ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE PROPOSED WHITE SEAL PROCESSING PLANT ON PORTION 3354, EXTENSION 9 OF HENTIESBAY ALONGISDE HENTIES BAY – USAKOS D1918 ROAD (ERONGO REGION)

Assesed by:

GMAC INVESTMENT CC

Proponent:

WHITE SEAL INVESTMENT GROUP PTY LTD
P.O Box 9141
Eros
Namibia

January 2023

Title	Application for Environmental Clearance Certificate for the Newly proposed Seal Processing Plant on 4 hectares, on portion of portion 3354 of Henties bay Extension 9 zoned "undermined"
Environmental Practitioner	GMAC investment cc
Reviewer	None
Client	White Seal Investment Group Pty Ltd
Status	Environmental Management Plan (EMP)
Issue Date	January, 2023

TABLE OF CONTENT

1. INTRODUCTION

White seal Investment Group (PTY) Ltd is a 100% Namibian entity initiated by young Namibians to participate in and benefit from Namibia's fishing of marine industry through fishing rights and quota allocations for culling of 1000 to 2000 seals per annum. The company is also involved in the youth, consultancy and market related sector. The company (WIG) Holding Company, intends to set up or construct a state-of-the-art Seal Factory in Henties Bay. In December 2022/2023 financial year, White-Seal Investment group through Ministry of fisheries and aquaculture was awarded seal harvesting right in Cape cross and Torra bay situated about 50 to 52 kilometres from Henties bay in Erongo district.

In order to fully realise the business potential of this right, the company intends to setup a seal factory processing plant on portion 3354 Henties bay townland no. 133 where the harvested seal shall be processed, packaged and exported and/or sold for markets. The processing plant shall process products such as pelts, meat, blubber and other by-products.

The Ministry of Fisheries and Marine Resources allocates a Total Allowable Catch (TAC) for seals on an annual basis. WIG is a holding company owned by different entities with various experience in different fields of the economy. Most importantly, one of the shareholders is a right holder with interest in the Seal specie. The Ministry of Fisheries and Marine Resources grants our right holders a quota of around 600 Bulls and 2000 Pups per annum. There are mainly 4 different groups of products that will be commercialised; Skins, Oil, Meat and Organs. The culling period usually starts in July to December of every year. After completion of this State-of-the art Factory we will have the capacity to harvest 8000 Bulls and 40000 Pups per annum.

White-Seal Investment CC appointed by GMAC Consultant cc to apply for acquisition of the Environmental Clearance Certificate for compliance purposes. The Environmental Impact Assessment (EIA) will conduct under the requisites of the Environmental Management Act (EMA) (Act 7 of 2007) and its Regulations (2012).

1.2 MAIN OBJECTIVE

- To apply for the acquisition of the Environmental Clearance Certificate (ECC) for the proposed new Seal factory processing plant on portion 3354 of the Henties bay Townland No. 133 on behalf of White-Seal Investment Group Pty Ltd.
- To provide a brief background of the proposed project and its proponents
- Explain the need for this project;
- To explain the process that was followed during the Environmental Scoping Study;
- Provide for the Compliant and updated Environmental Management Plan for the project and explain all matters in relation to the Bio-physical environment of the project area;

1.3 THE PROCESSING PLANT

The plant will be erected to accommodate the different processes needed to produce the bulk products. The total cost to construct the Factory is in the region of N$30 million. Products produced are likely to stay in its primary form, but with added elements to diversify usage. For example,

- Skins will be pelted then sold.
- Oil from the blubber is made fit for human and animal consumption, as well as create biodiesel.
- The meat is usually processed and placed on the local and international markets.
- Organ processing and market set-off is still in the early planning stage.

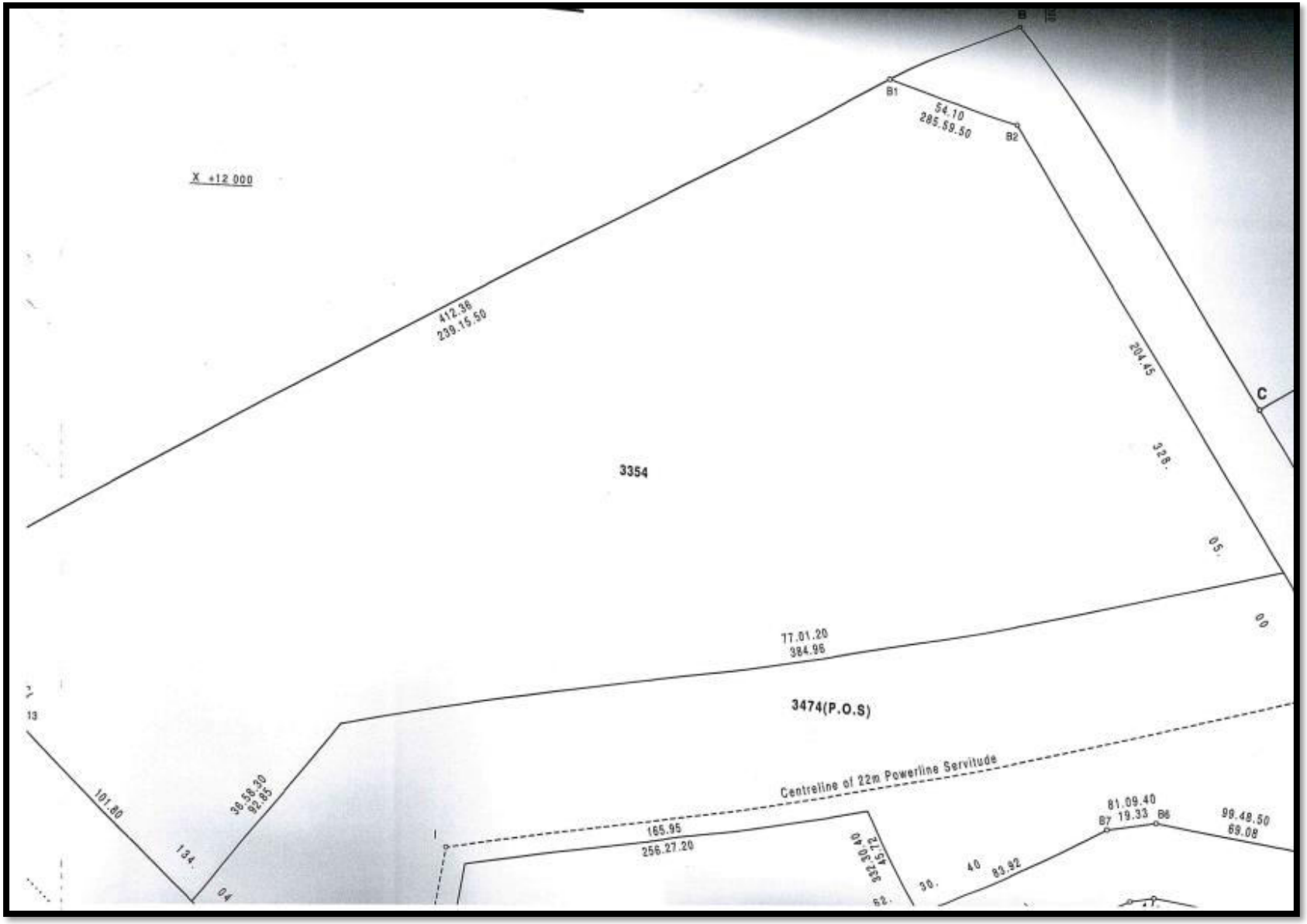
1.4 AIMS OF THIS STUDY

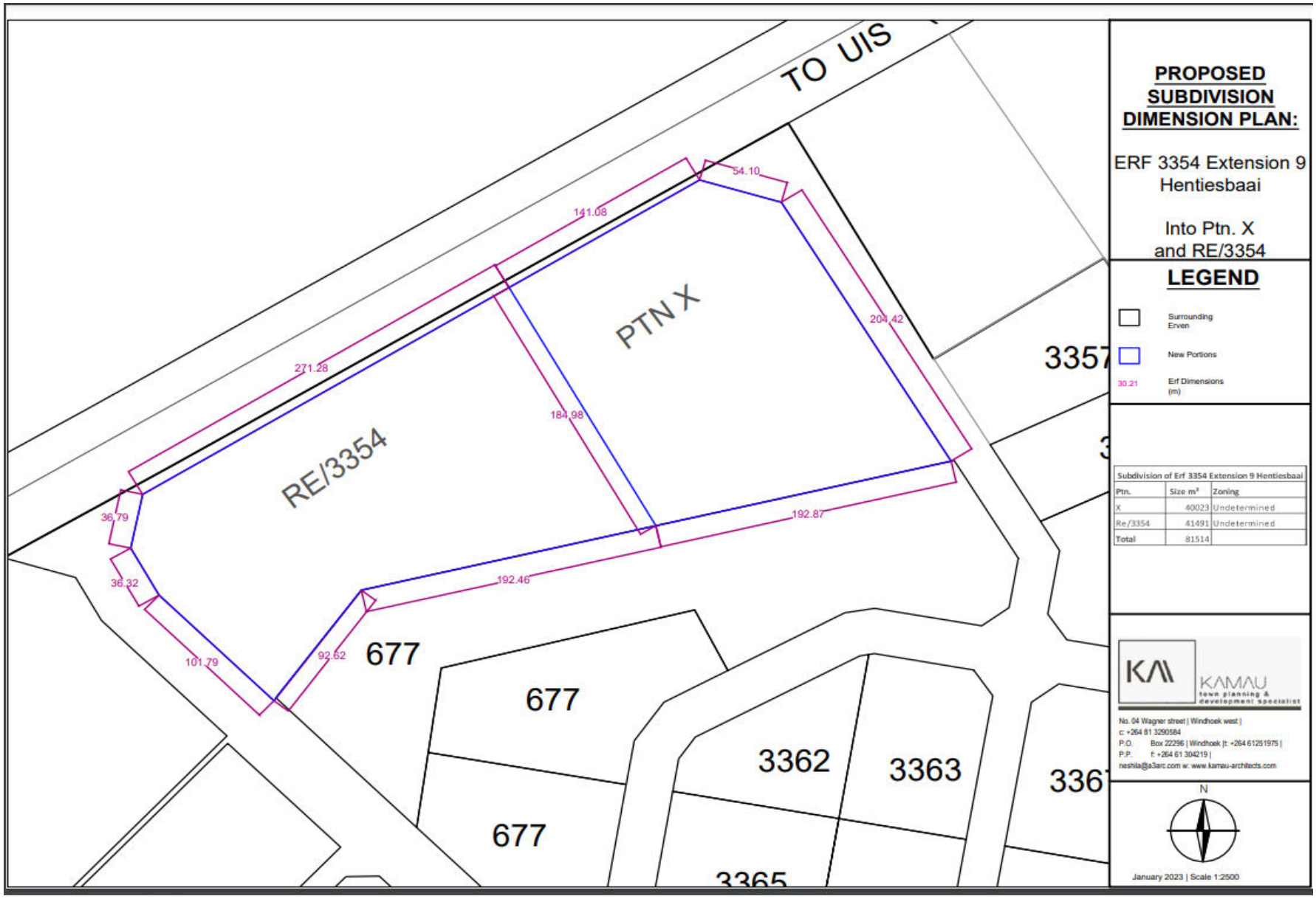
- Comply with Namibia's Environmental Assessment Policy, Environmental Management Act (2007) and its February 2012 EIA Regulations;
- Compile a management plan in line with the 2012 EIA Regulations of the Environmental Management Act (2007) and terms of reference.

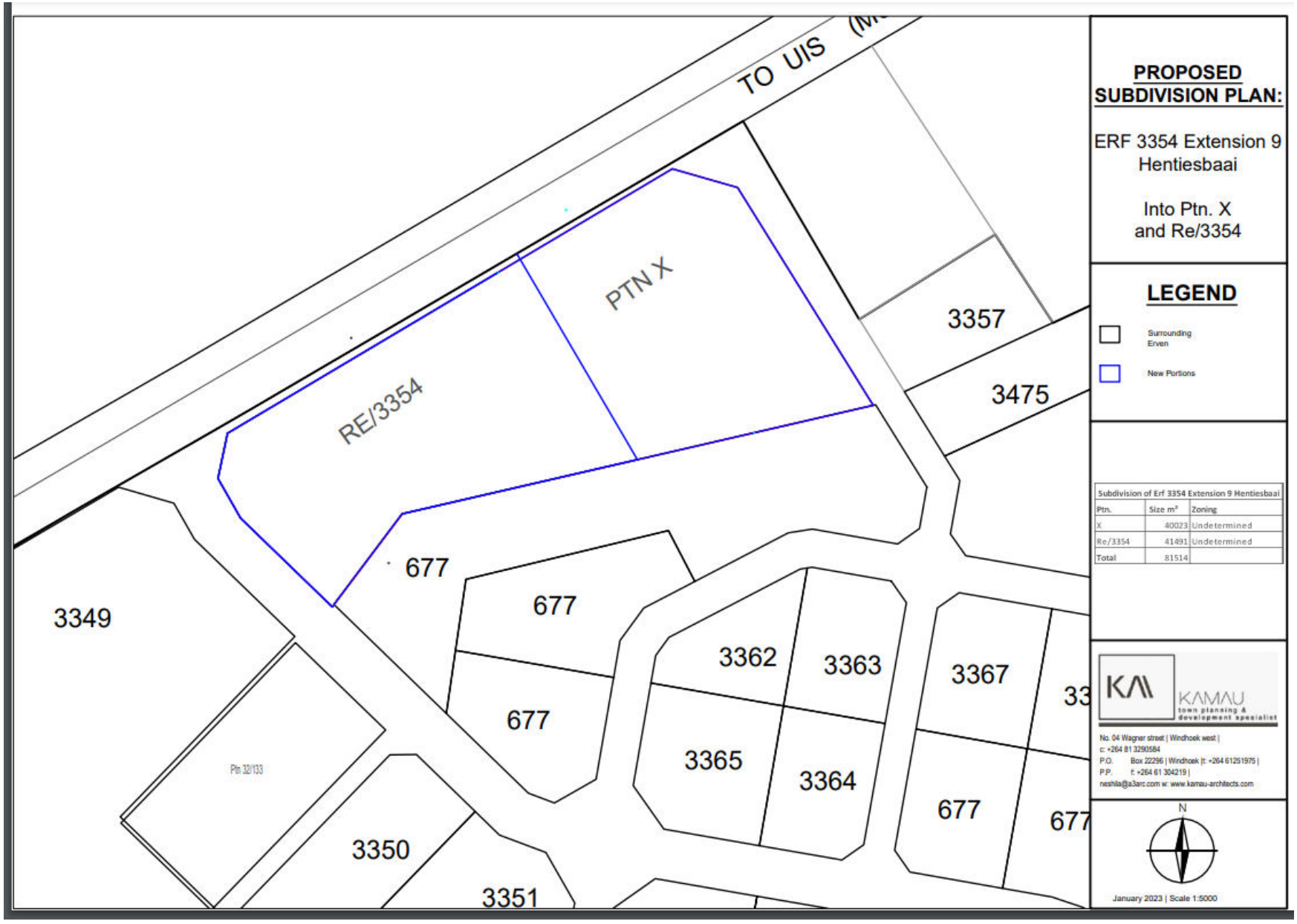
1.5 LOCALITY

The proposed new Seal processing plant in Henties Bay will be established and constructed on portion 3354 of Henties bay townland no. 133. The portion is in extent of 4 hectares (equivalent to 40,000 m²). The "site" is situated alongside the M0043 Henties bay Usakos Road. The site is also situated immediate next to the existing and already operational Henties bay Seal Product Pty Ltd. The proposed site is currently surveyed with nearby services, it is currently vacant and is zoned undetermined. The entire size of portion 3354 is 7,7729 Hectares. Hence the developer shall subdivide the land into two portion, where he shall obtain 4 hectares as depicted on the map.

Figure 1: Proposed Seal processing Plant locality area


X +12 000
B
B1
54.10
285.59.50
B2
412.36
239.15.50
204.45
C
3354
328.
05.
00
77.01.20
384.96
3474(P.O.S)
Centreline of 22m Powerline Servitude
13
101.80
134.
04
38.58.30
92.85
165.95
256.27.20
81.09.40
B7 19.33 B6
99.48.50
69.08
40
83.92
30.


TO UIS
PTN X
RE/3354
3357
677
677
677
3362
3363
3365
54.10
141.08
204.42
271.28
184.98
36.79
36.32
192.87
192.46
101.79
92.62
PROPOSED SUBDIVISION DIMENSION PLAN:
ERF 3354 Extension 9 Hentiesbaai
Into Ptn. X and RE/3354
LEGEND
Surrounding Erven
New Portions
30.21
Erf Dimensions (m)
Subdivision of Erf 3354 Extension 9 Hentiesbaai
Ptn. | Size m² | Zoning
X | 40023 | Undetermined
Re/3354 | 41491 | Undetermined
Total | 81514 |
KAMAU town planning & development specialist
No. 04 Wagner street | Windhoek west |
c: +264 81 3290584
P.O. Box 22296 | Windhoek |t: +264 61251975 |
P.P. f: +264 61 304219 |
neshila@a3arc.com w: www.kamau-architects.com
N
January 2023 | Scale 1:2500


TO UIS
PTN X
RE/3354
3357
3475
677
677
677
3349
3362
3363
3367
3365
3364
677
677
Ptn 32/133
3350
3351
PROPOSED SUBDIVISION PLAN:
ERF 3354 Extension 9 Hentiesbaai
Into Ptn. X and Re/3354
LEGEND
Surrounding Erven
New Portions
Subdivision of Erf 3354 Extension 9 Hentiesbaai
Ptn. | Size m² | Zoning
X | 40023 | Undetermined
Re/3354 | 41491 | Undetermined
Total | 81514 |
KAMAU town planning & development specialist
No. 04 Wagner street | Windhoek west |
c: +264 81 3290584
P.O. Box 22296 | Windhoek |t: +264 61251975 |
P.P. f: +264 61 304219 |
neshila@a3arc.com w: www.kamau-architects.com
N
January 2023 | Scale 1:5000

The plant will be designed and erected to accommodate the different processes needed to produce the bulk products. The products will likely stay in their primary form, but with added elements to diversify their usage. For example, skins will be pelted and oil from the blubber will be made fit for human and animal consumption and to create biodiesel. The meat will be processed and placed on the local and international markets. Organ processing and market set-off will still be in the advanced planning stage.

1.5.1 The project and air emissions

A flow diagram of the process is provided in Figure 2. Below. The projected and anticipated main source of emission of air pollutants will be the boilers used to generate heat for the cookers, to render the blubber to oil. Odors, which can be a nuisance rather than a classic air pollutant, may emanate from different areas of the plant including the animal preparation area, from meat processing, skin and blubber splitting, skin cleaning and organ processing and from the storage of the animal carcasses.

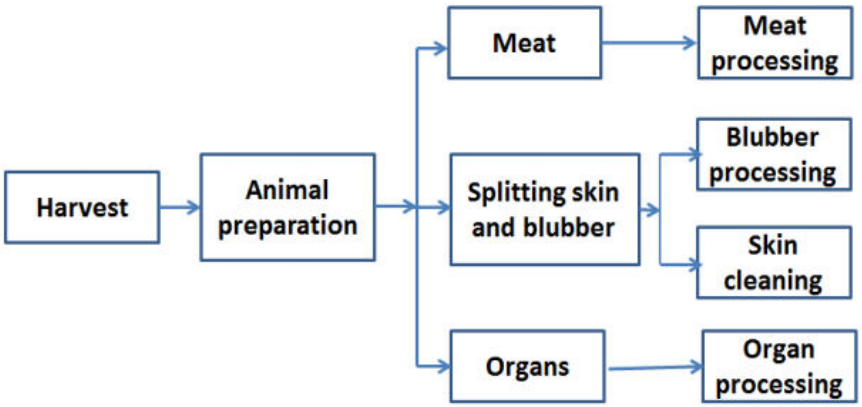


Figure 2: Seal process flow diagram (adopted from Enviro dynamics)

1.5.2 The Boiler

The boiler at the White Seal processing plant is diesel-fired. The by-products (or waste) from diesel combustion, as with all fossil fuels, include sulphur dioxide (SO2), oxides of nitrogen (NOX) and particulate matter inducing respirable particulates (PM10). SO2 will be produced from the combustion of sulphur that is bound in coal. NOX is produced from

thermal fixation of atmospheric nitrogen in the combustion flame and from oxidation of nitrogen bound in the coal. The quantity of NOX produced is directly proportional to the temperature of the flame. SO2 and NOX are released to the atmosphere via the boiler stack. The non-combustible portion of the fuel remains as solid waste or ash which is entrained in the flue gas and released via the stack as particulates.

1.5.3 Odour

Odors from animal processing plants are typically caused by the decomposition of animal by-products. Odors generated at White seal processing plant are expected to be minimized due to the daily process. The process will be designed to minimize the time length for each part of the animal and assure the food, nutraceutical or pharmaceutical grade. The turnaround time between the harvest and the processing will be anticipated to be less than 10 hours which will significantly reduce the spread of odors. The two places where odors may result is when the carcasses are left for up to eight hours being processed and when meat is cooked after a longer delay.

To minimize the potential of odors from the process, it is proposed that no drying of meat or bones will be done in open air, no sun drying will be done, and exhaust fans will be placed over the tables when skins are removed from the carcasses and in the cooking area.

2. LEGAL AND REGULATORY REQUIREMENTS

The Namibian Environmental Management Act (Act No. 7 of 2007) promotes the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment. With regard to managing ambient air quality in a sustainable way and limiting impacts, health-based ambient standards, emission standards, and ambient monitoring are considered the most appropriate approaches.

2.1 Emission standards and guidelines

Emission standards may be set for industrial processes so that the resultant ambient air quality concentrations will not exceed the air quality standards. Namibia does not have emission standards for industrial processes. The International Finance Corporation (IFC) provides emission guidelines for SO2, NOx and particulate matter for small combustion

facilities (IFC, 2007). The World Bank provides emission and effluent guidelines for a variety of industrial processes that are normally accepted by the World Bank (World Bank, 1998).

2.2 Monitoring

Emissions and ambient air quality monitoring provide the necessary information to assess the effectiveness of emissions management. There are no specifications regarding monitoring of either in the Namibian environmental legislation. The IFC provides guidelines for monitoring programs (IFC, 2007) which include parameters to be monitored, the type of monitoring and frequency, the location of sampling equipment and the sampling methods.

3. IMPACT ASSESSMENT

3.1 Identification of key impacts

Project components that may have impacts on air quality and were assessed in the air quality specialist study are listed in Table below:

Project Component	Potential Impacts
Construction	None as the construction was already completed
Operations: Processing plant	Potential impacts on air quality from emissions from the boiler stack increasing concentrations of SO2, NOx and PM10. Potential impact on air quality from emissions of odors from the processing of seal meat, skins and organs
Decommissioning	Nuisance dust generated from demolition equipment and general decommissioning activities

3.2 Methodology for impact assessment

The assessment was conducted in terms of the significance of direct air quality impacts from the proposed development. Factors that were considered are the source strength, the characteristics of the pollutants, predicted ambient concentrations and the nature of the receiving environment. The predicted ambient concentrations are compared with ambient air quality standards or guidelines and recognized dust deposition limits. The assessment

considered the extent, duration, intensity, probability, status of the impact and degree of confidence in predictions, which will lead to the determination of the significance of the impacts.

Criteria for the air quality assessment

Aspect	Scale	Definition
Extent	Site specific	Limited to the facility
	Local	Limited to within a radius of 15 km of the site
	Regional	Limited to within a radius of 100 km of the site
	National	Limited to Namibia
	International	Extends beyond Namibia
Duration	Very short term	Limited to 3 days
	Short term	3 days to 1 year
	Medium term	1 to 5 years
	Long term	5 to 20 years
	Permanent	Beyond the lifetime of the process
	No lasting effect	Predicted ambient concentrations are well below WHO ambient guidelines and no complaints are received.
	Minor effect	Predicted ambient concentrations occasionally exceed WHO guidelines in sensitive areas and complaints are rarely received.
Intensity/ Magnitude Probability	Moderate effect	Predicted ambient concentrations frequently exceed WHO guidelines in sensitive areas and complaints are often received
	Serious effect	Predicted ambient concentrations always exceed WHO guidelines in sensitive areas and complaints are always received
	Improbable	Impacts are improbable
	Possible	Impacts may possibly occur
	Probable	Impacts will probably occur
	Highly probably/definite	Impacts will definitely occur
	Improbable	Impacts are improbable

Status	Positive	Project will lead to an improvement in current air quality
	Negative	Project will lead to a deterioration in current air quality
Degree of confidence	High	Good data and proven techniques are used
	Medium	Reasonable data and techniques are used
	Low	Data is poor or limited
		Good data and proven techniques are used
Significance	None	A concern or potential impact that, upon evaluation, is found to have no significant impact at all.
	Low	Any impacts will be localized and temporary. Accordingly, the impact is not expected to require amendment to the project design
	Medium	Impacts of moderate magnitude locally to regionally in the short term. Accordingly, the impact is expected to require modification of the project design or alternative mitigation
	High	Impacts of high magnitude locally and in the long term and/or regionally and beyond. Accordingly, the impact could have a 'no go' implication for the project unless mitigation or re-design is practically achievable

3.3 Construction

Consequently, the project will not have any impact from activities of construction as there is no construction to be undertaken. The plant already exists and operational, hence the application for renewal of the Clearance Certificate.

3.4 operations

3.4.1 Assessment for the Boiler

The existing boiler is a Thompson Compact TC250 3-pass wetback reverse flame steam boiler (pers. comm. Gordon Slater, Dryden Combustion) with a rating of 1 000 to 5 000 kg steam production per hour. It is fired by diesel or heavy fuel oil. It has a design fuel consumption of 162 l/h. The emission rates and stack parameters for the boiler are provided.

Estimated emissions from the Thompson T250 boiler
Emission rate

	kg/day	**g/s**
NOx	25.60	0.29
SO2	146.17	1.69
Particulate matter (PM10	4.65	0.054
Benzene	0.0001	0.0000012
Stack Dimensions		
Height above floor level (m)	10m	
Inside nominal diameter (m)	0.394 m	
Gas exit temp (K)	493 k	
Gas exit velocity (m/s)	12.5 m/s	

The emission and stack data in the table, above are used as input to SCREEN 3 as described in Section to predict the maximum ambient concentration downwind of the boiler. Points to note when assessing the predicted concentration are:

- These are predicted maximum concentrations. By definition, a maximum occurs once. It is not possible to assess the frequency of similar events using the SCREEN 3 model;
- It is assumed that all dust emitted from the stack is PM10 as the fraction of dust in the flue gas is not known. This assumption therefore provides a worst-case scenario;
- SCREEN 3 produces maximum predicted 1-hour concentrations. In order to compare predicted concentrations of PM10 with the daily guideline a multiplying factor is applied (CDPHE, 2002)

For NOX, the maximum predicted 24-hour ambient concentration of 43 µg/m3 occurs immediately at the stack, and concentrations decrease with increasing distance from the source (Figure 5-1). The predicted concentrations are significantly below the WHO 24-hour ambient guideline value of 200 µg/m3 for NO2. Considering that NOX = NO + NO2, and that not all NO converts to NO2, the predicted concentrations are conservative and are likely to

be lower than those shown. Because of the low predicted NOX concentrations and the fact that dispersion with the prevailing winds will be away from any sensitive receptors, the impact is *expected to be very low. It will occur only when the boiler is in operation, and it will be limited* to the immediate plant site.

Assessment of air quality impacts of the boiler

Activities	**Mitigation**	**Extent**	**Duration**	**Intensity/ Magnitude**	**Probability**	**Status**	**Confidence**
Boiler	Without	Local	Long term	No lasting effect	Improbable	Negative	Medium
	With	Site specific	Long term	No lasting effect	Improbable	Negative	Medium
Significance	Low for the standard stack height of 10 m, but very low if this is increased to 15 m or higher						

The higher stack, 15m instead of the designed 10m stack, provides better dilution and lower predicted ambient concentration. However, the impact as a result of the design stack is very low and installing a higher stack in not necessary. The predicted ambient concentrations of pollutants from the boiler are well below guideline values and ambient air quality is considered unnecessary.

3.4.2 Qualitative Odour Impact Assessment

Odors from animal processing plants are typically caused by the decomposition of animal by-products. While they are seldom harmful to human health, they may be offensive and result in a nuisance impact and in some cases impact on quality of life. Odors may result from different parts of the seal processing process, particularly if delays of eight hours of longer occur from the time carcasses arrive to the time they are processed. Odor may also result from meat after such delays.

The process is designed to minimize the time length for each part of the animal to be processed to assure the food, nutraceutical or pharmaceutical grade of the products, i.e., that quality of the products. The animals will be processed in batches and the turnaround

time between the harvest and the processing of a batch is anticipated to be less than 10 hours. This approach significantly

This approach significantly reduces the time that carcasses may be unattended and that decomposition may occur. In turn the potential the generation of offensive odors is significantly reduced. Furthermore, it is proposed to minimize the potential of odors from the process by:

- Ensuring no drying of meat or bones in the open air;
- Ensuring no sun drying will be done;
- Installing and placing exhaust fans over the tables when skins are removed from carcass;
- Installing and operating exhaust fans in the cooking area.

The seal harvest and subsequent processing of seals is seasonal and odors will only be present during the harvest and when animals are processed. The health impacts of odors under normal operating conditions are expected to be low for a number of reasons. The health risk associated with odors is generally low, there are proposed measures to minimize odors at the seal processing plant, the processing is seasonal, and the prevailing winds that will disperse odors away from any sensitive receptors. However, the nuisance impact of potentially offensive odors cannot be discounted if the normal processing regime is upset and animals are not processed in the desired time, or the installed odors control mechanisms do not function adequately. In this case, the impact may be significant. It was therefore important that the best available techniques be considered in the design, operation and management of the plant. The following is and/or were recommended over-and-above the measures that have been proposed by the developer:

- Provision is made in the plant design and process management to refrigerate a batch of harvested carcasses in the event of a delay in processing;
- The plant design ensures that exhaust fans in the area where skins are removed from carcasses and in the cooking, area are ducted to collect odors for treatment before being released to the atmosphere. Treatment

of odors may be done by bio-filters, activated carbon, or the release via a stack (EC, 2005).

1. Biofilters comprise an air distribution system and a carrier medium, often made from an organic material, which can support growing micro-organisms which feed on malodorous substances and thereby remove odors form the air. The malodorous substances must be caught on the micro-organism carrier, which must have a sufficiently high surface area.
2. Activated carbon is used for odors abatement, based on the very large specific surface area, in the form of micro-pores, which bind the odors molecules.
3. The efficiency falls as the pores become saturated and the carbon must be replaced or regenerated.
4. Malodorous air from various sources may be collected into one or more chimney stacks for emission at a suitable height to ensure sufficient dilution and dispersion of the odors thereby reducing perception of odors problems.

As a result of the proposed efficient processing of seals, the fact that seals are not processed all year, and the commitment to odors management measures such as extractors and no open drying, the intensity of the impact is expected to be medium in the immediate surroundings, and downwind under the prevailing south-south-easterly winds. The intensity of the impact may be reduced considerably if best available techniques are practiced throughout the process, refrigeration is available and malodors air is treated before being released to the atmosphere.

Assessment of air quality impacts of the TSF

Activities	Mitigation	Extent	Duration	Intensity/ Magnitude	Probability	Status	Confidence
Odor	Without	Local	Long term	medium	probable	Negative	Medium

	With	Site specific	Long term	Low	Possible	Negative	Medium
Significance	Medium without mitigation and without due process, but low with mitigation and best available techniques						

Odor is subjective and is perceived differently by different people. It is therefore difficult to measure odors in a cost-effective manner. Rather than a measuring program for odors, it is recommended that complaints register and committee be established to log and attend to odors complaints. Importantly, the record of complaints should include the date and time so that it may be associated with the odors generating activity. With identification of the odors source (or activity) management intervention can brought about to eliminate the activity as a future source.

4. CONCLUSIONS AND RECOMMENDATIONS

White Seal Investment Group Pty Ltd was awarded seal harvesting right and permit in Cape-cross and Torra Bay seal colon in Erongo region in November 2022. The seals will be acquired through the annual seal quota allocation system of the Ministry of Fisheries and Marine Resources. In order to fully realize the business potential of this right, the company proposes to establish a seal processing facility enabling processing of pelts, meat, blubber and other by-products.

Potential air quality impacts were identified as a key environmental issue through the scoping process. The main source of emission of air pollutants are the boilers used to generate heat for the cookers to render the blubber to oil. Odors, which are a nuisance rather than a classic air pollutant, may emanate from different areas of the plant including the animal preparation area, from meat processing, skin and blubber splitting, skin cleaning and organ processing and from the storage of animal.

The atmospheric dispersion potential in Henties bay is expected to be effective for a lot of the time due to the frequent moderate or strong wings. As a result, pollutants are expected to disperse effectively. Poor dispersion conditions can occur when cool temperatures coincide with light or calm winds such, particularly between May and November when the coldest night time temperatures occur. Current air quality in Henties bay is perceived to be good, although odors were experienced in the Henties bay Extension 9, Henties bay Industrial Area during the site visit, emanating from an effluent pool adjacent to the existing seal processing plant. The significance of impacts on air quality from construction activities at the seal processing facility is zero as there are no construction activities to be conducted.

The significance of impacts on air quality as a result of emissions from the boiler stack is expected to be low. A small boiler was proposed (during the scoping report) that will only operate during the harvest and the prevailing winds are orientated away from any sensitive receptors. There are no predicted exceedances of ambient NOX and PM10 guidelines. While there are predicted exceedances of the WHO 24-hour SO2 guideline

at the plant site, the guideline is very low compared to the interim target values of 125 and 50 µg/m3 that are typically adopted.

As the direction of dispersion with the prevailing winds will be away from any sensitive receptors and the predicted concentrations are well below the interim target values, the impact of SO2 from the boiler is expected to be low. Odors may result from different parts of the seal processing process, particularly if delays of eight hours of longer occur from the time carcasses arrive to the time they are processed. Odor may also result from meat after such delays. While they are seldom harmful to human health, they may be offensive and result in a nuisance impact and in some cases impact on quality of life.

The process is designed to minimize the time length for each part of the animal to be processed to assure the food, nutraceutical or pharmaceutical grade of the products, i.e., the quality of the products. The animals will be processed in batches and the turnaround time between the harvest and the processing of a batch is anticipated to be less than 10 hours. This approach significantly reduces the time that carcasses may be unattended and that decomposition may occur and the potential for offensive odors to generate. It is proposed to further minimize the potential of odors from the process by ensuring no sun drying or drying of meat or bones in the open air and to installing and placing exhaust fans over the tables when skins are removing from carcass and the cooking area.

The health impacts of odors under normal operating conditions are expected to be low for a number of reasons. They may only result during the harvest, the health risk associated with odors is generally low, there proposed measures to minimize odors. However, the nuisance impact of potentially offensive odors cannot be discounted if normal processing procedures are upset and animals are not processed in the desired time, or the installed odors control mechanisms do not function adequately, in this case, the nuisance impact may be significant.

It is therefore important that the best available techniques are considered in the design, operation and management of the plant. Over-and-above the proposed measures to control odors, it is recommended that provision is made in the plant design and process management to refrigerate a batch of harvested carcasses in the event of a delay in processing. It is also recommended that the plant design ensures that exhaust fans in the area where skins are removed from carcasses and in the cooking, area are ducted to collect odors for treatment before being released to the atmosphere. Dispersion from the designed 10 m stack is effective and ensures ambient concentrations are well below ambient guideline values. Installing a higher stack in not necessary and ambient air quality is considered unnecessary.

Odour is subjective and perceived differently by different people. It is therefore difficult to measure odour in a cost-effective manner. Rather than a measuring program for odour, it is recommended that complaints register and committee be established to log and attend to odour complaints. Importantly, the record of complaints should include the date and time so that it may be associated with the odour generating activity. With identification of the odour source (or activity) management intervention can brought about to eliminate the activity as a future source.

.....

GMAC Investment CC
Environmental and Management Consultant

5. REFERENCE

Colorado Department of Public Health and Environment (CDPHE). (2002): SCREEN3 Stationary Source Modeling Guidance, Colorado Department of Public Health and Environment - Air Pollution Control Division (CDPHE/APCD) Technical Guidance Series: Air Quality Modeling, January 1, 2002

European Commission (2005): Integrated Pollution Prevention and Control, Reference Document on Best Available Techniques in the Slaughterhouses and Animal By-products Industries, May 2005, http://eippcb.jrc.ec.europa.eu/reference/sa.html

Enviro Dynamics, (2013): Background Information Document (BID), Proposed seal processing plant in Luderitz, September 2013.

World Bank Group, (1998): Pollution Prevention and Abatement Handbook, General Environmental Conditions and Summary of Air Emissions and Effluent Discharge Requirements, July 1998.

World Health Organisation, (2005): WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide, Global update 2005, WHO/SDE/PHE/OEH/06.02