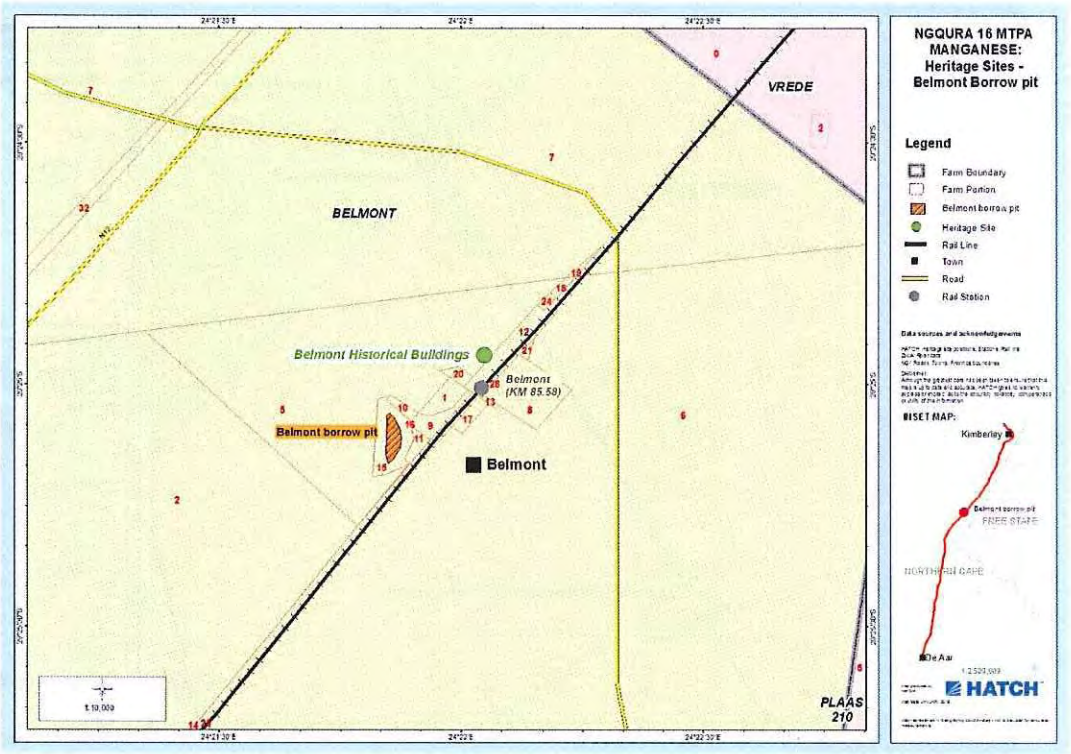

Figure 14: Heritage Sites – Belmont Borrow Pit

APPENDIX E3:

SOCIAL IMPACT ASSESSMENT