



**Walvis Bay Salt Holdings (Pty) Ltd**

**Amended Environmental Management Plan for  
Walvis Bay Salt Holdings (Pty) Ltd**

**October 2021**

## DOCUMENT INFORMATION

<b>Title</b>	Environmental Management Plan for Walvis Bay Salt Holdings (Pty) Ltd
<b>Client</b>	Walvis Bay Salt Holdings (Pty) Ltd
<b>Date last saved</b>	October 2021
<b>Keywords</b>	Walvis Bay Salt Holdings, EMP
<b>Project Number</b>	734.23021.00001
<b>Issue Date</b>	October 2021
<b>Amendments</b>	<b>Amended as part of the ECC renewal Application. All changes from the previously approved EMP are highlighted in this document.</b>

# ENVIRONMENTAL MANAGEMENT PLAN FOR WALVIS BAY SALT HOLDINGS (PTY) LTD

## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION TO THE PROJECT .....</b>	<b>1-3</b>
1.1	KEEPING EMPs CURRENT .....	1-6
1.2	DETAILS OF THE COMPANY WHO PREPARED THIS EMP.....	1-6
<b>2</b>	<b>PROJECT DESCRIPTION .....</b>	<b>2-6</b>
2.1	DESCRIPTION OF CURRENT OPERATIONS .....	2-7
2.1.1	PROCESS DESCRIPTION .....	2-7
2.1.2	OPERATIONAL DESCRIPTION.....	2-11
2.1.3	EXISTING INFRASTRUCTURE.....	2-13
2.2	DESCRIPTION OF PROPOSED EXPANSION.....	2-14
2.2.1	PAN LAYOUT DESIGN PARAMETERS.....	2-16
2.2.1	SEAWATER INTAKE .....	2-20
2.2.1	BRINE SUPPLY .....	2-20
2.2.2	BITTERNS DISPOSAL .....	2-21
2.2.3	POWER SUPPLY .....	2-22
2.2.4	TRANSPORT OF THE PRODUCT TO THE HARBOUR .....	2-22
<b>3</b>	<b>OVERALL ENVIRONMENTAL OBJECTIVES FOR THE EMP.....</b>	<b>3-23</b>
<b>4</b>	<b>ENVIRONMENTAL MANAGEMENT PLAN .....</b>	<b>4-24</b>
4.1	ACTION PLANS TO ACHIEVE OBJECTIVES .....	4-24
4.1.1	ACTION PLAN: VISUAL.....	4-25
4.1.2	ACTION PLAN: AIR QUALITY.....	4-27
4.1.3	ACTION PLAN: BIODIVERSITY .....	4-28
4.1.4	ACTION PLAN: SOIL, LAND CAPABILITY, LAND-USE AND TOPOGRAPHY .....	4-32
4.1.5	ACTION PLAN: NOISE .....	4-37
4.1.6	ACTION PLAN: SURFACE WATER.....	4-39
4.1.7	ACTION PLAN: GROUNDWATER .....	4-43
4.1.8	ACTION PLAN: SOCIO-ECONOMIC .....	4-45
4.2	ACTION TABLES.....	4-48
4.3	CLOSURE .....	4-50
<b>5</b>	<b>ENVIRONMENTAL MONITORING AND PERFORMANCE ASSESSMENTS .....</b>	<b>5-51</b>
5.1	NOISE MONITORING (GENERATORS AND PUMPS) .....	5-51
5.1.1	OPERATIONAL NOISE MONITORING .....	5-51
5.1.2	TRANSPORT NOISE MONITORING.....	5-52
5.2	AIR EMISSION MONITORING .....	5-52
5.3	WATER MONITORING.....	5-53
5.3.1	GROUNDWATER MONITORING .....	5-53
5.4	SOIL AND VEGETATION MONITORING.....	5-54
5.5	MARINE ENVIRONMENT .....	5-54
5.6	FRESHWATER USE .....	5-54
5.7	ENVIRONMENTAL REPORTS.....	5-55
5.7.1	AUDITS AND INSPECTIONS .....	5-55
5.7.2	SUBMISSION OF INFORMATION.....	5-56

<b>6</b>	<b>ENVIRONMENTAL AWARENESS PROGRAMME.....</b>	<b>6-57</b>
6.1	MANAGEMENT OBJECTIVE.....	6-57
6.2	MANAGEMENT MEASURES.....	6-57
6.2.1	INDUCTION.....	6-57
6.2.2	COMMUNICATION FROM EXTERNAL PARTIES AND EMPLOYEES.....	6-57
6.2.3	IN-HOUSE TRAINING (AWARENESS).....	6-58
6.2.4	ON THE JOB TRAINING.....	6-58
<b>7</b>	<b>ENVIRONMENTAL EMERGENCY PREPAREDNESS AND RESPONSE.....</b>	<b>7-59</b>
7.1	EMERGENCY PROCEDURES.....	7-60
<b>8</b>	<b>PARTIES RESPONSIBLE FOR THE IMPLEMENTATION OF THE EMP.....</b>	<b>8-62</b>
8.1	WALVIS BAY SALT HOLDINGS – RESPONSIBLE PARTY.....	8-62
8.2	RESPONSIBILITIES.....	8-62
8.3	CONTRACTORS.....	8-63
<b>9</b>	<b>REFERENCES.....</b>	<b>9-64</b>

#### **APPENDIX A: MINE CLOSURE FRAMEWORK**

#### **APPENDIX B: COASTAL HUMMOCK MONITORING PLAN**

### **LIST OF FIGURES**

FIGURE 1-1: MINING LICENSE 37.....	1-5
FIGURE 2-1: CURRENT LAYOUT.....	2-9
FIGURE 2-2 LOADING PLANT LOCATION.....	2-10
FIGURE 2-3: CONCEPTUAL DESIGN.....	2-15
FIGURE 2-4: PROPOSED CRYSTALLISER LAYOUT.....	2-18

## ENVIRONMENTAL MANAGEMENT PLAN FOR WALVIS BAY SALT HOLDINGS (PTY) LTD

*(Note: The approved EMP has been amended as part of the Environmental Clearance Certificate (ECC) renewal Application. All changes from the previously approved EMP are highlighted in grey in this document).*

### 1 INTRODUCTION TO THE PROJECT

The salt field operation (Salt Works) at Walvis Bay was established in 1964 and is one of the largest solar evaporation facilities in Africa, currently processing approximately 100 50 million tons of seawater to produce roughly approximately 1,000,000 750-000 tons of high-quality crude salt per annum. Walvis Bay is situated on the Western coast of Africa midway between the Northern and Southern borders of Namibia.

The Salt Works presently consists of three operating companies, namely Salt and Chemicals (Pty) Ltd, which is the mining operation; Walvis Bay Salt Refiners (Pty) Ltd; and Ekango Salt Refiners (Pty) Ltd, both manufacturing operations, which are all subsidiary companies of Walvis Bay Salt Holdings (Pty) Ltd (WBSH). WBSH is again a subsidiary company of BUD Chemicals and Minerals Chlor-Alkali Holdings (Pty) Ltd. In short, Salt & Chemicals produces the raw salt whilst Walvis Bay Salt Refiners further processes and markets the salt. Ekango Salt produces refined table salt.

Salt and Chemicals (Pty) Ltd utilises approximately 5 000 4-500 hectares for the production of crude coarse and refined salt through solar evaporation and fractional crystallisation. Walvis Bay Salt Refiners processes the crude salt for export to markets in Southern and West Africa. It is used by the chlor-alkali industry for the production of chlorine and caustic soda, other industrial uses such as Pool Salt, Oil Drilling, Washing Powder additive and other, by the agricultural sector as a feed supplement as well as a feedstock and for refined table salt for human consumption.

After re-integration of Walvis Bay into Namibia the Salt Works applied for and was granted the current mining licence (ML-37) in January 1998 and environmental clearance was obtained in November of the same year (following the issuance of the ML). Figure 1-1 indicates the extent of the ML-37 superimposed over a Google Earth Image of the area. Subsequent to the mining license and in accordance with the Minerals (Prospecting and Mining) Act (Act No. 33 of 1992) (Mining Act), Salt & Chemicals (Pty) Ltd also entered into an environmental contract with the Government of Namibia, duly represented by the Ministry of Mines and Energy (MME) and the Ministry of Environment and Tourism: Directorate of Environmental Affairs (MET: DEA) (now Ministry of Environment, Forestry and Tourism (MEFT)). In 2009 an Environmental Clearance was granted for the development of the refined salt plant (the above-mentioned Ekango Project). In 2010 the WBSH applied for environmental clearance for various additional activities (sewage pipeline, underground electrical cable and water pipeline) via a process outlined in the

Environmental Management Act (Act No. 7 of 2007) (EMA) regulations that were in their draft form at the time. WBSH also took the opportunity to develop a holistic Environmental Management Plan (EMP) covering all of the existing activities at the time. This application and EMP were approved by the MET: DEA in 2011. WBSH re-submitted the EMP to the MET: DEA as part of a renewal application for clearance in terms of the Environmental Management Act that was enacted on 6 February 2012. The MET: DEA provided the existing operations with Environmental Clearance in early 2013.



**FIGURE 1-1: MINING LICENSE 37**

(Image source: Google Earth)

WBSH proposed to increase their current production from 750 000 tons per annum to roughly 1 000 000 tons per annum. This would require an additional 1 500 ha of land within ML 37 to be converted to salt generation facilities (the project details are provided in section 2).

The EIA amendment application including the EIA Amendment Report (SLR, 2014a) and Amended EMP (SLR, 2014b) relating to the above mentioned project changes was approved in December 2018 when MEFT (DEA) issued an Environmental Clearance Certificate (ECC). The current ECC for the Salt Works operation will therefore expire in December 2021. WBSH therefore requires the ECC renewal from the MEFT (DEA) to allow their ongoing operations relating to the salt works and associated activities.

## 1.1 KEEPING EMPS CURRENT

Section 50 (g) of the Minerals (Mining and Prospecting) Act, 33 of 1992 states that the holder of a mining license shall undertake a periodic review of the EMP(s) should circumstances change.

Should a listed activity(s) as defined in the Environmental Impact Assessment Regulations: Environmental Management Act (EMA), 2007 (Government Gazette No. 4878) be triggered (as a result of future modifications/changes), this EMP will be required to be updated through another EIA process as stipulated in the EMA and its Regulations. Furthermore, proposed amendments to the approved activities (and facilities) need to be re-assessed and the EMP amended, as and where required.

## 1.2 DETAILS OF THE COMPANY WHO PREPARED THIS EMP

SLR Environmental Consulting (Namibia) (Pty) Ltd, who compiled the EIA Amendment report SLR, 2014a for the Walvis Bay Salt Works (WBSW) also compiled the original (approved) EMP in 2014 (SLR, 2014b).

This EMP has been updated ('minor' amendments) by WBSH assisted by Namisun Environmental Projects and Development.

## 2 PROJECT DESCRIPTION

The project description in the sections below was not significantly changed from the original (approved) EMP. The following must however be noted:

- After the successful implementation of the expansion project, WBSH currently produce approximately 1,000,000 t of high quality crude NaCl from seawater per annum that is distributed to various clients locally and exported to other markets.
- The total project site, including evaporation ponds, covers an area of ~ 5 000 ha (which increased from ~ 4 500 ha after the expansion project was implemented).
- Salt is transported by truck from the plant to the harbour via Kovambo Nujoma Avenue and 5th Road in Walvis Bay. With the expansion, the truck fleet was changed from a payload of 24 tons to 32 tons.
- Current activities are aligned with that described in the (approved) EIA Amendment (SLR, 2014) and section 2.2 below.



- Electricity to the WBSW is provided via NamPower. Power is supplied to the pump stations via below ground HT cables. WBSH recently installed below ground electrical cables to the seawater intake pumps as well and decommissioned the diesel generators in 2020.
- No construction activities are currently being conducted at the salt works. All construction related activities associated with the expansion project was completed by 2015.
- The current life of Mine (LOM for the WBSH, based on the renewed ML, is 15 years.
- Further (minor) changes are shown below.

## 2.1 DESCRIPTION OF CURRENT OPERATIONS

### 2.1.1 PROCESS DESCRIPTION

The salt pans are situated at the southern tip of the outer lagoon. Seawater intake occurs at the north eastern most point of the pans. To the east, the pans are separated from the Kuiseb River flood plain by vegetated dunes. The dune fields of the Namib Desert border the concentration ponds to the east. The Atlantic Ocean lies to the West of the operations. Figure 2-1 indicates the current layout of the Salt Works.

The Salt & Chemicals salt production process is based on the solar evaporation and fractional crystallisation of seawater, which is the only raw material used, to produce 99.4% pure sodium chloride (NaCl) on dry mass basis. The seawater, containing a 3.5% concentration of salts, of which 2.7% is made up of sodium chloride, is pumped from the deeper side of the Walvis Bay lagoon, at a rate of 240m<sup>3</sup> per minute as and when required into a series of pre-evaporation ponds followed by a series of concentration ponds. Stimulated by the wind and sun, the brine salinity (concentrated salt water) content of the seawater in the ponds gradually increases until it reaches 25%, at which point it is pumped into crystallisation ponds, each with a surface area of approximately 20ha, where the salt crystallises. The crystallisation ponds are flooded and periodically re-flooded with fresh maiden brine once the magnesium content of the brine in the crystallisation ponds exceeds 3% or higher. The brine drained off is referred to as bitterns and is discharged into the Atlantic Ocean. The Salt Works has a discharge permit for the release of bitterns issued by The Ministry of Agriculture, Water and Forestry.

During the evaporation process, brine depths and densities are controlled to ensure that the maximum number of unwanted chemical impurities is not precipitated during the salt crystallisation process. A similar monitoring programme is adopted to control the depth and density of crystallisation ponds in order to achieve optimum efficiency levels. Performance is constantly monitored by technicians at an on-site laboratory.

Once the salt crystals have grown to the required depth, the salt is harvested and further processed by washing with concentrated brine in a wash plant. The final salt crystals are then dried in a centrifuge and stored on a stockpile at the mine.

The salt destined for bulk export is transported to a dedicated storage and loading facility in the harbour while salt required by customers in bags are packed at an automated bagging facility, according to individualised bag mass requirements and incorporating specific package identification and granule sizes according to customers' needs.

The salt works manages a storage and loading facility at the Walvis Bay Harbour, which also falls under the ambit of the WBSH operations. Figure 2-2 indicates the location of the loading plant within the Walvis Bay Port boundary.

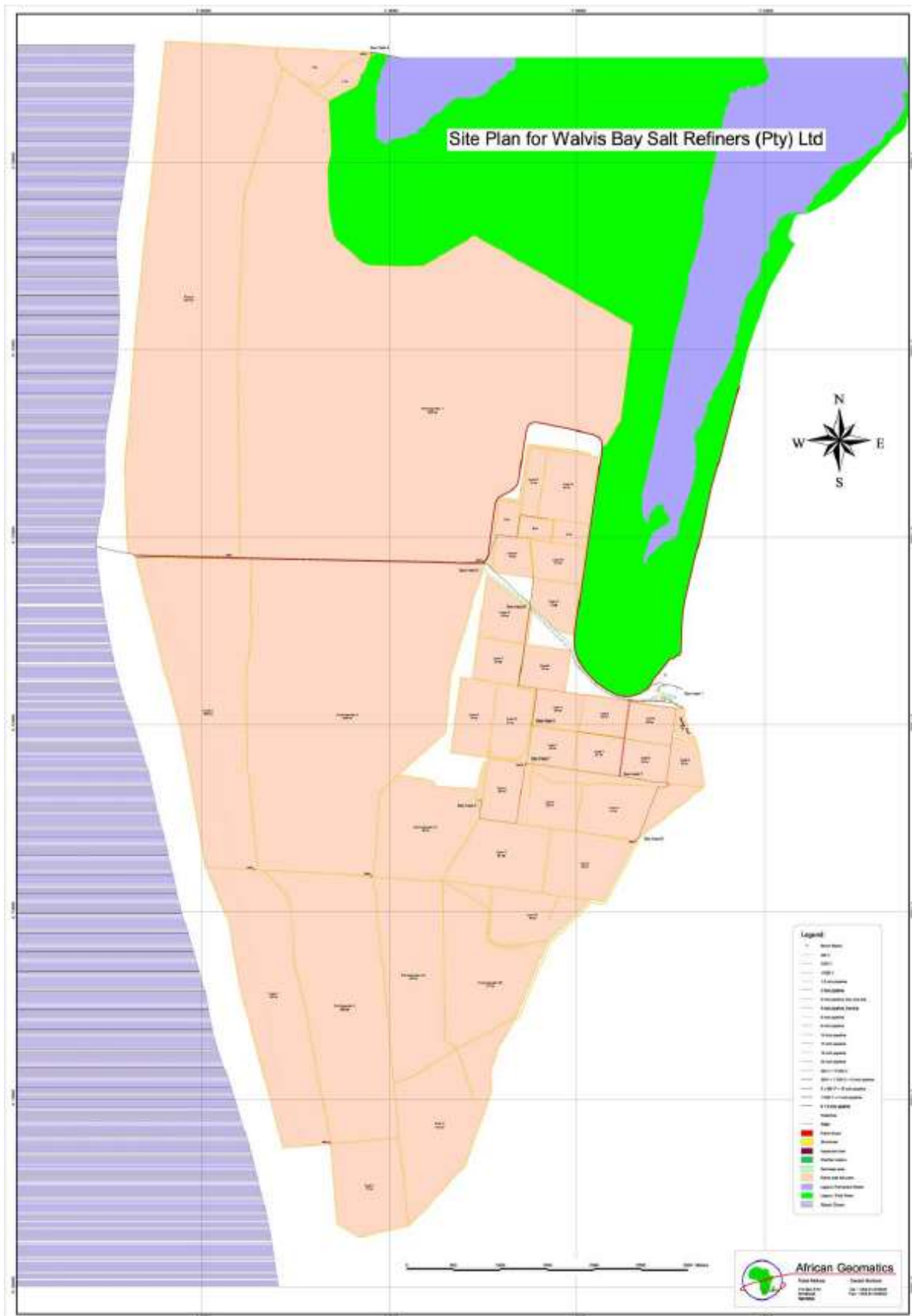


FIGURE 2-1: CURRENT LAYOUT



**FIGURE 2-2 LOADING PLANT LOCATION**

(Image source: Google Earth)

## 2.1.2 OPERATIONAL DESCRIPTION

This section provides a more detailed description of the various facilities and activities associated with the existing operations.

### 2.1.2.1 Seawater intake

- Pump seawater from jetty into evaporation ponds by means of electricity driven pumps generator and pump
- Operation and maintenance of diesel generator
- Maintenance of diesel storage tank

### 2.1.2.2 Ponds

- 11 Natural evaporation of seawater in evaporation ponds - 3322 ha
- 5 Natural production of maiden brine in concentrator ponds – 262 ha
- 17 NaCl precipitation in crystalliser ponds – 369 ha
- Maintenance of ponds (wall repairs)
- 9 Electricity driven lifting pump stations and 10 diesel driven mobile pump units
- Harvesting of salt
- Fuelling of production vehicles

### 2.1.2.3 Bitterns storage and discharge (concentrated sea water)

- Storage of bitterns (bitterns storage area) - ±10 ha
- Discharge of bitterns via pipeline into sea

### 2.1.2.4 Washing and stacking

- Washing of salt with process water (no fresh water)
- Operation and maintenance of washing and stacking operations
- Vehicles/machinery on site

### 2.1.2.5 Salt bagging

- Iodate dried salt crystal
- Bag salt according to specifications (crushing, weighing, bagging, sewing)
- Operation and maintenance of salt bagging facility

### 2.1.2.6 Refining

- Operation and maintenance of refining plant
- Burning of Heavy Fuel Oil (HFO) to produce heat for drying (2300l per day)
- Storage of HFO in above ground storage tank (23 m<sup>3</sup>)

- Store refined salt in silos or in final packaging

#### 2.1.2.7 Loading plant (Walvis Bay Harbour)

- Operation and maintenance of loading plant
- Hydrocarbon and other hazardous chemical substance storage, use and disposal

#### 2.1.2.8 Transport

- Transport of process inputs (including fuel, vehicle components, oils, etc.)
- Transport of bulk salt from site to harbour along access road using ~~five ten~~ 24 ton trucks and four PBS trucks with 60t payload.
- The ~~current~~ average daily load for bulk salt ~~requires less than 130 is 23 tons, which equates to roughly 130~~ return trips per day. Only in exceptional circumstances is salt transported to the harbour outside of normal working hours, Monday to Friday.
- The route taken to the harbour is as follows:
  - Exit the Salt Works;
  - Travel along Kovambo Nujoma Road past Meersig;
  - Left into 5<sup>th</sup> road;
  - Enter the harbour via the alternate SW access gate.
- Bagged coarse salt and refined salt that is shipped from the Walvis Bay harbour is transported to the port on flat-bed trucks that follow the same route as the bulk trucks. Such salt is either containerised or in 2mt bulk bags.
- Fuelling of production vehicles.
- Maintenance of vehicles.
- Vehicle washing.

#### 2.1.2.9 Workshops, offices and general infrastructure on site

- Scheduled and unscheduled maintenance of equipment and/or vehicles
- General maintenance and housekeeping
- Vehicle washing
- Hydrocarbon and other hazardous chemical substance storage, use and disposal
- Fresh water usage

#### 2.1.2.10 Waste

- Solid waste generation (Non- hazardous):
  - Disposed of at the Walvis Bay Landfill site.
- Hazardous waste generation (hydrocarbons and hydrocarbon contaminated waste):
  - Disposed of at the Walvis Bay hazardous waste disposal site.
- Sewerage waste:

- Pumping sewage to centralised sewage sump.
- Transferred to the Municipal Sewage Treatment system via a pipeline.
- Maintenance of pipelines

### 2.1.3 EXISTING INFRASTRUCTURE

The following is a list of all infrastructure currently present on site and at the harbour:

1. Main office building
2. HR office and Laboratory office building
3. Maintenance workshop
4. Sewage Sump
5. Conservancy tank / sewage storage tank
6. Main Diesel tank and bund wall
7. Contractor diesel tank and bund wall
8. Oil separator and bund wall
9. Old bagging plant building
10. Vehicle washbay
11. Wash plant facility
12. Bag Plant building
13. Refining Plant
14. Jetty pump station
15. Jetty diesel tank and bund wall
16. Jetty engine room
17. Jetty canal
18. Water bridge at evaporator 1 (one)
19. Lookout building
20. Bitterns pump station and electrical substation
21. Bitterns discharge pipelines (6" and 9")
22. Concrete weirs (4)
23. Five pump station and substation
24. Polly pump station and substation
25. Canal / Rassie pump station and substation
26. Blue pump and substation
27. Substation A
28. Process dam weir
29. Wash water lines (from Paaltjies to plant)
30. Process dam pump station
31. Pipe lines between plant and process pump station
32. Bitterns pipeline from Blue pump station
33. Effluent water pipeline to bitterns discharge canal.

34. Pond access road(s)
35. Security office
36. Boundary wall and gate
37. Laser eye mounting points
38. Sewage pump at change house
39. Change house facilities (lunch and change house)
40. Scrap store
41. Workshop
42. Garage and store room
43. Store and clock room
44. Underground conveyor belt system
45. Underground tunnel
46. Office
47. Substation
48. No2 belt incline
49. No1 belt gantry
50. Boom belt
51. Chute

## 2.2 DESCRIPTION OF PROPOSED EXPANSION

The conceptual design for the proposed expansion includes (Figure 2-3):

- The upgrading of the existing seawater intake to provide sufficient brine to existing operations as well as the proposed expansion area;
- A series of evaporator ponds located to the west of Evaporators A, B and C moving brine in a southern direction;
- Further brine development ponds (evaporator and concentrator ponds) located to the south of existing operations within the area earmarked for future expansion; and
- A series of crystalliser ponds to the south-east of existing operations.



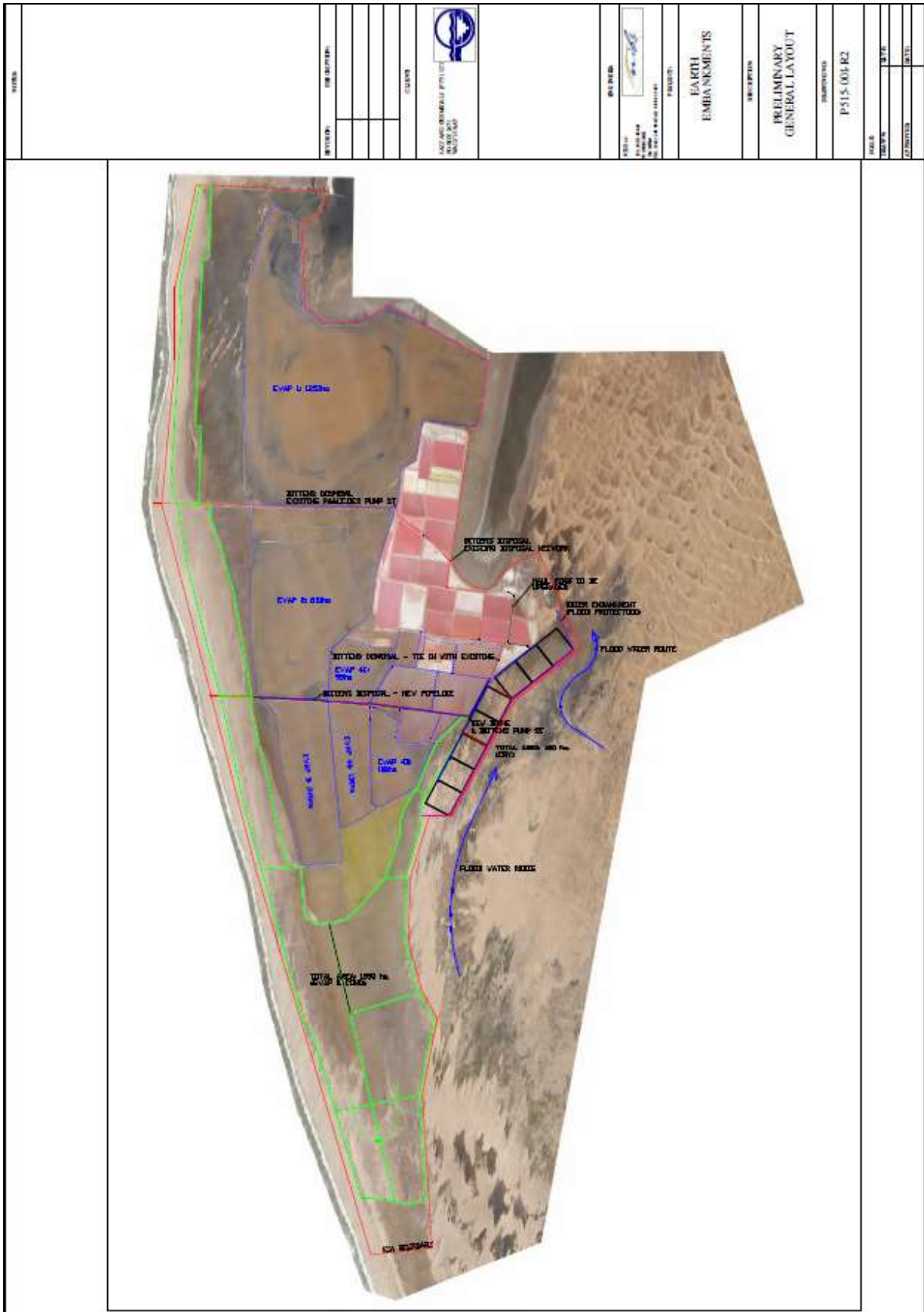


FIGURE 2-3: CONCEPTUAL DESIGN

### 2.2.1 PAN LAYOUT DESIGN PARAMETERS

The pond sizes indicated below are indicative only as this study forms part of an overall feasibility study for the proposed expansion. A detailed engineering preliminary and design phase is still to take place during which the ponds themselves will be designed. However, the general layout has been finalised and the general layout (evaporator, concentrator and crystalliser areas) will not vary. From an environmental perspective this makes little difference. What is of consequence is the proposed footprint. In response to this, the Salt Works has demarcated an outer boundary within which all potential activities take place. No activities will be permitted outside of this area. The coordinates of this boundary limits are indicated below:

**TABLE 2-1: EXPANSION BOUNDARY COORDINATES**

UTM-WGS84

Point	X	Y
1	441 820.527	7 460 347.024
2	439 523.627	7 460 461.446
3	439 159.307	7 458 692.024
4	439 159.307	7 457 437.315
5	438 927.921	7 454 955.844
6	440 556.686	7 448 611.545
7	442 538.412	7 441 974.843
8	443 595.322	7 442 093.932
9	443 427.240	7 444 736.080
10	443 681.660	7 446 067.666
11	443 415.382	7 446 539.272
12	443 184.404	7 447 380.692
13	443 225.161	7 448 515.269
14	443 546.374	7 449 550.401
15	443 942.806	7 449 550.827
16	445 015.811	7 451 538.568
17	446 160.749	7 452 443.957
18	445 421.680	7 454 135.046
19	444 916.759	7 453 868.213
20	444 581.470	7 453 472.697
21	444 581.470	7 453 472.697
22	444 345.497	7 453 501.349
23	444 096.100	7 453 680.250
24	443 956.846	7 453 900.169
25	443 933.471	7 454 051.695
26	444 232.528	7 456 066.671
27	444 430.680	7 456 412.226
28	444 567.603	7 457 428.113
29	442 867.543	7 458 393.346
30	442 305.230	7 458 066.714

31	441 703.145	7 458 087.272
32	441 402.044	7 458 356.518
33	441 339.290	7 459 792.869
34	441 660.820	7 459 969.952

The feasibility design commenced with a detailed investigation of the total area available for expansion as per the conceptual design. The design of solar salt fields historically has been based mostly upon prior experience with some technical information guiding the process. According to various literature sources, although engineering has optimised solar salt works, the importance of site knowledge and experience cannot be undervalued. As such, for the initial design, technical information including the ratio of various types of ponds and pond sizes was determined from the existing infrastructure at WBSH. This was then verified using the literature available.

The overall ratio of evaporators/concentrators to crystallisers is accepted to be approximately 10:1. Using this ratio as a basis, the total area identified for proposed evaporator and concentrator development was delineated. The total area available for brine development is 1754 hectares. Allowing for marginal excess, the design was based upon the availability of 170 hectares for crystalliser pond development. In discussion with WBSH, the optimum size of a crystalliser as per experience is approximately 20 hectares. As such, the design has allowed for the accommodation of six (6) ~~eight (8)~~ crystallisers each approximately 19 ~~21.15~~ hectares in size (Figure 2-4). The additional 110 ~~170~~ hectares of crystalliser ponds, assuming a deposition depth of 20cm/annum, would correspond to an increase in production of 280 000 tonnes/annum. As mentioned previously, the total increase in ponds size would be roughly 1500 hectares in extent.

The site selected for the crystallisers was determined by:

- Location as near as possible to existing crystallisers in order to minimise the distance required to haul harvested salt. A maximum distance of 4km from the wash plant was set;
- The location maximises the area available for brine development;
- The area is partially protected by sand dunes. The area that is not naturally protected has a higher elevation than the Kuiseb River floodwater channel and is easily protected through a floodwater embankment;
- Electrical supply is in relatively close proximity; and
- The location facilitates tying into the existing bitterns disposal system negating the need of a separate, independent system.

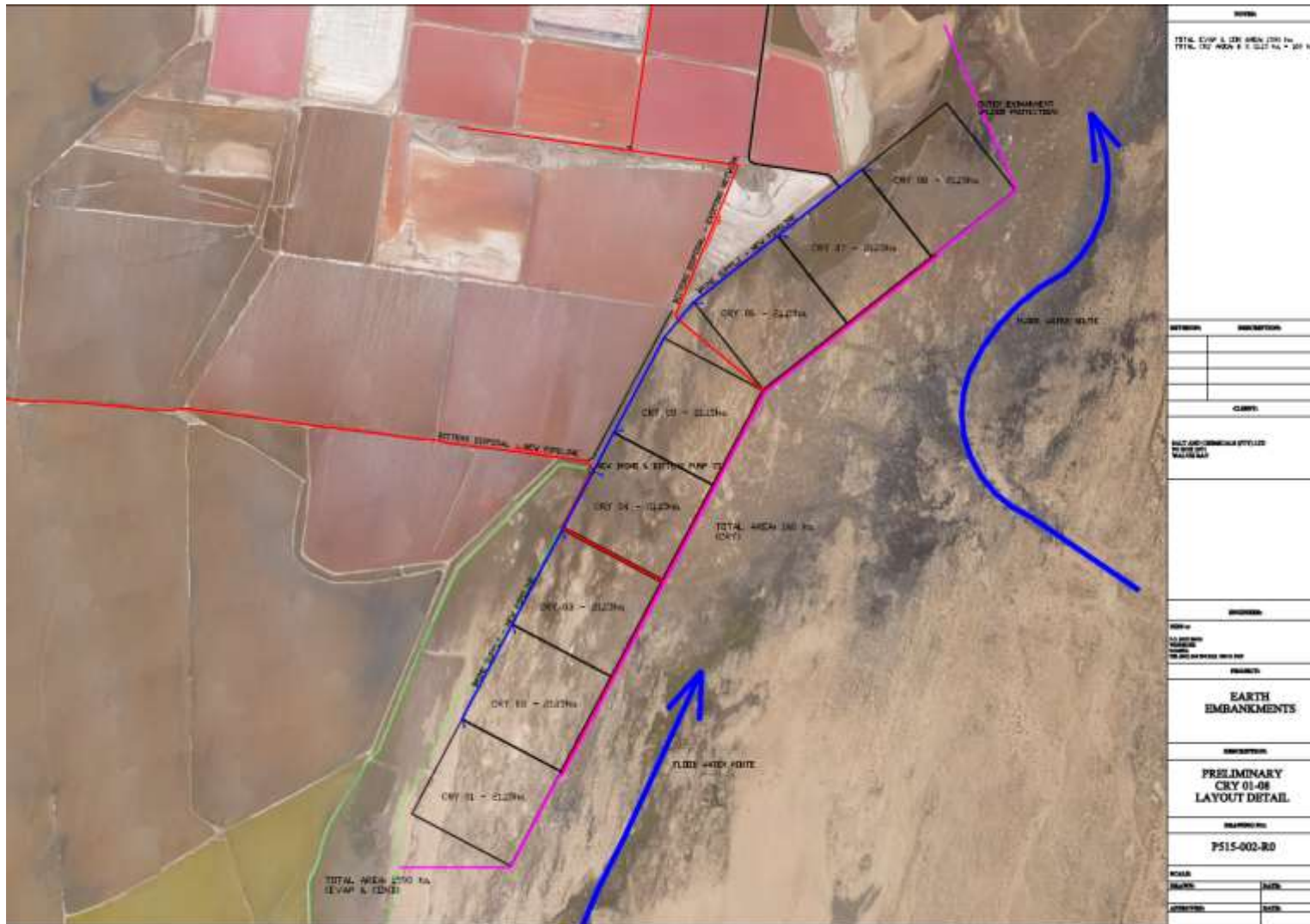


FIGURE 2-4: PROPOSED CRYSTALLISER LAYOUT

Considering the existing operations, the ratio between evaporators and concentrators was determined to be 12.7:1 (Table 2-1). Using 1700 hectares, this allows for approximately 1575 hectares of evaporator ponds and 125 hectares of concentrator ponds. Successful operations at the Walvis Bay salt works indicate that the ideal number of:

- Evaporator ponds is five (5); and
- Concentrator ponds is four (4).

**TABLE 2-2: RATIO BETWEEN EXISTING EVAPORATORS AND CONCENTRATORS**

Evaporators	Size (ha)	Concentrators	Size (ha)
A	526	1	25
B	89	2	64
C	53	2A	45
D	64	3	54
E	128	4	41
1	1253	5	33
2	631		
3	245		
4A	130		
4B	108		
4C	95		
sub-total	3322	sub-total	262
Ratio Evaporators:Concentrators			12.7:1

Gravity flow should be the main driving factor with minimal pumping activity. Through the correct contouring of the proposed evaporators, this should be readily achieved as the proposed concentrator ponds area to the south of the existing works is the area with the lowest elevation and the feed from the seawater intake at the top of the proposed evaporators has the highest elevation.

The majority of the perimeter embankments are either already constructed or comprise of the existing dune belt. A new embankment will be required down the length of the western evaporators and should be constructed on the edge of the existing sea water line in order to fully utilize the fall out areas of these evaporators. Training levies will in all probability be required in the southern most evaporator/concentrator ponds in order to ensure full use of the brine development area.

The proposed evaporators are on average 0.5m higher than the existing evaporators. In order to ensure that seepage does not take place, impermeable embankments are required. Clay core waterproofing should be incorporated into the pond wall design. Should the clay core not prove sufficient waterproofing, alternatives such as polyethylene plastic sheeting require consideration.

The concentrators are located along the south-eastern wall of Evaporator E and 4B. The concentrators should be constructed with a clay core to provide waterproofing. A new Brine Pump Station will be required

to pump the brine to one of 8 x 21.15ha crystallisers located in a north-easterly line as can be seen on Figure 4-3. The crystallisers should be slightly contoured to facilitate bitterns removal and this should be maintained during the harvesting process. This would reduce the necessity of a number of mobile pumps to drain the crystallisers.

A new Flood Protection Embankment will be required along the entire eastern edge of the proposed crystallisers. This embankment will run from the southern dune belt and ties into the existing flood protection embankment constructed in 2012. The placement of the new crystallizers will have minimal impact on the floodwaters as the natural flow patterns are maintained. As described previously the crystallisers have been placed as close as possible to the existing operations, facilitating efficient haulage during harvesting and allowing the possible cross-utilization of brine and wash water if and when required. A haul road has been indicated on Figure 2-3.

### 2.2.1 SEAWATER INTAKE

The infrastructure at the existing seawater intake would require minor upgrades to ensure the capacity required to provide the proposed expansion area with brine. ~~An additional Intake Pump Set will be required to provide the seawater required. The most cost effective means determined is the use of two smaller pumps (with an additional as spare) versus one larger pump (with an additional as spare).~~

The seawater will be pumped via a 300m GRP pipeline feeding a 2km long earth canal that delivers water to the first evaporator pond. It is important to note that the existing raceway is located on the northernmost boundary of the Mining Licence area. ~~As such, the proposed expansion to the seawater intake will require the intake being located to the south of the existing infrastructure. In order to facilitate this, the access road alongside the existing infrastructure will require upgrading, including the importing of material to widen the access road, the stockpiling and replacing of the riprap, and the excavation of the sump.~~

An abstraction permit taking into account changing volume requirements due to the expansion project will be required from the Directorate of Law Administration prior to any increase in abstraction taking place.

### 2.2.1 BRINE SUPPLY

WBSH required that the brine supply at the proposed crystallisers be achieved through a single pump station and pipeline. A pipeline along the western edge of the new crystallisers is therefore proposed based on a similar system to that currently feeding Crystallisers 12 – 17 on the existing system and is proven effective. 250mm PN6 u-PVC piping will be used to deliver the maiden brine from the pump station to the crystallisers.

The brine supply infrastructure is to be developed in conjunction with the bitterns removal system.

### 2.2.2 BITTERNS DISPOSAL

The bitterns disposal comprises a network of canals and/or pipelines that deposit the bitterns in the ocean at Paaltjies. ~~Two options were considered, namely (i) a completely new system separate of the existing bitterns infrastructure and (ii) a system that ties into the existing bitterns infrastructure.~~

~~The first option of a new, separate system (Figure 4-5) was rejected owing to the fact that the infrastructure would pass through valuable brine development areas. Should a pipeline or canal be damaged, the effect of bitterns entering the system as it passes through the evaporator and concentrator area would be significant.~~

The option of tying into the existing system is favourable in terms of the path that will be followed through the crystallisers of the existing system (northern bitterns layout as per Figure 4-3). An additional Bitterns Pump Station will be constructed on the eastern corner of Concentrators 3 & 4 enabling the delivering of bitterns to the existing bitterns system. The existing system is currently being upgraded and the option of expansion has been incorporated into the design. 355mm PN6 u-PVC piping will be used to deliver the bitterns to the existing infrastructure tie in location. The existing canals will require some minor upgrading and this will be completed accordingly.

The draining of the crystallisers should be achieved through a similar but opposite system to the brine supply infrastructure. Slight contouring of the crystallisers and subsequent maintenance thereof during the harvesting process should facilitate the draining of the crystallisers without the need for additional mobile pumps.

A Wastewater and Effluent Disposal Exemption Permit to allow for an increase in bitterns discharge due to the expansion project will be required from the Directorate of Pollution Control within the Ministry of Agriculture, Water and Forestry. At the time of submission of this EMP the Directorate of Pollution Control requested the following information prior to the issuance of the exemption permits:

- a) A Water Management Plan for Salt & Chemicals (Pty) Ltd
- b) The Projected Future Development, Expansion and Decommissioning Plans
- c) A Wastewater discharge permit from the Walvis Bay Municipality for discharging the domestic effluent into their system

No increase in discharge will be permitted until such time as the above-mentioned requirements have been met and the permit issued. It is also recommended that the Environmental Clearance for the expansion include this as a condition of approval.

### 2.2.3 POWER SUPPLY

Power is required at the proposed new pump station sites. Overhead power lines will not be considered. All power lines will therefore be below ground HT cables. Approximately 2km of supply cable will be required and the relevant transformer will require upgrading to facilitate the proposed expansion power requirements.

### 2.2.4 TRANSPORT OF THE PRODUCT TO THE HARBOUR

At present the bulk/ salt from site is transported to harbour using a combination of five x 24 ton payload trucks and 4 x 60 ton payload trucks. ~~approximately ten 24 ton payload trucks. Should the project be approved, the WBSH will instead utilise trucks with a 32 ton payload and a similar overall weight to the existing trucks.~~ The control of the vehicle loads will be carried out through the use of a weighbridge.

Through the use of these trucks the average number of trips per day would be reduced from 130 to 127 (including the additional product generated by the expansion project). The table below indicates the estimated transport volumes when taking the implementation of the alternative into account.

**TABLE 2-3: TRANSPORT STATISTICS**

	<b>Current annual capacity</b>	<b>Tons per vehicle</b>	<b>Average Number of loads per day</b>
Current	750 000	23.00	130
After expansion	1 000 000	<del>50 31.50</del>	<del>80 127</del>



### 3 OVERALL ENVIRONMENTAL OBJECTIVES FOR THE EMP

The following overall environmental objectives have been set for WBSH:

- To comply with national legislation and standards for the protection of the environment.
- To comply with corporate sustainable development policies and objectives.
- To limit potential impacts on biodiversity through the minimisation of the footprint and the conservation of the surrounding environment.
- To limit contaminated effluent discharge into the environment
- To protect soils and groundwater resources through the implementation of measures for spill prevention and clean-up.
- To ensure the legal and appropriate management and disposal of general and hazardous waste, through the implementation of a strategy for the minimisation, recycling, management, temporary storage and removal of waste.
- To minimise the potential for noise and vibration disturbance in surrounding areas.
- To develop, implement and manage monitoring systems to ensure good environmental performance in respect of the following: ground and surface water, air quality, noise, biodiversity and rehabilitation.
- To ensure the health and safety of surrounding communities.
- To support and encourage environmental awareness and responsibility amongst all employees and service providers.
- To provide appropriate environmental education and training for all employees and service providers.
- Prevent and minimise pollution.
- To ensure all the contractors adhere to the construction related management commitments.
- Ensure compliance to the EMP.

## 4 ENVIRONMENTAL MANAGEMENT PLAN

The conceptual management measures proposed to mitigate the potential impacts are detailed in the action plans below.

Environmental aspects associated with the Salt Works and the proposed expansion are detailed in the Scoping Report and are listed below:

- noise
- air quality
- visual
- biodiversity (including avifauna and marine ecology)
- soil and land capability
- groundwater
- surface water
- socio-economic
- hydrocarbon spillages
- generation of waste

It is expected that the potential impacts associated with the above aspects would mainly occur during the construction and operation phase.

### 4.1 ACTION PLANS TO ACHIEVE OBJECTIVES

Action plans to achieve the objectives are listed in tabular format together, separated by project phases and activities. The action plans also includes the frequency for implementing the mitigation measures as well as identifying the responsible party.

#### 4.1.1 ACTION PLAN: VISUAL

##### Objective:

To limit the negative visual impact on the surrounding landscape.

##### Construction phase

Activities/ facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Clearing and landscaping activities	Clearing land for ponds and construction of pond embankments	<ul style="list-style-type: none"> <li>Construction areas must be kept clean and tidy.</li> <li>Areas of construction shall be clearly demarcated. No construction or project related activities may be undertaken outside of the demarcated areas.</li> <li>Landscaping must be limited to those areas that are required for construction.</li> </ul>	Prior to construction and throughout construction	Operations Manager / External Consultant

##### Operational phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Seawater intake	The deterioration of the infrastructure in place for the abstraction of sea water would have a negative visual impact.	<ul style="list-style-type: none"> <li>Implement a monitoring and maintenance programme for this infrastructure.</li> <li>The environmental monitoring programme must include the monitoring of visual conditions.</li> </ul>	Ongoing	Maintenance Manager
Ponds	The visual impact of the ponds	<ul style="list-style-type: none"> <li>Maintain the ponds in order to maintain the current visual "status quo".</li> </ul>	Ongoing	Operations Manager
Bitterns discharge	Negative visual impact of pipeline and discharge point	<ul style="list-style-type: none"> <li>Monitor discharge point – weekly updates.</li> <li>On-going maintenance to take place in order to ensure that the visual integrity of the discharge point is maintained.</li> </ul>	Weekly	Operations Manager
Operation and maintenance of washing and stacking/ heaping operations, salt bagging facility and refinery	These facilities have a potential visual impact	<ul style="list-style-type: none"> <li>Implement a monitoring and maintenance programme for this infrastructure.</li> <li>The environmental monitoring programme must include the monitoring of visual conditions.</li> <li>Avoid reflective surfaces.</li> <li>Paint with neutral colours.</li> </ul>	Ongoing and during maintenance	Operations Manager/Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Stockpile/ heap/ store refined salt	The stockpiles of refined salt have a visual impact	<ul style="list-style-type: none"> <li>None possible</li> </ul>	N/A	N/A

### Decommissioning phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Removal of ponds and surface infrastructure	The removal of dams will leave a bare "scar" on the landscape, creating a visual impact.	<ul style="list-style-type: none"> <li>Natural vegetation establishment (self-succession) will be encouraged.</li> <li>The natural topography will be mimicked where possible.</li> </ul>	Decommissioning and closure planning	Operations Manager / External Consultant
Landscaping and rehabilitation	The landscaping will remove the visual incongruity.	<ul style="list-style-type: none"> <li>Where possible, landscaping will restore the natural aesthetics of the area.</li> <li>The self-succession of natural vegetation will be encouraged</li> </ul>	Decommissioning and closure planning	Operations Manager/External Consultant

#### 4.1.2 ACTION PLAN: AIR QUALITY

##### Objective:

To reduce air pollutant generation during all project phases.

##### Construction phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Use of construction vehicles and machinery	Improperly maintained vehicles and machinery may release excessive gases thereby contributing to air pollution.	<ul style="list-style-type: none"> <li>Vehicles will be regularly monitored and maintained. Maintenance programmes will be established and implemented.</li> <li>Generators shall be equipped with the necessary measures to minimise the emissions of air pollutants (refer to Section 4 for recommended measures).</li> <li>Maintenance and monitoring programme for the diesel generators shall be established.</li> <li>Air quality will be monitored in accordance with Section 5.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

##### Operational phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Operation and maintenance of diesel generators	Generators release air pollutants and smoke that have negative impacts on air quality	<ul style="list-style-type: none"> <li>Generators shall be equipped with the necessary measures to reduce the emissions of air pollutants.</li> <li>Maintenance and monitoring programme for the (backup) diesel generators shall be established.</li> <li>Air quality will be monitored in accordance with Section 5.</li> </ul>	Ongoing	Maintenance Manager
Burning of Heavy Fuel Oil (HFO) to produce heat for drying (2300l per day)	The burning of HFO will produce air pollution			
Transport (use of vehicles)	Improperly maintained vehicles may release excessive gases thereby contributing to air pollution.	<ul style="list-style-type: none"> <li>Vehicles will be regularly monitored and maintained. Maintenance programmes will be established and implemented.</li> <li>Air quality will be monitored in accordance with Section 5.</li> </ul>	Ongoing	Operations Manager / SHREQ Manager

#### 4.1.3 ACTION PLAN: BIODIVERSITY

##### Objective:

To limit the disturbance of biodiversity during all project phases.

##### Construction phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Clearing land for ponds and construction of pond embankments	Impact on biodiversity habitat	<ul style="list-style-type: none"> <li>Areas of construction shall be clearly demarcated. No construction or project related activities may be undertaken outside of the demarcated areas.</li> <li>Section 2 of this report includes the coordinates of the outer boundaries of the proposed expansion area. No construction activities will be permitted outside of this area.</li> <li>Landscaping must be limited to those areas that are required for the construction of the sump and sewage line.</li> <li>Where possible, topographical alteration shall be designed to take the natural topography of the area into account.</li> </ul>	Project planning and implementation	Operations Manager / External Consultant
	Impacts on avifauna	<ul style="list-style-type: none"> <li>Identify breeding sites prior to construction of new facilities.</li> <li>Avoid breeding sites should these be present.</li> <li>Avoid unnecessary disturbances — i.e. limit development to proposed areas only and ensure that contractors do not stray from these areas.</li> </ul>	Design and construction	Operations Manager / External Consultant
	Impacts on avifaunal habitat	<ul style="list-style-type: none"> <li>Avoid unnecessary disturbances to adjacent important habitats — i.e. limit development to proposed areas only and ensure that contractors do not stray from these areas.</li> <li>Monitor the siltation effect of added development in the Kuseb River Delta area on lagoon.</li> <li>Ensure that the new ponds on the eastern periphery — i.e. towards the Kuseb River Delta area — do not impede the occasional flow.</li> </ul>	Design and construction	Operations Manager / External Consultant
Installation of seawater intake infrastructure (additional pump set)	Noise from construction activities may pose a nuisance to local fauna	<ul style="list-style-type: none"> <li>Vehicles and machinery will be regularly monitored and maintained. Maintenance programmes will be established and implemented.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager
	Production of waste during construction may lead to surface water contamination (marine)	<ul style="list-style-type: none"> <li>Waste management guidelines are included in Section 4.2.</li> </ul>	Ongoing	Operations Manager
Use of construction vehicles	Increase in disturbing noise levels (nuisance to local fauna)	<ul style="list-style-type: none"> <li>Vehicles will be regularly monitored and maintained. Maintenance programmes will be established and implemented.</li> <li>Speed limits will be maintained (higher speeds generated higher noise levels). Speed limit signs will be visible and legible on site.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Use of construction vehicles & machinery	Oil and diesel spillages from construction vehicles / machinery may contaminate the lagoon and marine environment	<ul style="list-style-type: none"> <li>All vehicles transporting fuel and generators shall be serviced regularly and shall be kept in good working order.</li> <li>All materials presenting a potential contamination threat will be stored in an area with a bunded capacity of 110% of the volume stored.</li> <li>Spill kits shall be available at all areas where hydrocarbons are utilised.</li> <li>Employees shall be trained in the utilisation of the spill kits.</li> <li>If any minor spillage occurs the spillage will be cleaned immediately and the contaminated area shall be rehabilitated, as appropriate.</li> <li>Employees shall be educated by means of training and the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by the implementation of the good housekeeping practices.</li> <li>A rapid response team should be available on 24-hour notice to deal with hazardous spills.</li> <li>If a major spillage occurs the supplying contractor or area supervisor shall be called out to clean the contaminated area and rehabilitate the soils, as appropriate.</li> <li>All major spills (&gt;200l) will be reported to the Department of Water Affairs.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

### Operational phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Seawater intake	The abstraction of sea water may harm marine fauna. Marine fauna can be caught up with the seawater when abstracted.	<ul style="list-style-type: none"> <li>Install filtering mechanism.</li> </ul>	During construction	Operations Manager / External Consultant
	Impacts on bay and lagoon hydrodynamics caused by excessive abstraction	<ul style="list-style-type: none"> <li>Abstraction volumes may not exceed abstraction permit limits.</li> </ul>	Ongoing	Operations Manager
	General	<ul style="list-style-type: none"> <li>No increase in abstraction is permitted until such time as an abstraction permit allowing for an increase in abstraction has been obtained from the Directorate of Law Administration within the MAWF.</li> <li>All conditions outlined in the amended abstraction permit will apply.</li> </ul>		
Operation and maintenance of diesel generators	Maintenance of diesel generator may produce waste which may lead to	<ul style="list-style-type: none"> <li>Refer to previous table.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
and diesel storage tanks	contamination of the lagoon			
	Potential hydrocarbon contamination of surface water and the associated marine ecology from spills from the diesel storage tank			
Ponds	The seepage of concentrated brine into the land alongside the ponds could negatively impact the local flora	<ul style="list-style-type: none"> <li>Visual monitoring of the surrounding limited vegetation must take place. This must be reported on in the monthly Environmental Report.</li> <li>The loss of concentrated brine would impact the product of salt. The state of the pond walls must therefore be carefully monitored.</li> <li>The risk of seepage is managed by engineered containment of ponds.</li> <li>The pond walls are continually monitored and maintained.</li> </ul>	Design phase, construction and ongoing	Operations Manager / External Consultant
	Impacts on plant diversity (hummocks)	<ul style="list-style-type: none"> <li>The monitoring of the plant health must be carried out periodically by a qualified botanist. The floral health on the hummocks must be monitored on an annual basis and reported on in the annual report submitted to the MET.</li> <li>A hummock monitoring plan has been developed and has been included in the EMP.</li> </ul>	Annual	Operations Manager / External Consultant
Bitterns discharge	Smothering of fauna at site of bittern discharge	<ul style="list-style-type: none"> <li>The sand that is removed from the pipe outlet channel should be removed and used for the dike walls of the ponds nearby.</li> <li>Survey the extent of the mound so that it stays within the existing area.</li> </ul>	Ongoing	Operations Manager
	Loss of intertidal fauna and flora at site of bittern discharge	<ul style="list-style-type: none"> <li>Developing a groundwater monitoring network in accordance with the recommendations of the Marine Ecology Study (8 monitoring sites to the east of the discharge point, 4 to the north and 4 to the south – all at 25m intervals). Annual surveys will be required as a minimum.</li> <li>A reference survey of the macrofauna and meiofauna prior to the pumping of the new increase bittern volumes would provide a picture of the current faunal community structures according to spatial distribution, abundance and biomass.</li> <li>Obtain a Wastewater and Effluent Disposal Exemption Permit. Ensure that the bitterns discharged meet the conditions outlined in the permit.</li> </ul>	Immediate and ongoing	Operations Manager / External Consultant
	Spill or seepage of bitterns from holding ponds into the southern end of the lagoon	<ul style="list-style-type: none"> <li>Regular inspections of the dyke walls would ensure that their integrity is maintained.</li> <li>Pumping of bitterns from these ponds must be ensured to prevent overflow.</li> </ul>	Ongoing	Operations Manager
	General	<ul style="list-style-type: none"> <li>All conditions outlined in the latest Wastewater and Effluent Disposal Exemption Permit will apply.</li> <li>The following existing discharge permit conditions apply: <ul style="list-style-type: none"> <li>Weather proof warning notices in English and a local language mostly spoken in that area indicating that the site is out of bounds and the water being discharged consist of "bitterns", shall be displayed.</li> </ul> </li> </ul>		



Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
		<ul style="list-style-type: none"> <li>○ The notice shall state that bitterns may cause skin eczema and that Management of Salt &amp; Chemicals shall not be held liable for any inconvenience caused by exposure. Accidental exposure can be dealt with by washing with seawater. The sign/board shall be prominently displayed on site.</li> <li>○ The disposal of mining effluent and waste and of sewage as well as of leaks shall be supervised by suitably qualified and competent persons who shall ensure the efficient functioning of the systems at all times.</li> <li>○ The permit holder shall consider water saving and re-use measures for all water to the satisfaction of the Permanent Secretary.</li> <li>○ Any change in process techniques/ or change in supervision shall be reported without delayed.</li> <li>○ A summary of water balance records showing accurate water use, water re-use figures, domestic and industrial effluent produced and water losses shall be recorded.</li> <li>○ All water meters shall be in a satisfactory operational state at all times. There shall be sufficient meters to allow for an accurate compilation of water balance records showing accurate water use and effluent production.</li> <li>○ Industrial effluents should at any time there be an unforeseen occurrence environmental pollution in or outside the monitoring area that can be related to the activities of Salt &amp; Chemicals mine.</li> <li>○ The efficiency of the effluent disposal system and pollution control shall be evaluated by a responsible person, appointed by the Manager of the Salt &amp; Chemicals, and he/she shall submit a report to the Department of Water Affairs on request.</li> <li>• No increase in discharge permitted without a Wastewater and Effluent Disposal Exemption Permit. Ensure that the bitterns discharged meet the conditions outlined in the permit.</li> <li>• Monitor volumes of bitterns discharged.</li> </ul>		
General	Impacts on avifaunal habitat	<ul style="list-style-type: none"> <li>• Monitor the siltation effect of added development in the Kuseb River Delta area on lagoon.</li> <li>• Ensure that the new ponds on the eastern periphery – i.e. towards the Kuseb River Delta area – do not impede the occasional flow.</li> </ul>	Ongoing	Operations Manager
Transport (use of vehicles)	Vehicles travelling too fast may harm local fauna.	<ul style="list-style-type: none"> <li>• Drivers will receive induction and awareness training informing them of the rules related to travelling in designated areas and the importance of conserving the local fauna and flora.</li> <li>• Speed limits will be maintained. Speed limit signs will be visible and legible on site.</li> <li>• Vehicular movements on site will be restricted.</li> </ul>	Ongoing	Operations Manager
Staff on site	Increased harvesting of local fauna and flora	<ul style="list-style-type: none"> <li>• The poaching and hunting of animals will be strictly forbidden.</li> <li>• Workers will be restricted to construction / operational areas.</li> <li>• All employees will be educated on the procedures to follow and the environmental restrictions regarding all environmental parameters. This will form part of the environmental awareness plan (Section 5 of the EMP).</li> <li>• Access on site will be restricted to construction and operational areas.</li> <li>• Penalties will be imposed on all staff that unnecessarily damage any environmental parameters.</li> </ul>	Ongoing	Operations Manager

**Decommissioning phase**

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Removal of ponds	The salt works ponds provide an important avifauna. The removal thereof result in a significant loss of habitat and artificial	<ul style="list-style-type: none"> <li>The proposed Closure Plan must address this issue. The possibility of not removing the ponds should be addressed,</li> </ul>	During construction	Operations Manager

**4.1.4 ACTION PLAN: SOIL, LAND CAPABILITY, LAND-USE AND TOPOGRAPHY**Objective:

To limit the negative impacts on soil, land capability, land-use and topography during all project phases.

**Construction phase**

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Use of construction vehicles & machinery	Oil and diesel spillages from construction vehicles / machinery may contaminate soils	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbons.</li> </ul>	Ongoing	Maintenance Manager
Clearing land for ponds and construction of pond embankments	Limiting of existing land uses (tourism and recreational activities)	<ul style="list-style-type: none"> <li>Refer to socio-economic action plan.</li> </ul>	Ongoing	Operations Manager / External Consultant

**Operational phase**

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Operation and maintenance of vehicles, machinery and fuel storage tanks (including HFO)	Potential hydrocarbon contamination of soils from spills	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbons.</li> </ul>	Ongoing	Maintenance Manager
Storage and transport of bitterns	Potential contamination of soil by seepage of bitterns into subsoil	<ul style="list-style-type: none"> <li>A monitoring and maintenance programme must be established to for the bittern storage and transport infrastructure.</li> <li>Visual inspections will be used to determine whether spillages have occurred.</li> </ul>	Ongoing	Operations Manager /Maintenance Manager
Operation and maintenance of the salt bagging facility, refinery and loading plant	The operation and maintenance of the salt bagging facility will generate domestic waste, which may impact the local land capability	<ul style="list-style-type: none"> <li>A detailed waste management strategy will be established and implemented (refer to Section 4.2).</li> </ul>	Ongoing	SHREQ Manager / Operations Manager
Hydrocarbon and other hazardous chemical substance storage, use and disposal	Potential soil pollution from leakages	<ul style="list-style-type: none"> <li>Refer to the action table 4.2 to 4.2 in Section 4.2 for details on hydrocarbon storage, handling and disposal.</li> </ul>	Ongoing	SHREQ Manager / Operations Manager
Washing of vehicles	The contaminants removed during the washing process may result in soil contamination.	<ul style="list-style-type: none"> <li>A vehicle wash-bay will be constructed with a settlement pond and hydrocarbon separator. This wash-bay will be capable of handling a minimum of 30 m<sup>3</sup> per month.</li> <li>The washing of vehicles will only be permitted within the above-mentioned wash-bay.</li> <li>Hydrocarbon contaminants will be removed and disposed of as hazardous waste (refer to Section 3-2).</li> <li>Wash-bay discharge will not be permitted to be discharged into the local environment.</li> <li>The discharge from the settlement pond and hydrocarbon separator will be piped into the sewerage pipeline.</li> <li>Contractors will not be permitted to wash their vehicles on site.</li> <li>The water use in and discharge from the wash-bay must be carefully monitored in order to ensure no losses from the system. Losses would indicate leakages, which could result in soil or water contamination.</li> </ul>	Ongoing	SHREQ Manager / Operations Manager
Scheduled and unscheduled maintenance of equipment and/or vehicles; General	Potential hydrocarbon contamination of soils from vehicle and/or machinery spills/leaks.	<ul style="list-style-type: none"> <li>The handling, storage and disposal of hazardous chemical substances shall be in accordance with Section 4.2 of the EMP.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
maintenance and housekeeping				
Excavation of sand for earthworks on roads	The uncontrolled excavation of sand impacts land capability on site	<ul style="list-style-type: none"> <li>Excavations may only take place with prior consent from the Quality and Environmental Management Coordinator.</li> <li>Excavations will only be permitted within a designated area within the operations boundaries and access by members of the public must be restricted.</li> <li>All slopes will be maintained at a minimum angle of 18° when the removal of sand has been completed.</li> <li>Full landscaping and rehabilitation must take place upon completion of the excavations.</li> <li>Warning signs must be erected and maintained.</li> <li>Environmental method statements and risk assessments must be compiled for all sand excavations</li> </ul>	When required	Operations Manager / External Consultant
Staff on site	Workers may directly impact soils through improper waste disposal and not using sanitation facilities.	<ul style="list-style-type: none"> <li>A detailed waste management strategy will be established and implemented (refer to Section 3.2).</li> <li>Workers/visitors will be restricted to construction / operational areas.</li> <li>All employees will be educated on the procedures to follow and the environmental restrictions regarding all environmental parameters. This will form part of the environmental awareness plan (Section 6 of the EMP).</li> <li>Penalties will be imposed on all staff that unnecessarily damage any environmental parameters.</li> </ul>	Ongoing	Operations Manager / External Consultant
Operation and maintenance of the sewerage facilities and pipeline	Release of inadequately treated sewage may result in soil contamination	<ul style="list-style-type: none"> <li>There shall be an incident management system, including procedures and training, for dealing with incidents as prescribed within the Emergency Procedures and Response programme.</li> <li>The incident management programme will address sewerage spills.</li> <li>Major spillage incidents will be reported to the Department of Environmental Affairs, the Department of Water Affairs, the Ministry of Mines and Energy and the Walvis Bay Municipality. Appropriate remedial measures shall be implemented in consultation with these regulatory authorities.</li> <li>In the event that spills occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated.</li> <li>The sewerage works shall be monitored on a weekly basis.</li> <li>Refer to Section 7 of the EMP for the Emergency Procedures and Responses.</li> <li>All conditions outlined in the latest Wastewater and Effluent Disposal Exemption Permit will apply.</li> <li><del>The following conditions from the existing wastewater discharge permit apply:</del></li> </ul>	Weekly monitoring	SHREQ Manager / Operations Manager / Maintenance Manager
Operation and maintenance of water pipeline	The high salt content in the substrate around the plant makes it susceptible to dissolving should fresh water be introduced to the	<ul style="list-style-type: none"> <li>No direct discharge of fresh water into the local environment.</li> <li>Visual inspections to identify visible signs of freshwater leakages.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
	system. This may result in sinkholes developing, which create environmental and safety risks.			

### Decommissioning phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Removal of generators and fuels storage tanks	Removal of the generator and/or storage tank will produce waste which may lead to soil/land contamination and potential hydrocarbon contamination of soils from spills when removing diesel generator and/or storage tank	<ul style="list-style-type: none"> <li>A detailed waste management strategy will be established and implemented (refer to Section 3.2 of the EMP).</li> <li>Refer to previous comments on hydrocarbon management.</li> </ul>	Closure	SHREQ Manager / Operations Manager / External Consultant
Removal of ponds	The removal of the ponds will result in positive topographical alterations.	<ul style="list-style-type: none"> <li>The area from which the ponds are removed will be ripped and shaped to follow the natural contours as far as practically possible.</li> </ul>	Closure	Operations Manager / External Consultant
Removal of infrastructure	Removal of infrastructure will produce waste which may lead to land contamination	<ul style="list-style-type: none"> <li>A detailed waste management strategy will be established and implemented (refer to Section 3.2 of the EMP).</li> </ul>	Closure	Operations Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Removal of sewerage facility and pipes	Potential sewerage spills during the removal of the sewerage infrastructure may result in soil contamination	<ul style="list-style-type: none"> <li>• There shall be an incident management system, including procedures and training, for dealing with incidents as prescribed within the Emergency Procedures and Response programme.</li> <li>• The incident management programme will address sewerage spills.</li> <li>• Major spillage (&gt;200 50 litres) incidents will be reported to the Department of Environmental Affairs, the Department of Water Affairs, the Ministry of Mines and Energy and the Walvis Bay Municipality. Appropriate remedial measures shall be implemented in consultation with these regulatory authorities.</li> <li>• In the event that spills occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriately qualified specialist. If necessary, the polluted soils will be classified as waste and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated.</li> <li>• Refer to Section 7 of the EMP for the Emergency Procedures and Responses.</li> </ul>	Closure	Operations Manager / External Consultant / SHREQ Manager

#### 4.1.5 ACTION PLAN: NOISE

##### Objective:

To minimise noise pollution during all phases of the operation.

##### Construction phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Use of construction vehicles and machinery	Noise from vehicles and machinery leading to an increase in noise levels (nuisance)	<ul style="list-style-type: none"> <li>Vehicles will be regularly monitored and maintained. Maintenance programmes will be established and implemented.</li> <li>Speed limits will be maintained (higher speeds generated higher noise levels). Speed limit signs will be visible and legible on site.</li> </ul>	Ongoing	Operations Manager

##### Operation phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Operation and maintenance of diesel generators	Noise from generators may pose a nuisance to local fauna (limited impact on people as access to this area is limited)	<ul style="list-style-type: none"> <li>Generator shall be equipped with the necessary measures to minimise the emission of noise (refer to Section 10.1).</li> <li>A maintenance and monitoring programme for the (backup) generator shall be established.</li> <li>Continuous readings of at least 1 hour during operation every 3 months. In the absence of significant human receptors in the area, the monitoring of noise will be used to monitor for deterioration of the noise making equipment. Should there be an increase in noise levels averaging 3dB over a period of an hour noise reduction options must be implemented.</li> </ul>	Installation and ongoing	Operations Manager / Maintenance Manager
Operation and maintenance of the refinery	The refining process will generate noise	<ul style="list-style-type: none"> <li>Noise management and monitoring must take place in accordance with Section 5.</li> </ul>		Ekango Plant Manager / Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Transport (use of vehicles)	Improperly maintained vehicles may produce excessive noise.	<ul style="list-style-type: none"> <li>Vehicles shall be equipped with the necessary measures to minimise the emission of noise (refer to Section 4.2).</li> <li>Operational noise levels from the bulk transport vehicles ((excluding bagged salt / refined salt) may not exceed an average of 87.8dB at 1.5 m from the source of the noise (average of 10 vehicles).</li> <li>No more than an average of 130 trips will be permitted per day (excluding bagged salt / refined salt).</li> <li>A maximum of 160 trips will be permitted per day.</li> <li>A noise assessment of the proposed bulk haulage fleet (excluding bagged salt / refined salt) must be carried out by a suitably qualified noise specialist prior to the implementation of the expansion project. Average noise levels from the bulk salt transporting trucks exceeding those described above will not be permitted.</li> <li>Vehicles travelling at higher speeds generate higher noise levels. Speed control will be installed in all vehicles, thereby preventing excessive speeds and minimising noise generation.</li> <li>Vehicles will be well maintained, ensuring that noise generated by equipment in poor repair is avoided.</li> <li>Transporting vehicles shall be serviced regularly and shall be kept in good working order.</li> <li>Contractors must provide maintenance records upon request of WBSH.</li> <li>Vehicles transporting the salt to the harbour will be restricted to working hours (7:00AM – 6:00PM) on weekdays. Should it be necessary to work outside of these hours, all registered I&amp;APs will be notified in writing.</li> <li>Audits will be carried out by an external specialist when complaints are received from I&amp;APs or at least every three years <del>every 12 months</del> on the noise generated by the transport vehicles. Should an average increase of over 4dBa be observed, then steps must be taken to ensure that noise levels are reduced. These audit result will be made available to the relevant I&amp;APs upon request. They will also be included in the annual reports to be submitted to the MET.</li> <li>Noise management and monitoring must take place in accordance with Section 5.</li> </ul>	<p>New vehicles will for bulk salt transport will be available prior to expansion operations (excluding bagged salt / refined salt)</p> <p>Ongoing maintenance</p>	Operations Manager / Business Dev. Manager



#### 4.1.6 ACTION PLAN: SURFACE WATER

##### Objective:

To limit the impacts on surface water resources.

##### Construction phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Expansion of salt works	Impacts on run-off	<ul style="list-style-type: none"> <li>Due to the low significance of the impact, no mitigation measures are required.</li> </ul>	N/A	
Ponds	Impact of Surface Water Runoff on The Salt Works	<ul style="list-style-type: none"> <li>Additional flood protection structures constructed along southern boundary of new concentrators, and along eastern boundary of new crystalliser ponds.</li> </ul>	Immediate	Operations Manager

##### Operation phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Operation of combustion machinery and fuel storage tanks	Potential hydrocarbon contamination of surface water runoff from spills	<ul style="list-style-type: none"> <li>Refer to section 4.1.3 for management measures relating to hydrocarbon spills.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager
Stockpile/ heap/ store refined salt	Potential contamination of surface water runoff.	<ul style="list-style-type: none"> <li>Storm-water management is implemented on site.</li> <li>Stormwater management infrastructure is maintained.</li> </ul>	Ongoing	Operations Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Operation and maintenance of the loading plant	Hydrocarbon and other hazardous chemical substance storage, use and disposal - Potential soil pollution from leakages	<ul style="list-style-type: none"> <li>Refer to Section 4.2 for guidelines on hazardous chemical substance storage, handling and disposal.</li> <li>All vehicles transporting fuel shall be serviced regularly and shall be kept in good working order.</li> <li>All chemicals, contaminated water and/or hydrocarbons will be stored in designated areas.</li> <li>All materials presenting a potential contamination threat will be stored in an area with a bunded capacity of 110% of the volume stored.</li> <li>Spill kits shall be available at all areas where hydrocarbons are utilised.</li> <li>Employees shall be trained in the utilisation of the spill kits.</li> <li>If any minor spillage occurs the spillage will be cleaned immediately and the contaminated area shall be rehabilitated, as appropriate.</li> <li>Employees shall be educated by means of training and the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by the implementation of the good housekeeping practices.</li> <li>A rapid response team should be available on 24-hour notice to deal with hazardous spills.</li> <li>If a major spillage occurs the supplying contractor or area supervisor shall be called out to clean the contaminated area and rehabilitate the soils, as appropriate.</li> <li>All major spills (&gt;200 50 l) will be reported to the Department of Water Affairs.</li> <li>A monitoring and maintenance programme/procedure will be established for the fuel storage facility.</li> </ul>	Ongoing	Business Dev. Manager / Maintenance Manager
Washing of vehicles	The discharge of contaminated water during the vehicle washing process may impact surface water in the area (where it exists).	<ul style="list-style-type: none"> <li>A vehicle wash-bay will be constructed with a settlement pond and hydrocarbon separator. This wash-bay will be capable of handling a minimum of 30 m<sup>3</sup> per month.</li> <li>The washing of vehicles will only be permitted within the above-mentioned wash-bay.</li> <li>Hydrocarbon contaminants will be removed and disposed of as hazardous waste (refer to Section 4.2 of the EMP).</li> <li>Wash-bay discharge will not be permitted to be discharged into the local environment.</li> <li>The discharge from the settlement pond and hydrocarbon separator will be piped into the sewerage pipeline.</li> <li>The water use in and discharge from the wash-bay must be carefully monitored in order to ensure no losses from the system. Losses would indicate leakages, which could result in soil or water contamination.</li> </ul>	Construction Ongoing monitoring and maintenance	SHREQ Manager / Operations Manager / Maintenance Manager
Scheduled and unscheduled maintenance of equipment and/or vehicles; General	Potential hydrocarbon contamination of surface water runoff from vehicle and/or machinery spills/leaks	<ul style="list-style-type: none"> <li>Vehicles and/or machinery shall be monitored frequently and maintained.</li> <li>Stormwater management must be implemented on site.</li> <li>All spills shall be contained.</li> <li>Hydrocarbon contaminated soils must either be removed and disposed of at a licensed hazardous disposal site or bio-remediated.</li> <li>All chemicals, contaminated water and/or hydrocarbons shall be stored in designated areas.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
maintenance and housekeeping		<ul style="list-style-type: none"> <li>Employees shall be trained in the utilisation of the spill kits.</li> <li>In the event of any other minor spillage occurring, the spillage shall be cleaned immediately and the contaminated area shall be rehabilitated, as appropriate.</li> <li>All materials presenting a potential contamination threat shall be stored in an area with a bunded capacity of 110% of the volume stored.</li> <li>Employees shall be educated by means of training in accordance with the Environmental Awareness Plan in order to make them aware of the necessity to prevent spillages by the implementation</li> </ul>		
Staff on site	Workers may directly impact surface water through improper waste disposal and not using sanitation facilities.	<ul style="list-style-type: none"> <li>Workers and visitors will be restricted to construction / operational areas.</li> <li>All employees will be educated on the procedures to follow and the environmental restrictions regarding all environmental parameters. This will form part of the environmental awareness plan (Section 5 of the EMP).</li> <li>Penalties will be imposed on all staff that unnecessarily damage any environmental parameters.</li> </ul>	Ongoing	Operations Manager / External Consultant
Operation and maintenance of the sewerage facilities and pipeline	Release of inadequately treated sewage may result in surface water contamination, which may, in turn, lead to eutrophication of standing water bodies and the development of potentially harmful algal blooms	<ul style="list-style-type: none"> <li>Refer to Section 4.1.4 for management measures relating to sewage spills.</li> </ul>	Ongoing	Operations Manager / Maintenance Manager
Ponds	Impact of Surface Water Runoff on The Salt Works	<ul style="list-style-type: none"> <li>Set up a network of contacts upstream, to warn of impending flood</li> <li>Monitor flood protection structures to identify any problem areas which may require placement of extra protection (eg. sandbags) to combat erosion.</li> </ul>	Weekly monitoring	Operations Manager

**Decommissioning phase**

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Removal of Ponds- Landscaping and rehabilitation	The landscaping of the area will restore the natural topography and therefore the natural flow regimes of the area.	<ul style="list-style-type: none"> <li>The area from which the ponds are removed must be landscaped to conform to the natural topography of the area.</li> <li>Where possible, the natural flow regime of the area will be restored.</li> <li>Landscaping will take the natural flow regimes and topography into account.</li> </ul>	Decommissioning	Operations Manager / External Consultant
Removing General Infrastructure/Roads - Landscaping and rehabilitation	The landscaping of the area will restore the natural topography and therefore the natural flow regimes of the area.	<ul style="list-style-type: none"> <li>Where possible, and necessary, the natural flow regime of the area will be restored.</li> <li>Landscaping will take the natural flow regimes and topography into account.</li> </ul>	Decommissioning	Operations Manager / External Consultant
Removal of sewerage facility and pipes	Potential sewerage spills during the removal of the sewerage infrastructure may result in surface water contamination	<ul style="list-style-type: none"> <li>Refer to Section 4.1.4 for management measures relating to sewage spills.</li> </ul>	Decommissioning	Operations Manager / External Consultant

#### 4.1.7 ACTION PLAN: GROUNDWATER

##### Objective:

To prevent and/or limit any negative impact on groundwater resources.

##### Construction phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Use of construction vehicles and machinery	Oil and diesel spillages may lead to groundwater contamination	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbon spills.</li> <li>A detailed waste management strategy will be established and implemented (refer to Section 4.2 of the EMP).</li> </ul>	Ongoing	Operations Manager / Maintenance Manager

##### Operational phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Ponds	Impacts on groundwater quality due to seepage	<ul style="list-style-type: none"> <li>In order to establish whether or not there is significant movement of water from the ponds into the groundwater, water levels are monitored.</li> <li>The combination of compaction and the development of a natural algal lining significantly reduce the probability of this from occurring.</li> <li>The risk of seepage is mitigated by engineered containment of ponds.</li> <li>These measures would reduce the probability of seepage to low, and the likely duration of impacts to medium.</li> </ul>	Continuous monitoring and maintenance.	Operations Manager / SHREQ Manager
Transport (use of vehicles)	Hydrocarbon spills/ may lead to the contamination of groundwater through filtration.	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbon spills.</li> <li>A detailed waste management strategy will be established and implemented (refer to Section 4 of the EMP).</li> </ul>	Ongoing	Business Dev. Manager / SHREQ Manager
Washing of vehicles	The contaminants removed during the washing process may result in the contamination of	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbon spills.</li> </ul>	Ongoing	SHREQ Manager / Operations Manager / Maintenance Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
	groundwater through filtration.			
Scheduled and unscheduled maintenance of equipment and/or vehicles; General maintenance and housekeeping	Potential spillage of hydrocarbons (diesel, oil, grease etc.) may lead to the contamination of groundwater through filtration.	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbon spills.</li> </ul>	Ongoing	Operations Manager / SHREQ Manager / Unitrans
Operation and maintenance of the sewerage facilities and pipeline	Release of inadequately treated sewage may result in groundwater contamination through filtration	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbon spills.</li> </ul>	Ongoing	Operations Manager / SHREQ Manager

**Decommissioning phase**

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Removal of sewerage facility and pipes	Potential sewerage spills during the removal of the sewerage works may result in groundwater contamination through filtration	<ul style="list-style-type: none"> <li>Refer to Section 4.1.3 for management measures relating to hydrocarbon spills.</li> </ul>	Decommissioning	Operations Manager / External Consultant

#### 4.1.8 ACTION PLAN: SOCIO-ECONOMIC

##### Objective:

To minimise the impacts on recreational (e.g. fishing, sightseeing etc.) and economic activities (e.g. tourism, etc).

##### Construction phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Clearing and landscaping activities	Loss of access to southern areas	<ul style="list-style-type: none"> <li>The Salt Works will ensure that access to the areas to the south of the operations will not be restricted. It has been suggested that the eastern embankment of the crystalliser ponds be developed as an access route. The use of the embankment as a transport route will aid in the compaction of the embankment.</li> <li>Access to the southern areas will not be restricted. A number of routes to the areas south of the Salt Works travel through the area allocated to the southern ponds. These routes are used for tourism-related activities, recreation and fishing. There are numerous routes that provide access to these southern areas as there has been little control over the establishment of new routes in the past. It would be preferable to reduce and formalise the number of available routes to the southern areas. This would require the cooperation and approval of the Directorate of Parks and Wildlife who manage the Naukluft National Park which is located immediately adjacent to the southern boundary of ML-37 (refer to Figure 5-2).</li> </ul>	Planning and construction	Business Dev. Manager / Operations Manager

##### Operational phase

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Ponds	Uncontrolled access to the ponds by the public poses a safety risk as well as a risk to private property	<ul style="list-style-type: none"> <li>With the exception of the areas along public roads, access to the site is restricted.</li> <li>Warning signage must be erected (and monitored).</li> </ul>	Immediate Continuous monitoring	Operations Manager / SHREQ Manager

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Washing of salt with concentrated seawater	The high salt content in the substrate around the plant makes it susceptible to dissolving should freshwater be introduced to the system. This may result in sinkholes developing, which create environmental and safety risks.	<ul style="list-style-type: none"> <li>No direct discharge of fresh water into the local environment.</li> <li>Visual inspections to identify visible signs of freshwater discharge.</li> <li>Monitor freshwater use and compare this with discharge from the sewerage system.</li> <li>The use of fresh water would dissolve the salt, and therefore the plant may not utilise freshwater to wash the salt. However, the washing of vehicles and machinery requires fresh water. This water use be monitored and recorded.</li> </ul>	Ongoing	Operations Manager
Transport (use of vehicles)	The vehicles transporting salt to the loading facility at the harbour disturbs the residents along the route	<ul style="list-style-type: none"> <li>Transporting vehicles shall be serviced regularly and shall be kept in good working order.</li> <li>Contractors must provide maintenance upon request of the WBSH.</li> <li>Vehicles transporting the salt to the harbour will be restricted to working hours (7:00AM – 5:00PM) on weekdays. Should it be necessary to work outside of these hours, all registered I&amp;APs will be consulted.</li> <li>A complaints register will be maintained by the WBSH. This register will be included in the annual report submitted to the MET.</li> </ul>	Ongoing Annual reporting of complaints to the MET	Business Dev. Manager / Managing Director
	Additional product transported to the harbour could result in increased wear and tear on the roads.	<ul style="list-style-type: none"> <li>No increase in the number of trucks on the road with the proposed expansion.</li> <li>The municipal vehicle weight restrictions may not be exceeded. This will be controlled by the use of a weighbridge.</li> <li>The road is a public road.</li> <li>The following road maintenance conditions are required: <ul style="list-style-type: none"> <li>The Maintenance of the road in town (Bungalows to Harbour gate) is carried out by Walvis Bay municipality</li> <li>Road from bungalows to Paaltjies turnoff is maintained by Roads Construction Company.</li> <li>The distance from turnoff to Gate – graded when required – twice a months if not done by RCC.</li> </ul> </li> <li>A formal communication mechanism between the RCC and the Walvis Bay Salt Works is required whereby the Walvis Bay Salt Works will regularly report on the condition of the roads. It is recommended that this feedback takes place during the Walvis Bay Environmental Management Forum (WEMAF) Meetings.</li> </ul>	Every load Ongoing	Business Dev. Manager / External Consultant
	Salt Works vehicles travelling too fast may create an additional safety risks	<ul style="list-style-type: none"> <li>No increase in the number of trucks on the road. However, speed control measures will be installed in the new vehicles in order to minimise safety risks.</li> </ul>	Prior to expansion activities	Business Dev. Manager / Unitrans
Staff on site	Job creation: The Walvis Bay Salt Mine contributes to the local socio-economic environment job creation and supports local businesses	<ul style="list-style-type: none"> <li>The Walvis Bay Salt Mine maximises the use of the local workforce component.</li> <li>A wide variety of training and skills development systems will be made available to all employees. These training materials serve to build flexible, portable skills profiles, and reflect the true lifelong learning opportunities available at Walvis Bay Salt Mine to employees, contractor employees and the wider surrounding communities.</li> </ul>	Ongoing	Managing Director



Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
	The Walvis Bay Salt Mine contributes significantly to the regional and local economy through the payment of rates and taxes. There are also significant CSR contributions from the Walvis Bay Salt Mine (refer to the Scoping Report for details)	<ul style="list-style-type: none"> <li>Continue with CSR contributions. To be included in annual reports submitted to MET.</li> </ul>		

**Decommissioning phase**

Activities / facility	Aspect / impact	Technical and management options	Action plan	
			Frequency	Responsible parties
Operations ceasing	Job losses	<ul style="list-style-type: none"> <li>Although no mine closure is envisaged, an emergency mine closure plant must be developed. This plan must take into account the potential impacts associated with job losses resulting from operations ceasing.</li> </ul>	Within two years of approval of the amended EMP	Managing Director

## 4.2 ACTION TABLES

**TABLE 4-1: DISPOSAL OF WASTE**

Items to be considered		Intentions
General	Specific	
Procedures	General	A waste management procedure will be developed. This will cover the storage, handling and transportation of waste.
	Waste minimization and recycling	Opportunities to minimize waste production will be identified and taken where possible. Where possible, waste will be recycled.
Waste disposal facilities	Collection points	Waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity and that these are serviced frequently.  Different skips shall be provided for wood, scrap metal, and hazardous waste.
	On site waste disposal facilities	No waste disposal facility will be developed without the relevant legal authorisation.
	Off site waste disposal facilities	Waste will be disposed of at appropriate permitted waste disposal facilities. An agreement will be put in place to ensure that the facility is capable of handling the waste.
Waste transport	Contractor	An approved subcontractor, working to local authority standards, will undertake the waste transport.
Disposal of different types of waste	Hazardous wastes	Hazardous waste will be collected by a contractor with the relevant permits and will be removed to a permitted hazardous waste disposal facility.  Hazardous waste may only be stored on site, in a fenced off area with access control, for up to 90 days.
	Non-hazardous waste	Waste will be collected by the Municipality and will be removed to the Walvis Bay waste disposal site.
	Any soil polluted by a spill of chemicals	If remediation of the soil in situ is not possible, the soils will be classified as hazardous waste s and will be disposed of at an appropriate permitted waste facility.
	Scrap metal	Care will be taken to ensure that scrap metal does not become polluted or mixed with any other waste.  The scrap metal will be collected in a designated area for scrap metal (scrap yard). It will be sold to scrap dealers.

Items to be considered		Intentions
General	Specific	
	Oil	<p>Oil will be collected in suitable containers at designated collection points. The collection points will be bunded and underlain by impervious materials to ensure that any spills are contained. Notices will be erected at each waste oil point giving instructions on the procedure for waste oil discharge and collection.</p> <p>An approved subcontractor will remove oil from site.</p>

TABLE 4-2: STORAGE OF HAZARDOUS CHEMICAL SUBSTANCES

Product	Storage
<b>Oils</b>	Storage in mild steel or stainless steel drums. The containers will be stored in bunded facilities that will have the capacity contain all potential spills. Bunded areas must be capable of containing 110% of the capacity of maximum capacity of the storage containers within the storage areas.
<b>Diesoline</b>	<p>Diesoline will be stored in tanks within bunded areas with smooth, impermeable surfaces. Bunded areas must be capable of containing 110% of the capacity of maximum capacity of the storage containers within the storage areas.</p> <p>Diesoline may be stored in externally clean drums. These drums may only be stored on smooth, impervious surfaces in facilities that will contain spills.</p>
<b>Other: Paint, thinners, varnish, turpentine, detergents etc.</b>	<p>These substances must be stored in clearly marked containers.</p> <p>These containers must be sealable and must not leak.</p> <p>The may only be stored within the workshops and storerooms.</p>

TABLE 4-3: HANDLING OF HAZARDOUS CHEMICAL SUBSTANCES

Product	Handling
<b>Oils</b>	All oils will be handled according to their specific Material Safety Data Sheets.
<b>Diesoline</b>	<p>Diesel will be handled according to its Material Safety Data Sheet.</p> <p>Where possible, diesel transferrals must take place in the designated refuelling areas on smooth, impervious surfaces.</p> <p>Drip trays will be positioned at each machine whilst being refilled. Drip trays will be drained into suitable containers. Smaller plant and tyre wheeled equipment will also re-fuel at the main storage areas.</p>
<b>Other: Paint, thinners, varnish, turpentine, detergents etc.</b>	These substances must be used in accordance with their respective MSDS's.

**TABLE 4-4: DISPOSAL OF HAZARDOUS CHEMICAL SUBSTANCES**

<b>Product</b>	<b>Disposal</b>
<b>Hydrocarbons</b>	Old/used hydrocarbons will be stored in drums and weatherproof waste collection containers. Receipts /proof of their final disposal must be received and kept on file.
<b>Other: Paint, thinners, varnish, turpentine, detergents etc.</b>	These substances must be used in accordance with their respective MSDS's.

### 4.3 CLOSURE

Despite the fact that no closure is envisioned for the operations, it is essential that a closure plan be developed in order to ensure that adequate closure can take place in the event of the unplanned closure of the mine. This plan will also ensure that adequate financial provisions are made for closure.

This plan must be developed within 2 years of approval of this amendment application.

## 5 ENVIRONMENTAL MONITORING AND PERFORMANCE ASSESSMENTS

Based on the location of the project, the focus of monitoring will be based on the requirements of the marine, terrestrial, air quality and groundwater impacts of the mine.

### 5.1 NOISE MONITORING (GENERATORS AND PUMPS)

#### 5.1.1 OPERATIONAL NOISE MONITORING

Continuous readings (for at least 1 hour) must be taken when complaints are received from IAPs or at least every three years ~~on an annual basis~~ for noise generating activities:

- ~~Generators;~~
- Pumps;
- Plant.

In the absence of significant human receptors in the area, the monitoring of noise will be used to monitor for deterioration of the noise making equipment. Should there be an increase in noise levels averaging 3dB over a period of an hour noise reduction options must be implemented.

Where noise levels exceed acceptable/legal occupational health levels, hearing protection PPE must be provided to staff operating within the area at risk.

Noise reduction options that should be considered include:

**TABLE 5-1: NOISE REDUCTION OPTIONS**

Noise reduction options
<ul style="list-style-type: none"> <li>• Utilising lighter and quieter vehicles.</li> <li>• Selecting equipment with lower sound power levels</li> <li>• Installing silencers for fans</li> <li>• Installing suitable mufflers on engine exhausts and compressor components</li> <li>• Installing acoustic enclosures for equipment casing radiating noise</li> <li>• Improving the acoustic performance of constructed buildings, apply sound insulation</li> <li>• Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m<sup>2</sup> in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective</li> <li>• Installing vibration isolation for mechanical equipment</li> </ul>

- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding
- Siting permanent facilities away from community areas if possible
- Taking advantage of the natural topography as a noise buffer during facility design
- Reducing project traffic routing through community areas wherever possible
- Developing a mechanism to record and respond to complaints

### 5.1.2 TRANSPORT NOISE MONITORING

Bi-annual noise monitoring must be taken when complaints are received from IAPs or at least every three years in the residential area (Meersig) adjacent to one of the speed humps and along the stretch of open road providing access to the salt works. The noise monitoring must be carried out by a suitably qualified noise specialist. The noise monitoring measurements will be included in the annual report to be submitted to the MET.

#### 5.1.2.1 Lagoon road (access road)

The meter will be placed approximately 1.5m away from the road. Individual measurements of a minimum of 30 trucks will be taken.

#### 5.1.2.2 Speed hump assessment

The meter will be placed approximately 1.5m away from the speed bump in free-field conditions, i.e. at least 3.5m from the nearest vertical, reflecting surface. Individual measurements of a minimum of 30 trucks will be taken.

The interpretation of the data will be carried out by a suitably qualified noise specialist.

## 5.2 AIR EMISSION MONITORING

In order to prevent excessive emissions of air pollutants and to determine the effectiveness of emissions management strategies, an emissions and air quality monitoring programme must be implemented.

The air quality monitoring must cater for :

- All generators.
- Engines (including vehicles).

- HFO fuel burning facility in the refining plant.

The air quality monitoring program must consider the following elements:

- Monitoring parameters.
- Baseline calculations.
- Monitoring type and frequency.

The following parameters must be monitored bi-annually:

**TABLE 5-2: AIR EMISSION MONITORING PARAMETERS**

<b>Emission</b>	<b>Monitoring</b>	<b>Limits</b>
NOx	Continuous monitoring of either NOx emissions or indicative NOx emissions using combustion parameters.	500 tpy
SO2	Continuous monitoring if SO2 control equipment is used.	500 tpy

Source: World Health Organisation Guidelines.

The emission monitoring and analysis must be conducted by entities permitted or certified for this purpose.

## **5.3 WATER MONITORING**

### **5.3.1 GROUNDWATER MONITORING**

The movement of water from the ponds into the Dorob aquifer could have potential negative environmental implications. In order to establish whether or not there is significant movement of water from the ponds into the groundwater; water levels are monitored.

The groundwater levels are monitored twice every lunar month: at spring and at neap tide.

Develop a groundwater monitoring network in accordance with the recommendations of the Marine Ecology Study (8 monitoring sites to the east of the discharge point, 4 to the north and 4 to the south – all at 25m intervals). Annual surveys will be required as a minimum.

## 5.4 SOIL AND VEGETATION MONITORING

General soil and vegetation (although limited) monitoring must take place in a qualitative manner and be conducted by the Quality and Environmental Management Coordinator. All non-conformances are to be recorded in an Incident Register.

The floral health on the hummocks must be monitored on an annual basis and reported on in the annual report submitted to the MET.

## 5.5 MARINE ENVIRONMENT

The discharge of concentrated sea water into the local marine environment may impact the local marine ecology in the area.

A reference survey of the macrofauna and meiofauna prior to the pumping of the new increase bittern volumes would provide a picture of the current faunal community structures according to spatial distribution, abundance and biomass. The methodology for sampling should be carried out by a suitably experienced marine biologist or technician who has done this type of work before. Species identification and laboratory work can be done locally as well. A reference survey of the intertidal beach macro and meiofauna could be undertaken at the bittern discharge site, and at 2 km and 4 km to either side of the site. This would not only provide site-specific information on beach communities in the area, but serve as a pre-expansion reference for follow up monitoring surveys to assess the impacts resulting from bittern discharge. After the initial reference survey, two subsequent surveys, at one year intervals could be planned in order to assess changes in the faunal community.

The siltation effect of added development in the Kuiseb River Delta area on the lagoon must be monitored. This must be carried out at the same time as the surveys described above.

## 5.6 FRESHWATER USE

The high salt content in the substrate around the plant makes it susceptible to dissolving should freshwater be introduced to the local soil environment. This may result in sinkholes developing, which create environmental and safety risks. It is vital that there be no direct discharge of fresh water into the local environment. Visual inspections shall be used to identify visible signs of freshwater discharge. Another, more accurate, means of ensuring that no freshwater is discharged



into the local environment is to monitor freshwater use and compare this with discharge from the sewerage system.

The water use in and discharge from the wash-bay must be carefully monitored in order to ensure no losses from the system. Losses would indicate leakages, which could result in soil or water contamination.

## **5.7 ENVIRONMENTAL REPORTS**

The commitments contained in this EMP are WBSH's contractual agreement with the Namibian authorities for sound environmental management. All employees, contractors and sub-contractors and any visitors to site will be expected to comply with the commitments contained herein.

WBSH further undertakes to:

- Appoint a responsible person(s), in writing, who will monitor all environmental aspects of the site on a regular basis.
- The appointed person will communicate, on a regular basis, with the local interested and affected parties identified with regards to the operations and will report on the progress made with regards to implementation of the mitigation measures. Any complaints with regard to the mining activity will be reported to the appointed person and be recorded in a complaint register.
- Maintain records relating to compliance/non-compliance with the conditions of authorisation. These records must be made available to the relevant authorities within 7 (seven) days of receipt of a written request.

### **5.7.1 AUDITS AND INSPECTIONS**

The WBSH Environmental Department will conduct internal management audits against the commitments in the EMP. In the operational phase, these audits will be conducted on a quarterly basis. The audit findings will be documented for both record keeping purposes and for informing continual improvement.

In addition, an independent professional will conduct an EMP performance assessment at least once every two years. The mine's compliance with the provisions of the EMP and the adequacy of the EMP relative to the on-site activities will be assessed in this report.

The Environmental Department will furthermore conduct daily inspections during construction and weekly inspections during operations.

#### **5.7.2 SUBMISSION OF INFORMATION**

As a minimum, the following documents will be submitted to the relevant authorities on an ongoing basis:

- The annual report to be submitted to the MET (DEA) will include:
  - Monthly environmental reports will be compiled, which will address all pertinent environmental issues on site and present the findings of all monitoring on site. These reports will be assimilated into an annual report which will be made available to the MET upon request.
- Legal and performance environmental audits conducted by an independent auditor to be carried out and submitted every two years.
- Other monitoring reports will be provided to the relevant authorities as per the permit and other agreements.

## **6 ENVIRONMENTAL AWARENESS PROGRAMME**

### **6.1 MANAGEMENT OBJECTIVE**

To ensure that the environmental awareness plan is relevant and sufficient for the Walvis Bay Salt Mine.

### **6.2 MANAGEMENT MEASURES**

#### **6.2.1 INDUCTION**

This includes the following:

- Ensure that all employees are aware of their individual and their job descriptions and their potential impacts on the environment.
- Employees are aware of any ecological sensitive, cultural sensitive and historical sensitive sites.
- The measures and procedures to follow should ecologically sensitive, culturally sensitive or historically sensitive sites be detected.
- The preventative measures and procedures to undertake in order to reduce the risk of a potential impact.
- Establish and continually enhance external and internal communication measures.
- Environmental Management and Advisory Forum (WEMAF):
  - WBSR is a member of the WEMAF.
  - Interested and affected parties will have the opportunity to raise environmental concerns during the Forum sittings.
  - Records will be kept of all decisions and concerns.
  - All issues and concerns raised will be addressed within a specific timeframe as approved by the relevant stakeholders and authorities.

#### **6.2.2 COMMUNICATION FROM EXTERNAL PARTIES AND EMPLOYEES**

A formal mode of communication must be established for liaison with the media in respect of all crises within the Salt Works.

Communication from external interested and affected parties is received by e-mail, fax, telephonically or by mail. Where required a written response must be sent, on receiving such communication, by the appropriately appointed individual under signature of the Quality and Environmental Management Coordinator, to the respective interested and/or affected party. All telephonic or facsimile correspondence received on the mine must be forwarded to the Environmental Department for action.

### **6.2.3 IN-HOUSE TRAINING (AWARENESS)**

In-house training sessions will be held with relevant employees. The training sessions will be planned by the Environmental Department, and allow employees to participate in determining what the environmental issues and concerns are with regard to their specific occupation.

### **6.2.4 ON THE JOB TRAINING**

On the job training is an essential tool in environmental awareness. Employees are given details of the expected environmental issues and concerns specifically related to their occupation. Employees are trained on how to respond if an environmental problem or source of environmental pollution arises. The training will be on-going, and all new employees will be provided with the same standard of training as existing employees.

## 7 ENVIRONMENTAL EMERGENCY PREPAREDNESS AND RESPONSE

An effective, comprehensive, well-considered and tested environmental emergency preparedness and response plan has the potential to save lives, prevent unnecessary damage to the company and other property and to manage environmental risk in the event of a large chemical spill, oil spill, fuel spill, explosives spill or sewerage spill.

Environmental emergencies occur over the short term and require an immediate response. An Emergency Plan must be compiled and disseminated to all employees and contractors and in the event of an emergency, the emergency response plan should be consulted.

This plan should be placed around the mine where it will be easily viewed. The plan should contain a list of procedures, evacuation routes and a list of emergency contact numbers. It is advisable that the mine tests the emergency response plan in order to identify any areas for improvement.

If the emergency has the potential to affect surrounding communities, they should be alerted via alarm signals or contacted in person. The surrounding community will be informed, prior to mining taking place, of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radio's, pagers or telephones, must be placed around the mine. A checklist of emergency response units must be consulted and the relevant units notified.

The checklist includes:

- Fire department;
- Police;
- Emergency health services such as ambulances, paramedic teams, poisons centres;
- Hospitals, both local and further a field, for specialist care;
- Public health authorities;
- Environmental agencies, especially those responsible for air, water and waste issues;
- Other industrial facilities in the vicinity with emergency response facilities;
- Public works and highways departments, port and airport authorities; and
- Public information authorities and media organisations.

## 7.1 EMERGENCY PROCEDURES

Please refer to the table overleaf for the basic environmental emergency procedures to be followed and incorporated into the Emergency Preparedness and Response Plan:

**TABLE 7-1 EMERGENCY PREPAREDNESS AND RESPONSE PLAN**

Possible Environmental Related Emergency	Action plans/Remediation
Spillage of oil, diesel by vehicles, tankers, storage tanks etc.	<ul style="list-style-type: none"> <li>• The spillage should be contained (bund earth walls) by all means. Depending on the amount of spillage it could be remediated in situ or in the case of large amount of spillage that is contained, could be removed, etc.</li> <li>• Leakage from the vehicle, tanker etc, that caused the emergency, should be stopped and the vehicle removed to the workshop area for repairs.</li> <li>• In all cases of spillage, irrespective of the chemical, remove or extinguish any fire (naked flame) to within at least 10 metres from the spill.</li> <li>• Cover the spills with absorbent material.</li> <li>• Obtain Material Safety Data Sheet (MSDS) if the substance is known.</li> <li>• The person who reported the spill must fill out an incident report and forward it to the Environmental Department after a thorough investigation.</li> </ul>
Sewage spills	<ul style="list-style-type: none"> <li>• The spillage should be contained (bund earth walls) by all means. Depending on the amount of spillage it could be remediated in situ or in the case of large amount of spillage that is contained, could be removed, etc.</li> <li>• The leakage must be stopped and reason for spill must be rectified.</li> <li>• The person who reported the spill must fill out an incident report and forward it to the Environmental Department after a thorough investigation.</li> </ul>
Fires	<ul style="list-style-type: none"> <li>• The necessary equipment should be in place and ready to be used if an accidental fire is started.</li> <li>• There shall be an emergency preparedness plan in place in order to fight accidental fires, should they occur.</li> <li>• No fires may be lit except at places approved by the Quality and Environmental Management Coordinator (basic fire-fighting equipment shall be to the satisfaction of the Local Emergency Services.</li> <li>• Precautions shall be taken when working with welding or grinding equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire extinguisher immediately at hand and the use of welding curtains.</li> </ul>

## 8 PARTIES RESPONSIBLE FOR THE IMPLEMENTATION OF THE EMP

This section describes the roles and responsibilities for implementing the different parts of the environmental management plan (EMP).

### 8.1 WALVIS BAY SALT HOLDINGS – RESPONSIBLE PARTY

The WBSH Managing Director has overall responsibility for environmental management and for ensuring this EMP is implemented. The Managing Director will be dedicated to managing and monitoring the environmental issues associated with the facilities/activities.

### 8.2 RESPONSIBILITIES

The Quality and Environmental Management Coordinator / Environmental Manager / Officer will be responsible for assisting the Managing Director in all environmental issues, and specifically to ensure that the commitments as set out in this EMP are implemented during the construction, operations, decommissioning and closure phases.

Responsible related to compliance of this EMP:

- Regular inspections and auditing compliance to this EMP and any other relevant legal requirements e.g. permits, authorisations, conditions of the Environmental Clearance Certificate.
- Conduct environmental awareness training during induction training and on an ad hoc basis thereafter.
- Ensure compliance to this EMP and permits and authorisations issued to WBSH by relevant authorities. Ensure responsibilities and target dates are developed for each one of the commitments in this EMP. This will be through one of the following mechanisms:
  - Design requirements; or
  - Construction tender documents and contracts.
- Ensure that contractor staff is controlled through the implementation of appropriate security measures.
- Carefully manage the storage and handling of hydrocarbons and other hazardous materials.
- Monitor for excessive dust, noise and vibrations and implement control measures if necessary.
- Implement a waste management strategy.
- Monitoring and maintenance equipment and machinery.
- Ensure the provision of adequate sanitation facilities.
- Implement an environmental awareness plan.



- Installation of emergency plans (fire, evacuation etc.) and first-aid procedures.
- Control of traffic safety and road conditions.
- Ensure that surface runoff is controlled and impacts on water resources are prevented.

### **8.3 CONTRACTORS**

The Contractor Managers will be contractually required to comply with the relevant commitments in this EMP. Each contractor will be required to develop their own individual EMPs and/or relevant Method Statements (MS) based on this EMP and any other relevant Walvis Bay Salt Works' requirements and specifications and any permits or authorisations issued to Walvis Bay Salt Works. These contractor EMPs/MS will focus on the specific aspects of the contractors work requirements and work areas.

The Quality and Environmental Management Coordinator and the relevant contractor's environmental officer will conduct daily informal inspections at contractor areas. Non-compliances will be recorded and action plans developed in conjunction with the contractor that contravened the clause of the EMP.

Contractors will be formally audited on a monthly basis in order to determine compliance with the relevant EMPs/MSs. In the event of non-conformances, the contractor will be required to take corrective action according to the requirements of Walvis Bay Salt Holdings.

## 9 REFERENCES

**SLR. 2014a** Scoping Report (with Assessment) for Walvis Bay Salt Holdings (Pty) Ltd

**SLR. 2014b** Environmental Management Plan for Walvis Bay Salt Holdings (Pty) Ltd

## APPENDIX A: CLOSURE FRAMEWORK

### 1. Introduction

The aim of this Mine Closure Framework (CF) is to present Walvis Bay Salt Holdings' commitment and approach towards closure of all aspects relating to the mine's operations. Ultimately it provides the basis for developing the Mine Closure Plan in conjunction with:

- Applicable legislation and relevant guidelines
- All stakeholders
- Best Practice

This document will therefore be a living document to be reviewed and updated when applicable and will form the basis of the Mine Closure Plan.

### 2. Approach

The *Namibian Mine Closure Framework* specifies the following content for this MCF:

- "Key objectives (for instance housing, community integration, future use of disturbed areas)
- Main closure aspects and associated components
- Closure risk analysis
- Stakeholder expectations
- Evaluation of alternatives
- Identification of preferred alternatives"

Walvis Bay Salt Holdings intends to follow the above mentioned guidance in developing its Mine Closure Plan which will be a dynamic process that is integrated with life-of-mine planning to ensure a seamless transition from the operational to the decommissioning phases in the project life cycle. Regular risk and opportunity assessment will be undertaken to ensure a consistent approach to the identification and management of issues associated with mine closure.

Successful mine completion is achieved with final lease relinquishment, the key to which is early establishment and agreement amongst all parties concerned, on attainable closure criteria. The Mine Closure Plan which is central to this process evolves in complexity throughout the life of the mine. There will always be a level of residual risk or uncertainty throughout the process and this requires on-going assessment and management. All closure planning will therefore be risk-based and consider environmental, social, economic and regulatory risks.

### 3. Legislation

Guidance relating to mine closure is provided in the *Namibian Mine Closure Framework* developed by the Namibian Chamber of Mines in November 2008. This document outlines the Namibian regulatory setting in some detail, with reference to the following pieces of legislation:

- Minerals Policy of Namibia, 2002
- Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation, 1994
- Policy for Prospecting and Mining in Protected Areas and National Monuments, 1999
- General Environmental Assessment Guidelines for Mining (Onshore and Off-shore) Sector of Namibia, 2000
- Policy for the Conservation of Biotic Diversity and Habitat Protection, 1994
- The Minerals (Prospecting & Mining) Act, No 33 of 1992
- The Environmental Management Act, 7 of 2007
- Water Act, 54 of 1956
- The Atmospheric Pollution Prevention Ordinance, 11 of 1976
- Labour Act No. 6 of 1992

Walvis Bay Salt Holdings will take into account the requirements of the above mentioned legislation and will implement the relevant requirements when developing the Mine Closure Plan.

#### 4. Mine closure objectives

The closure planning process will be guided by the following objectives that are endorsed by the Namibian Chamber of Mines (2008):

- To enable all stakeholders to have their interests considered during the mine closure process.
- To ensure the process of closure occurs in an orderly, cost-effective and timely manner.
- To ensure the cost of closure is adequately represented in company accounts and that the community is not left with a liability.
- To ensure there is clear accountability and adequate resources for implementation of the closure plan.
- To establish a set of indicators which demonstrate the successful completion of the closure process.
- To reach a point where the company has met agreed completion criteria to the satisfaction of the responsible Government regulator.

Ultimately it will be necessary for Walvis Bay Salt Holdings to demonstrate that closure is socially, technically and economically feasible without incurring long term liabilities for the government of Namibia.

In addition to the above, Walvis Bay Salt Holdings also acknowledges the mine closure objectives as specified in the *Namibian Mine Closure Framework*:

- Prepare for changes in employment conditions at closure (negative social effects on people dependent on mine)
- Understand closure risks and prepare to mitigate impacts on associated communities and dependent businesses
- Protect public health and safety and the environment by using safe and responsible closure practices
- Reduce or eliminate adverse environmental effects once the mine ceases operations
- Establish conditions which are consistent with the predetermined end use objectives
- Reduce the need for long-term monitoring and maintenance by establishing effective physical, chemical and ecological stability of disturbed areas.

## 5. Key environmental values

The Mine Closure Framework is based on addressing the following key environmental values:

- Disturbed areas will be returned to as close to the natural habitat as practicable.
- Permanent visible features will be left in a form that blends with the surrounds.
- All structures will be dismantled, and salvageable elements will be sold or disposed of appropriately.
- Linear infrastructure will be removed and the disturbed land rehabilitated to blend with the surrounding natural environment.
- All structures associated with these facilities will be broken and salvageable elements will be decontaminated and sold. The remainder of the infrastructure will be dismantled or broken up and disposed of at a site approved by the relevant authorities.
- Socio-economic impacts (including the loss of employment) will be minimised through careful planning and preparation for closure beginning three to five years before closure takes place.

The above principles and concepts will be refined as part of ongoing detailed closure planning and costing during the life of mine.

## 6. Closure needs

Walvis Bay Salt Holdings has developed a number of closure needs, based the key environmental and community values as described in Section 4. These include the following:

- Remove all infrastructure
- Re-establish a landscape that can over time regenerate sustainable endemic vegetation communities,
- Ensure that an ecologically functioning environment is left behind,
- Effectively decontaminate and remediate all areas affected by the mine,
- Socio-economic factors (employees, suppliers, community)

In addition to the above, the government and community needs will also be taken into consideration but there is currently limited information available on this. However, the objective of future stakeholder engagement is, amongst others, to understand these stakeholders' mine closure needs.

## 7. Stakeholder consultation

Walvis Bay Salt Holdings acknowledges the importance of both the positive and negative effects of the mine's activities on key stakeholders, including employees, local suppliers, communities, government and interested non-government organisations. The development of a successful Mine Closure Plan will require the involvement of all affected parties.

Understanding the concerns and obtaining the input from stakeholders will be an important part of the process while Walvis Bay Salt Holdings develops the Mine Closure Plan and during its periodic review

throughout operations. Walvis Bay Salt Holdings believes the benefits of a successful stakeholder engagement process include:

- improved planning decisions
- improved cooperation with government
- better closure decisions
- good corporate governance
- improved community receptiveness

Walvis Bay Salt Holdings expects to take the following steps to ensure quality stakeholder engagement:

#### Stakeholder identification

Stakeholders include employees, management and shareholders of the company, as well as external parties such as communities (for instance, local business, landholders, NGOs) and government (ministries, departments, local government and parastatals).

During the identification of the stakeholders for mine closure, Walvis Bay Salt Holdings will recognise the difference between those directly affected by mine closure such as employees and those that have an interest in the process of mine closure, and will address the issues of each different group in the Mine Closure Plan.

#### Effective consultation and working with communities

Walvis Bay Salt Holdings intends to engage with stakeholders throughout the throughout operations and into the closure and relinquishment phases. The EIA process that was followed for the operations has already given stakeholders the opportunity to provide input into the closure objectives, needs, etc.

Walvis Bay Salt Holdings will consult and provide feedback to stakeholders and interested parties and intends to follow a two-way communication approach. Additionally, Walvis Bay Salt Holdings' intention will be to manage and guide expectations of affected stakeholders and to mitigate, as best as possible, negative (economic, social and bio-physical) impacts and to enhance positive impacts for the establishment of the mine project.

#### Targeted communication strategy

Walvis Bay Salt Holdings aims to develop a communication strategy ensuring that the needs of stakeholder groups and interested parties are adequately addressed and reflected in the Mine Closure Plan.

Walvis Bay Salt Holdings understands that the different stakeholder groups, having different concerns and needs, are addressed in the appropriate manner, e.g. employees and suppliers will need to find other business opportunities, and the local communities will like to see the area adequately restored.

#### Adequate human and financial resources

Walvis Bay Salt Holdings' intention is that all stakeholders have the necessary information to cooperate effectively in the closure process. To achieve this goal Walvis Bay Salt Holdings intends to ensure that adequate human and financial resources are allocated from the start of the life of mine to plan for mine closure.

#### 8. Alternatives

As the operations are not utilising a depleting or fixed resource, there is no definitive LOM and therefore no envisaged closure point.

Based on the closure needs described in section 5, only one option is currently being considered for the purpose of closure. It is proposed, that the mine site is returned to its original condition of conservation/wilderness (or as close to this condition as possible).

#### 9. Closure criteria

Completion criteria will be used to facilitate the fulfilment of mine closure objectives and the closure needs, as follows:

- specific to the operations site reflecting its set of environmental, social and economic circumstances.
- the basis on which successful reclamation is determined, and should be developed in consultation with stakeholders. This ensures that there is broad agreement on both the end land use objectives and the basis for measuring the achievement of that objective.
- flexible enough to adapt to changing circumstances without compromising the agreed end objective. This provides certainty of process and outcome (relinquishment of tenement when the conditions have been met).
- completion criteria are periodically reviewed and modified of in light of improved knowledge or changed circumstance.

The closure criteria will be developed and included in the Mine Closure Plan and will take, amongst others, the following commitments into consideration:

- The removal of all infrastructure, plant and equipment.
- The engineering of all remnant mine landforms such that they are stable, non-polluting and blend into the surrounding landscape as far as possible.
- The rehabilitation of ecology/land use (e.g. ecosystem functionality).
- The implementation of an effective community exit strategy.
- Establishing an accurate closure cost estimate such that adequate closure provision can be made.
- Post closure monitoring and maintenance.



## 10. Risk assessment

All closure planning is risk-based and considers environmental, social, economic and regulatory risks.

A formal closure risk assessment is required to fully evaluate the potential closure risks and possible mitigation/control strategies.

The basis of this risk assessment process is the identification of Environmental Aspects and Impacts associated with mine closure. This process was initiated through the EIA process conducted (SLR 2013) and will be further refined through the mines closure planning process as more detail becomes available.

The risk assessment shall take the following categories into consideration:

- Mined area
- Infrastructure
- Processing Plant and Logistical support
- Tailings storage facility
- Waste rock dump
- Stakeholders (Employees, contractors/service providers, Government, local community, NGOs).

### *Risk assessment process*

The following steps will be undertaken when conducting the risk assessment:

- 1) Under each category (as described above) establish the "risk title" which describes the specific risk.
- 2) Determine the causes/indicators/triggers for each risk title.
- 3) Describe the potential impacts/consequences for each of the above
- 4) Establish which controls are already in place
- 5) Provide a likelihood and a risk rating (consequence) for each potential impact with reference to the descriptors in
- 6)
- 7) Table and Table .
- 8) Determine the risk level based on the matrix presented in Table .
- 9) Provide risk management measures during operations and closure.

Table 1: Likelihood descriptors

LIKELIHOOD DESCRIPTORS		
	Description	Indicative frequency
<b>Almost Certain:</b>	The event will occur on an annual basis	Once a year or more frequently
<b>Likely:</b>	The event has occurred several times or more in your career	Once every three years
<b>Possible:</b>	The event might occur once in your career	Once every ten years
<b>Unlikely:</b>	The event does occur somewhere from time to time	Once every thirty years
<b>Rare:</b>	Heard of something like the event occurring elsewhere	Once every 100 years

Table 2: Consequence descriptors

CONSEQUENCE DESCRIPTORS						
Severity level	Consequence Types					
	Financial (Revenue/Costs)	Health and safety	Natural environment	Social/cultural Heritage	Community/govt./reputation/media	Legal
<b>Catastrophic:</b>	>\$100M	Multiple fatalities, or significant irreversible effects to >50 persons	Very serious, long-term environmental impairment of ecosystem functions			Significant prosecution and fines Very serious litigation including class action
<b>Major:</b>	\$20M –\$100M	Single fatality and/or severe irreversible disability		On-going serious social issues. Significant damage to structures/items of cultural significance	Serious public or media outcry (international)	Major breach of regulation Major litigation
<b>Moderate:</b>	\$1M - \$20M	Moderate irreversible disability or impairment (>30%) to one or more persons	Serious medium term environmental effects		Significant adverse national media/public/NGO attention	Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible
<b>Minor:</b>	\$100, 000- \$1M	Objective but reversible disability requiring hospitalization	Moderate, short-term effects but not affecting ecosystem functions	On-going social issues. Permanent damage to items of cultural significance	Attention from media and/or heightened concern by local community. Criticism by NGOs	Minor legal issues, non-compliances and breaches or regulations
<b>Insignificant:</b>	<\$100,000	No medical treatment required	Minor effects on biological or physical environment	Minor medium-term social impacts on local population. Mostly repairable	Minor Adverse local public or media attention or complaints	

Table 3: Risk Categories

RISK CATEGORIES					
LIKELIHOOD	CONSEQUENCES				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
5 Almost Certain:	<u>M</u>	<u>H</u>	<u>H</u>	<u>VH</u>	<u>VH</u>
4 Likely:	<u>M</u>	<u>M</u>	<u>H</u>	<u>H</u>	<u>VH</u>
3 Possible:	<u>L</u>	<u>M</u>	<u>H</u>	<u>H</u>	<u>H</u>
2 Unlikely:	<u>L</u>	<u>L</u>	<u>M</u>	<u>M</u>	<u>H</u>
1 Rare:	<u>L</u>	<u>L</u>	<u>M</u>	<u>M</u>	<u>H</u>

## 11. Closure planning

The end use of the mine site has still to be determined through negotiation with stakeholders (including relevant Governmental Departments, NGOs and I&APs). At this stage however it is assumed that the mine area will revert back to its original land use (with reference to section 7 on Alternatives). As such the mine closure goal is to return the site to, as close as possible, its original state.

As such the closure strategy is to remove all buildings and structures from the project area and rehabilitate the sites, disposing of all chemicals and contaminated material in an environmentally-safe manner. All physical landforms/features resulting from mining operations are to be engineered in such a manner that their long-term landforms are stable, safe and re-vegetated. The water quality of any seepage or run-off will be such that it meets baseline water standards.

## 12. Closure Plan

Walvis Bay Salt Holdings acknowledges the requirements for the Closure Plan content specified in the Namibian Mine Closure Framework and the Mine Closure Plan will therefore include:

- Social Plan (employees and communities)
- Progressive rehabilitation plan
- Decommissioning plan
- Final rehabilitation plan
- Monitoring plan
- Detailed closure costing

**APPENDIX B: COASTAL HUMMOCK MONITORING PLAN****Monitoring methodology proposal, Walvis Bay Salt Works.****Background**

The coastal hummock belt is a highly restricted habitat because it is so narrow, and is not present along the entire Namibian coastline. Its total area in Namibia is probably less than 100km<sup>2</sup>. Because it has already been affected by mining and infrastructural projects, as well as tourism developments such as Mile 14 and human impacts such as vehicle tracks, in future cumulative damage may become a problem to endemic and near-endemic species that are restricted to this habitat. Characteristic plant species are *Zygophyllum clavatum*, *Brownanthus kuntzei* and *Arthroa leubnitziae* (which are dominant), and *Zygophyllum stapffii*.

It is my experience that long-term monitoring is best done using simple methods and simple statistics to assess changes over time as well as present differences.

**Suggested monitoring methodology****1. Line-intercept transect**

A line-intercept method should be used to give a relative estimate of total cover and cover per species. This will also give an indication of species diversity and dominance as well as allow for easy comparisons of changes in those aspects over time.

Five sites should be sampled, as indicated in Figure 1:

- East of the existing salt pans
- East of the proposed extensions, on the inland side
- West of the proposed extensions, on the coastal side
- South of the proposed extensions, on the inland side
- South of the proposed extensions, on the coastal side

At each site five 25m transects should be done 10m apart, starting on a north-south or a northwest-southeast baseline.

**Data to be recorded:**

Start and end point of each transect. A photo point should be established at the start of each transect.

Species (identity) and length of intercept of each plant along each transect.

**2. Photo point assessment**



In addition, I suggest that fixed photo points be set up, one at each of the sites. These cannot be statistically assessed, but may provide valuable material to illustrate changes or the lack thereof.

Set up a photo point as follows:

- Put a small blackboard at the beginning of the transect indicating clearly the date, transect number and GPS location in UTM.
- Stretch the tape along which the line transect will be done from the board to the end of the transect. Mark the end of the transect with a temporary but clearly visible marker peg.
- Standing 3m back from the board, take a photograph along the transect, with the board in the foreground. The photo should show the transect clearly.
- Step up to the board and take another photograph, or several, from closer to the transect.
- Immediately record the photo numbers on the data sheet.
- Once the transect has been done, remove the tape and take another photograph from the board along the transect towards the marker peg. Immediately record the photo number.

Using photo points

The main purpose of photo point monitoring is to provide a reliable and accurate record of the plant species/community/impact being monitored. However, it is all too easy to forget which photograph was taken from which photo point and when it was taken. This problem can be overcome by placing a data board containing the relevant information at the start of the transect. The information will then appear on the photograph itself.

The following information, as listed above, should appear on the data board:

- location of the site (UTM of marker peg)
- number of the photo point
- date

When you take your photograph make sure that you:

- take the photograph from the board towards the marker peg
- use a camera lens of the same specification each time and always use the camera the same way (i.e. landscape or portrait, or both)
- take the photograph at as close to the same date and time of day as possible each time
- take at least two photos each time (you could take two landscape and two portrait, for example)

Record the photo numbers on the data form (Form B).

Save the photos on the computer using a specific name (e.g. Transect 1A\_2014).





BACK UP all your photographs every year. Keep the backup disks or drives in a safe place. Save them to DropBox (or some similar facility) as well.

### **Analysis**

#### **Photopoints:**

Make a series of photographs for each transect so that once a year you can visually assess the photographs for apparent changes.

#### **Total cover:**

Calculate the percentage cover for each transect at each site.

The following comparisons could be made:

Changes within each site.

The degree of change, one site against another.

#### **Cover per species:**

Done similarly to total cover.

#### **Species Dominance:**

Done by simple comparison of number of individuals and/or cover per site.

#### **Species diversity:**

Simply count the number of different species found at each site.

### **Discussion**

Unless you are trained in statistical methods it will be difficult to do and understand the significance of analysis of these collected data. I suggest that you periodically employ an ecologist to assess the data for you. Ideally they should be properly assessed annually, but at least every second year. However, consistent and careful recording of these data should make it easy for an experienced practitioner to do the analysis for you.

#### **So, what you want to know is:**

Does the mean cover, or cover per species change significantly from year to year at any given site?

Does the difference in cover between years differ significantly between paired sites? (ie. is one site more affected than another?)

Is there any change in species dominance or species diversity at any site?

Is there any overtly visible deterioration in the sites according to the photographs?

### **Equipment needed**

GPS

Forms as provided

Pencil/Ballpoint pen

A small blackboard and white or yellow chalk

A white or brightly coloured marker peg.

25 m tape measure

Rope

Digital camera.

### **Constraints**

Note that very often methodologies have to be 'tweaked' once fieldwork begins, due to unforeseen aspects of access, terrain or other elements.

Figure 1: Suggested approximate locations of monitoring sites.





FORM B: Photopoint record (UTM and locality only needed when point is first established)		
Date:		Locality description/Notes
Site #, Transect #		
Person:		
UTM board	E	
	S	
UTM marker peg	E	
	S	
Photograph numbers from camera		Photograph names in computer
		Backup location:
Paste best photo here		