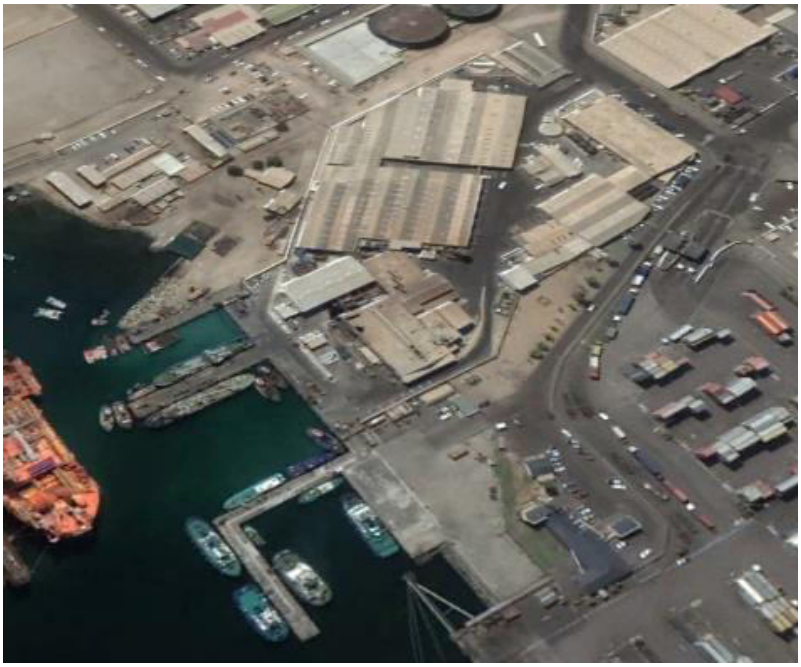
APP-00

UPDATED ENVIRONMENTAL MANAGEMENT PLAN INDUSTRIAL AND MANUFACTURING PROCESSES OF ETOSHA FISHING CORPORATION, WALVIS BAY



Prepared by:

Prepared for:

March 2024

Project:	**Updated Environmental Management Plan: Industrial and Manufacturing Processes of Etosha Fishing Corporation, Walvis Bay**	
Report Version/Date	Final March 2024	
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Report Approval	André Faul Conservation Ecology	

I LINEKELA KAPUNDJA acting as the representative of Etosha Fishing Corporation (Pty) Ltd, hereby confirm that we approve the updated Environmental Management Plan as presented in this document. All material information in the possession of the proponent that reasonably has or may have the potential of influencing the Environmental Management Plan was provided to the consultant.

Signed at WALVIS BA on the 11 day of MARCH 2024.

Etosha Fishing Corporation (Pty) Ltd

REG. NO 7704339/07
Company Registration Number / ID

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1 INTRODUCTION

Etosha Fishing Corporation (Pty) Ltd (hereafter referred to as Etosha Fishing or the Proponent) has an existing environmental clearance certificate (ECC) for the operations of their fish processing and related facilities in the fishing harbour of Walvis Bay, Erongo Region (Figure 1-1). Operations include offloading of fish from fishing vessels at the jetty, processing and freezing such fish in the factory, and the dispatch of fish products from the factory in trucks. Various support activities are also ongoing and include replenishing supplies and fuel on fishing vessels, operations of a fish meal plant, boiler and cold storage operations, fuel storage facility operations, daily administration, etc. Due to natural sedimentation and scouring of the seabed by vessels' propellers, the water depth next to their jetty is becoming too shallow. This poses a threat to vessels berthing at the jetty. As such, the Proponent is now required to undertake dredging in order to ensure water depth of -7.5 mCD where vessels are manoeuvred and berthed.

Etosha Fishing requested Geo Pollution Technologies (Pty) Ltd to amend and update their environmental management plan (EMP) to include the dredging activities. The amended and updated EMP will be submitted to the Ministry of Environment, Forestry and Tourism (MEFT), in order to apply for amendment of their ECC, to allow for the dredging component.

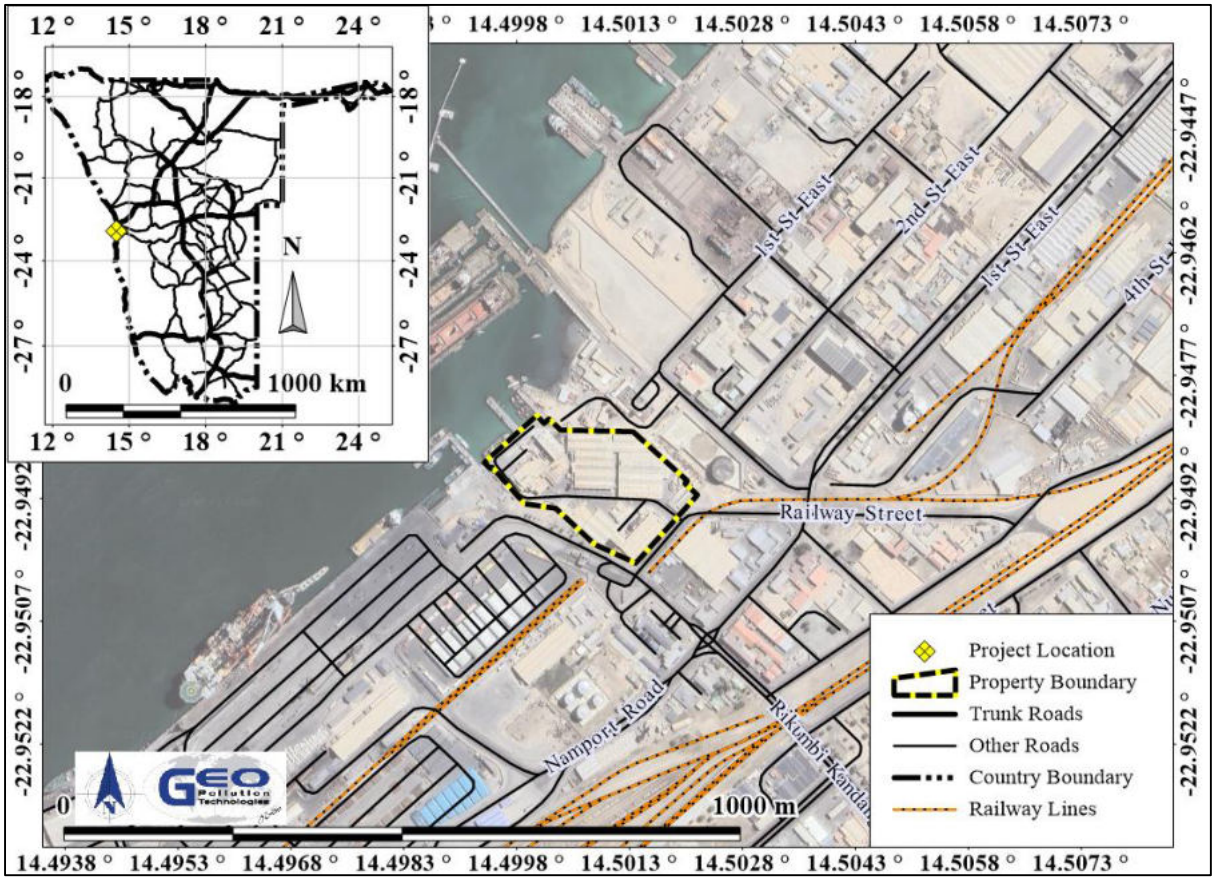


Figure 1-1 Project location

2 PROJECT DESCRIPTION

Etosha Fishing has a cannery and a fishmeal processing plant. The production figures per year depend on the quota allocated by the Ministry of Fisheries and Marine Resources (MFMR)[1]. The general layout of the premises is given in Figure 2-1 and views of the existing structures are provided in Photo 2-1 to Photo 2-10.

[1] The quota is revised annually by the Ministry of Fisheries and Marine Resources (MFMR), taking into account regular monitoring of fish stocks. As such, the quota allocation takes into account the sustainability of the fish resource. It is therefore not anticipated that Etosha Fishing's activities will have a significant negative impact on fish stocks.

2.1 FISH CANNING PROCESS

Etosha Fishing produces and supplies several well-known international brands of canned pilchards and horse mackerel. The general fish canning process sequence is provided in Appendix A.

2.1.1 Fresh Fish

The fish are off-loaded and flumed in seawater to a dewatering reel. It is then conveyed to indoor fish holding pits where it is held in purified seawater. The fish is then flumed to the cutting tables for processing into cutlets (headed, gutted and tail-off (HGT)) through the removal of heads, tails and other inedible parts. The inedible parts are passed to the fishmeal plant. The cutlets are spray rinsed with purified seawater, packed into cans, filled with fresh water and then passed into steam exhaust boxes where they are pre-cooked. The liquid is drained out of the cans before the required sauces from the sauce kitchen are added. The cans are then sealed, commercially sterilized in batch retorts, cooled and stored. Approximately 75 t of horse mackerel and 100 t of pilchard are canned per day.

2.1.2 Frozen Fish

Boxes containing approximately 20 kg blocks or two 10 kg blocks of frozen fish are off-loaded from freezer containers into cold storage or directly into defrosting tanks. The fish may be whole round or HGT. The defrosting tanks contain purified, aerated seawater. The HGT fish is pumped from the defrosting tanks to the indoor fish holding pits, the same ones used for fresh fish. Fish is then auto packed into cans. If the fish is whole round, it is pumped or conveyed to the cutting table before being washed with purified seawater, de-scaled by hand, again washed in purified seawater, before being auto packed into cans at the packing table. The cans are then pre-cooked in steam boxes and then undergo the rest of the process as for fresh fish. Approximately 10,000 t of frozen fish are processed per annum (100 t per day).

2.2 FISHMEAL PROCESS

An overview of the fishmeal production process sequence is provided in Appendix B. The fishmeal plant consists of a cooker, press, tri-canter, one steam drier, two-stage waste heat evaporator, polisher and seawater deodorizer. The bagging plant also has a meal cooler.

The system minimises emissions by deodorising vapour and condensing the vapour to water which are then passed through the effluent plant. Thus, there is no steam emissions carrying foul odours to the air.

Fish waste from the cannery and screening area is used to produce fishmeal. The fish waste is received in holding tanks that feed into the fishmeal plant cooker via a screw conveyor. The fish is cooked at 100 °C using steam generated by boilers. Recycled oil is typically used to fire the boilers, when available and more affordable than heavy fuel oil. Cooking coagulates the protein, ruptures the fat deposits, and liberates oil and physico-chemically bound water.

After cooking, the mixture is pressed to expel the oily liquor and the press cake is transferred to the first mill. The oily liquor passes through the decanter where it is separated into sludge and solids. The solids are re-cycled through the first press cake before the second mill from where it passes to the dryers. The oil is separated from the oily liquor (which contains high levels of dissolved proteins and minerals) in the centrifuge and is polished before it is stored. The rest of the liquid fraction from the centrifuge passes to the stick water plant where it is evaporated in triple effect evaporators. Process steam from the evaporators passes through a deodoriser to scrub odours. The solid concentrate from the evaporators is combined with the press cake from the second mill, treated with a quinoline-based antioxidant (E324: ethoxyquin), then passed to the steam drier (where the remaining water is evaporated and then condensed). The stable, sterilised fishmeal product is then packed and stored.

The current fishmeal plant operates when there is fish waste from the cannery and has a 4.2 t/hour capacity.

2.3 BOILERS

Etosha Fishing has one 20 t and one 10 t fire tube boiler in operation. The boilers are three pass boilers which have high efficiency and low nitrous oxides emissions. The boilers have an efficiency of up to 93%. Safety measures include a complete set of boiler valves that includes two safety blow of valves. An exhaust gas analyser effects a 3% fuel saving while still assisting combustion management and emission control. A spare fuel pump compatible with both the 20 t and 10 t boiler systems are present.

The 20 t boiler is in operation when both the fishmeal and fresh fish are worked. The 10 t boiler is only in operation for the fishmeal plant or only when the frozen fish is processed. During the fresh fish operations, the 10 t boiler will be used as back up for the 20 t boiler, therefore, fish canning and fishmeal operations cannot take place simultaneously.

Table 2-1 Boiler specifications

	20 t Boiler	**10 t Boiler**
Output	13,953 kW	8,000 kW
Steam production (12 bar)	20,000 kg/h	10,000 kg/h
Fuel specification	HFO or any other liquid fuel	HFO or any other liquid fuel

Photo 2-1 View of Etosha Fishing facilities from the jetty

Photo 2-2 Fishmeal and cannery plant 10 t boiler

Photo 2-3 Fishmeal and cannery plant 20 t boiler

Photo 2-4 Fish oil storage tanks

Photo 2-5 **Dissolved Air Flotation Filtration (DAFF) units**

Photo 2-6 **Ultra Floc solution and 3TL Sud Floc on site storage tanks**

Photo 2-7 **HFO on-site storage tank**

Photo 2-8 **Chemical spill response equipment**

Photo 2-9 **Chemical spill response equipment**

Photo 2-10 **Chemical spill response equipment**

Figure 2-1 Site map showing overview of Etosha Fishing's infrastructure at the main operational base

2.4 WATER REQUIREMENTS

Both untreated and treated seawater and fresh water (municipal supplied water) is used in the canning and fishmeal production process. A flow diagram indicating the water supply sources, daily average volumes, peak hourly flow volumes together with design capacities is provided in Figure 2-2. The fresh and seawater supply lines to the factory are indicated in Figure 2-3. The domestic and industrial effluent lines with their discharge points are indicated in Figure 2-4.

2.4.1 Seawater Requirements

Seawater is used for wet offloading, transportation, storing in fish holding tanks, fluming, washing and rinsing of defrosted fish, and for the deodoriser towers (designed to remove odours from emissions from the fishmeal plant).

Etosha Fishing uses approximately 151,124 m^3 of seawater per month when the cannery is operational. The quantity of seawater used has been reduced by the use of a pressure/vacuum offloading system where, after fluming the fish to the cannery, the seawater is drained into holding tanks, screened and pumped back to the vessel for-reuse in off-loading. The screened particles are diverted to the fishmeal plant for processing.

The seawater treatment plant has a design capacity of 127 m^3/h. The plant consists of three jetty pumps, two chemical dosing pumps and tanks, four flocculation vessels with a diameter of 859 mm, four dissolved air flotation filtration (DAFF)[2] units with a diameter of 2,500 mm, one transfer tank with a capacity of 0.5 m^3, and one sodium hypochlorite dosing pump.

The seawater is abstracted at the jetty with pumps. A coagulant, Cationic Polyelectrolyte (Appendix A1), is injected in the raw water jetty pump. The flocculant, Ultra Floc, is injected before the jetty pump line splits into four supply lines to each flocculator. The water enters at the bottom of the DAFF units. The DAFF units are equipped with three water injection nozzles. The flocculated water is subjected to micro-bubbles, which attach to the flock and carry some to the top of the unit to form a scum layer. After leaving the reaction zone, the water flows downwards through a dual media anthracite/sand filter. The scum is removed by filter back-wash and discharged.

[2] Dissolved air flotation filtration (DAFF) is a water treatment process that clarifies waste waters (or other waters) by the removal of suspended matter such as oil or solids. The removal is achieved by dissolving air in the water or waste water under pressure and then releasing the air at atmospheric pressure in a flotation tank or basin. The released air forms tiny bubbles which adhere to the suspended matter causing the suspended matter to float to the surface of the water. The seawater is then drained through dual media anthracite/sand filter. The scum which is left behind is removed by filter back-wash and discharged.

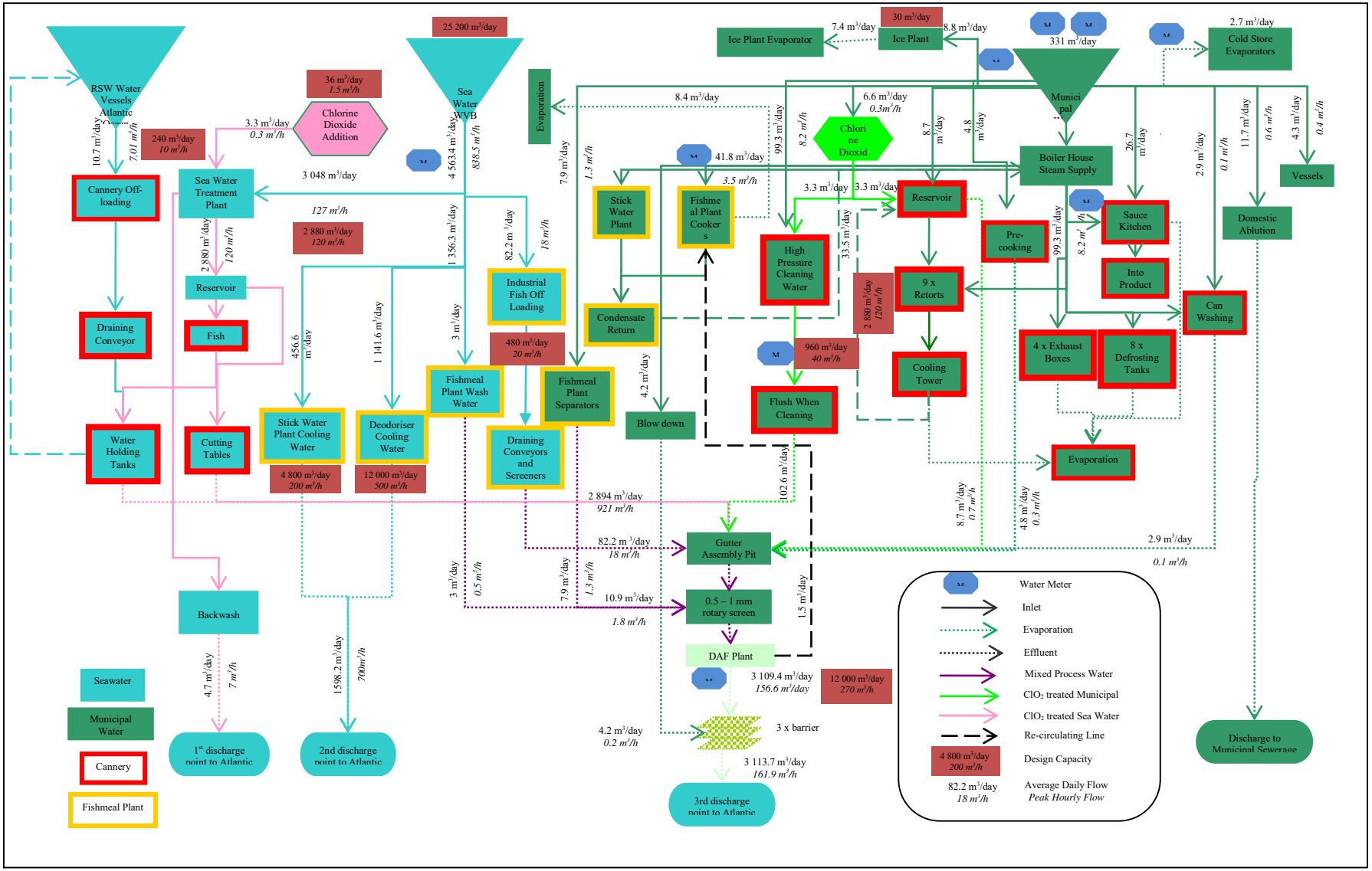


Figure 2-2 Water flow diagram/mass balances

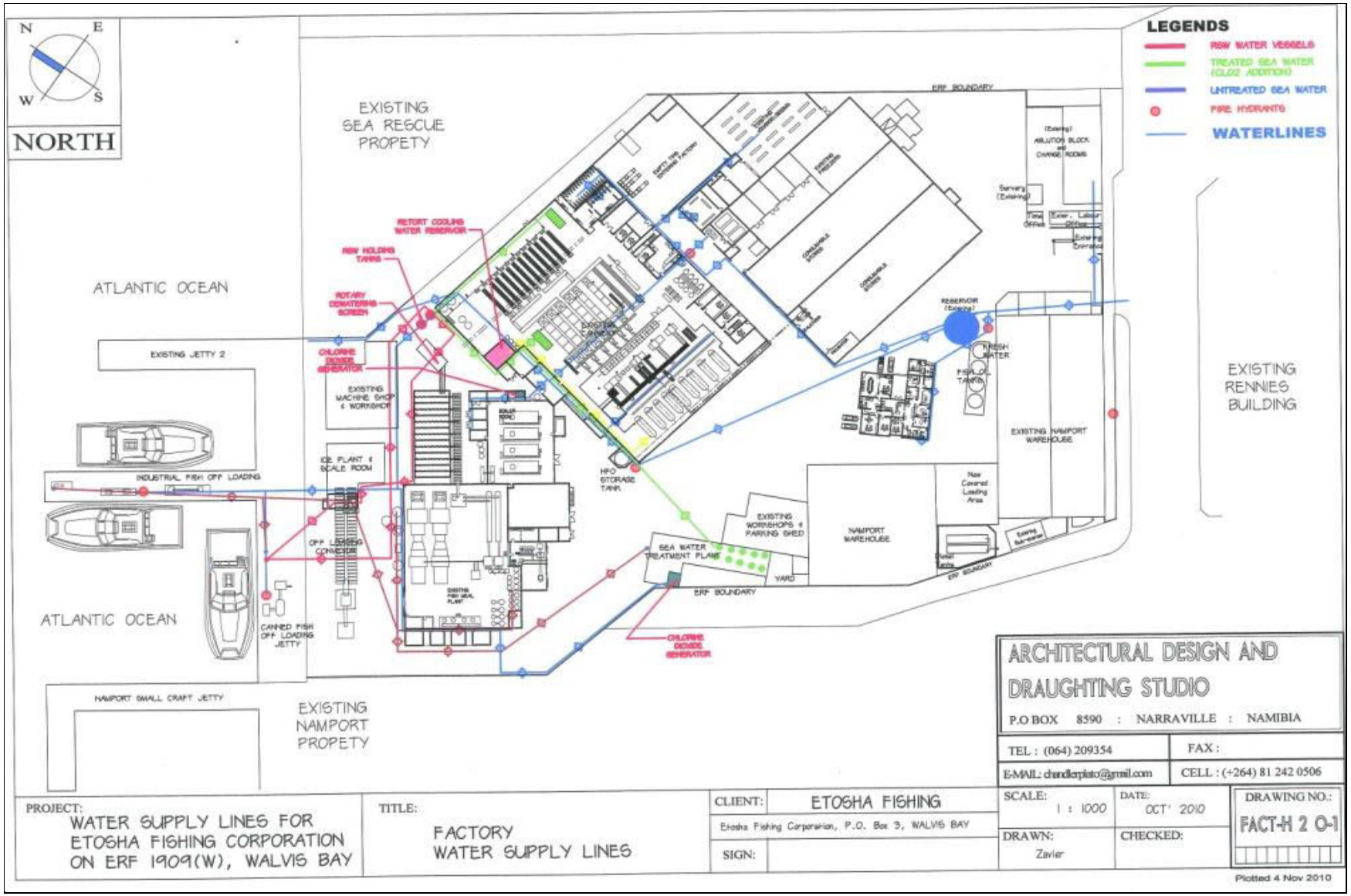


Figure 2-3 Factory water supply lines

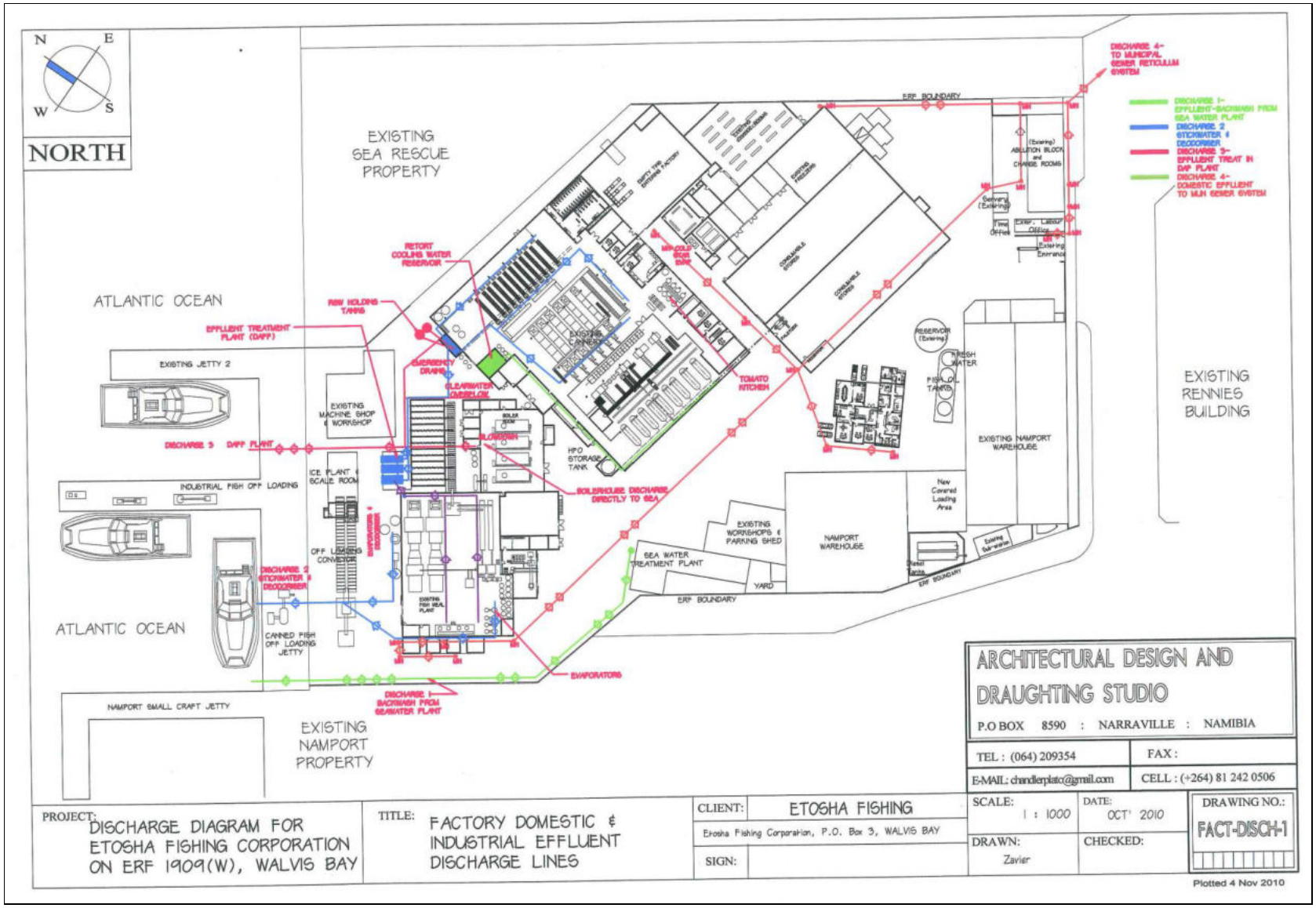


Figure 2-4 Domestic and industrial effluent lines and discharge points

2.4.2 Fresh Water Requirements

Etosha Fishing uses mostly seawater in its industrial and manufacturing processes, minimising its requirements for freshwater, a scarce resource in the area. The daily volume of seawater used is approximately 38.2 times that of fresh water. Etosha Fishing uses an average of 3948.7 m^3 of fresh water per month when cannery is operational.

Freshwater is supplied by the Walvis Bay Municipality. Fresh water is used for the separators/oil polishing, boilers feed (steam for cookers and stick water plant), domestic use, can washing, pre-cooking, sauce preparation, cold storage evaporator, ice plant, cooling and domestic purposes like the washing of floors and machines.

Due to the advanced spray technology used for cooling, the amount of fresh water used for retort cooling is significantly lower than for other comparable systems in southern Africa. The cooling water is circulated back to the reservoir through cooling towers, where after it is disinfected in the pipe leading to the retort, before being used again. This water may be circulated in this fashion for up to a week until it becomes unusable for technical reasons such as pH or total dissolved solids (TDS). A reverse osmosis plant filters the water used for the retorts. The low TDS brine from the reverse osmosis plant is added to the sea water treatment plant to reduce volume of seawater needed in the factory.

Fresh water used for cleaning and for the retort cooling water is sterilised through treatment with chlorine dioxide formed in a chlorine dioxide generator. By using chlorine dioxide, the formation of undesirable chlorinated disinfection by-products like trihalomethanes (THMs) or haloacetic acids (HAAs) are prevented. Fresh water used for the boiler supply is treated with de-ionising resin, anti-corrosion chemicals, an oxygen scavenger and an anti-foaming agent to minimize the TDS. Steam condensate formed in the cookers and stick water plant is returned to the boilers.

2.4.3 Effluent Management

A combination of one domestic and three industrial effluent streams are present. Table 2-2 describes the process water and chemical contents. Domestic wastewater is discharged into the Walvis Bay Municipality Wastewater Treatment System. Industrial effluent consists of:

- a backwash stream from the seawater supply purification plant discharged directly to the harbour;
- a seawater stream that is used for cooling with no additives which is discharged directly back into the harbour (the condensate from the new fishmeal plant's deodoriser will enter the DAF plant); and
- a mix of fresh water and seawater with suspended solids, fat, oil and grease and chemical contaminants from the waste water of the cannery and the fishmeal plant which is treated in a dissolved air flotation plant (DAF plant) before joining up with blow down water from boilers. The resultant scum from the DAF plant is recycled into the fishmeal plant and the treated effluent is disposed into the harbour via a triple net filter/barrier system. The treatment chemicals used in the DAF Plant are aluminium sulphate and Praestol 853 BC (Appendix A3), which is an acid derivative co-polymer of acrylamide with cationic acrylic.
- A 100 m^3 buffer tank holds the effluent and deliver the effluent to the DAF plant in a controlled manner ensuring that no overflows occur preventing spillages into the sea before the treatment has occurred. Additionally a chlorine dioxide (ClO_2) treatment is introduced to the effluent stream. The buffer tank volume of 100 m^3 buffer peaks in rates of effluent input. For example, when 90 m^3 of retort water has to go through the DAF plant.

Etosha Fishing discharges approximately 4,700m^3 of industrial water per day to the harbour when operational. On 22 February 2022, the Ministry of Agriculture, Water and Land Reform issued Etosha Fishing with Permit No. 699 (see Appendix B1), a Wastewater and Effluent Disposal Exemption Permit, in terms of section 21(5) and 22(2) of the Water Act, 1956 (Act 54 of 1956). This permit is valid for a period of five years (expiry date: 31 March 2027).

Table 2-2 Waste water and effluent contaminants

Effluent Stream No	Source of Effluent	Water Used	Waste products	Contaminants	Discharge Point
1	Backwash water from seawater purification plant	Seawater	Backwash scum after flocculation & DAF	Ultra Floc 3TL Sud Floc	1
2	Cooling water from deodorizer towers	Untreated Seawater	No extra impurities added	No extra impurities added	2
	Stickwater plant vacuum water	Untreated Seawater	No extra impurities added	No extra impurities added	2
3	Wash water from fishmeal plant floors and machines	Untreated Seawater	Fish oil, fish solids and blood	Cleaning chemicals and detergents	3
	Boiler blowdown water	Treated Fresh Water	-	Salt Threshold Volamine Carrox	
	Wash water from cannery floors and machines	Treated Fresh Water	Fish oil and fish solids	Cleaning chemicals, chlorine dioxide	
	Cannery flume water	Treated Seawater	Fish solids and blood	Cationic Polyelectrolyte Aluminium Chloro-hydrate Chlorine dioxide	
	Drained pre-cooking water	Fresh Water	Fish Oil, fish solids	-	
	Water from can washing	Fresh Water	Fish solids, fish oil, tomato or chili sauce	-	
	Water used during off-loading	Seawater	Fish solids and blood		
	Retort cooling water	Treated Fresh Water	Fish oil, fish solids, tomato or chili sauce	Chlorine dioxide	
4	Domestic	Fresh Water	Domestic waste	Cleaning chemicals	Through Municipal Sewerage System

2.5 AIR QUALITY MANAGEMENT

Typically lower volumes of gas with high concentrations of odorous substances are produced by the cooking, pressing and drying operations of fishmeal plants. Higher volumes of gas with lower concentrations of odorous substances are produced by conveyors, milling, meal cooling and room ventilation.

Apart from ensuring that fish is as fresh as possible when processed, Etosha Fishing ensures that measures are taken to prevent the escape of noxious or offensive gases from cooling vapours into the atmosphere. This is achieved through contact with water (stick water plant), which condenses most of the noxious gases and other condensable vapours, thereby cutting the gas volume by some 40% and eliminating the characteristic white vapour from the stack.

Etosha Fishing has been issued with Registration Certificate No. 1640 (see Appendix B2) in terms of the Atmospheric Pollution Prevention Act, 1965 (Act 45 of 1965) in respect of its operations (No. 69 of Second Schedule).

2.6 POWER REQUIREMENTS

Approximately 88,957 kWh/month of electricity are required by Etosha Fishing for the cannery and fishmeal plant industrial and manufacturing processes. Electricity is supplied by Erongo Red.

Boilers are used to produce the steam required for fishmeal production. Two boilers, one with a 10 t and one with a 20 t steam production per hour rating, are in use. Either HFO, recycled oil or gas can be used to fire the boilers. On average each boiler uses 0.5 m^3 of HFO per hour. Pre-heating of the water for the boilers occurs using an incinerator which is fuelled with waste cardboard.

2.7 WASTE GENERATION AND DISPOSAL

A waste sorting facility for recycling is present at the premises. Non-recyclable waste from Etosha Fishing's industrial process are collected in skips and removed at regular intervals and disposed at the waste disposal site of Walvis Bay Municipality. Old bags, broken pallets and other packing related material are recycled for secondary use as far as possible. Fluorescent tubes are crashed in closed drums to contain pollution. Waste cardboard is deposited in an incinerator to pre-heat water before it enters the boilers.

2.8 EMPLOYMENT

In 2024, approximately 370 of Etosha's employees had a stake in the company due to an employee share participation scheme. Additionally, all civil servants are participants in the potential profits of the group following a recapitalization exercise in 1995, whereby the Government Institutions Pension Fund acquired a 27.5% stake in the group. In addition to the 40 people directly employed by Etosha Fishing (permanent workers), approximately 400 people work seasonally when fish is available and is being processed at the plant.

2.9 PERIODIC DREDGING

Vessel berthing areas along Etosha Fishing's quay and jetty have previously been dredged to allow fishing vessels to safely enter and berth. Over time, natural sedimentation and scouring of the seabed by vessels' propellers result in the dredged areas becoming too shallow. This compromises the safety of vessels and their crew. Thus, as part of the general operations, some maintenance dredging of the area surrounding the jetties and quay may have to be performed. The next planned dredging by Etosha Fishing is targeted at the berthing area next to the jetty. An area of 15 m × 54.376 m will be dredged to -7.5 mCD (Figure 2-5).

Dredging can be conducted with a grab or backhoe dredger operated from the jetty, or with a hydraulic suction dredger operated from a floating platform. Dredged sediment will be dumped into tipper trucks parked on the jetty. The truck will remain on the jetty to allow excess water to drain from the dredged material and back into the sea. Dredged sediments will then be disposed of at the municipal landfill.

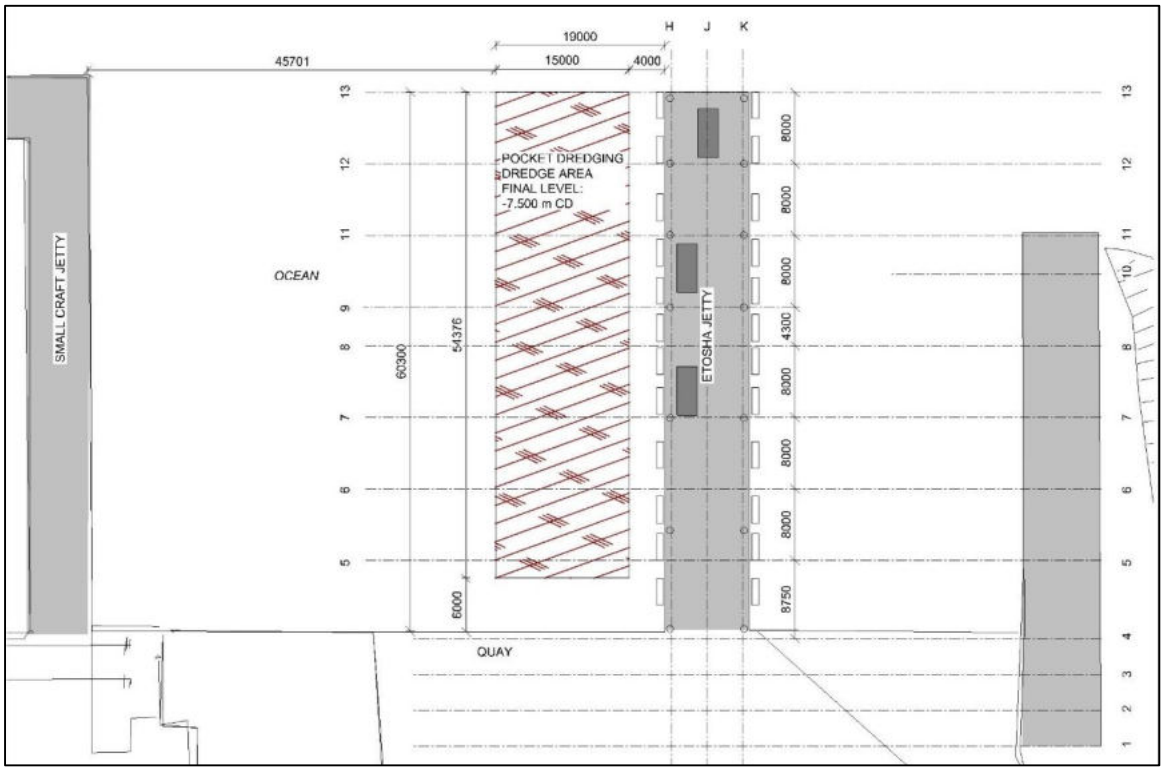


Figure 2-5 Area to be dredged in 2024 (source: WML Coast Consulting Engineers)

3 OBJECTIVES OF THE EMP

An EMP is a tool used to take pro-active action by addressing potential problems before they occur. This should limit the corrective measures needed, although additional mitigation measures might be included if necessary. An EMP acts as a stand-alone document, which can be used during the various phases of planning, construction (including maintenance), operations and decommissioning of any proposed or existing activity or development. All contractors and sub-contractors taking part in any of these phases should be made aware of the contents of the EMP, so as to plan the relevant activities accordingly and in an environmentally sound manner.

The Etosha Fishing's EMP provides management options to ensure operational and maintenance impacts related to their fish processing activities are minimised. The EMP is based on the updated environmental impact assessment (EIA) conducted by Geo Pollution Technologies in 2015 (Botha et al. 2015).

The objectives of the EMP are:

- To include all the components of the various activities performed by Etosha Fishing.
- To prescribe the best practicable control methods to lessen the environmental impacts associated with these activities.
- To monitor and audit the performance of operational and maintenance personnel in applying such controls.
- To ensure that appropriate environmental training is provided to responsible operational and maintenance personnel.

Etosha Fishing is hazard analysis and critical control points (HACCP) compliant as regulated by 21 Code of Federal Regulations (CFR) part 120 and 123. The Proponent is also continually assessing the company's health, safety and environment (HSE) and quality performance against set objectives and regularly reviewed targets.

4 THE EMP

The following general guidance for the EMP is based on the findings of the most recent updated EIA and risk assessment carried out by Geo Pollution Technologies (Botha et al. 2015) and the most recent updated EMP (Faul & Botha. 2018).

The EMP is designed with the long-term aims of:

- Ensuring environmental challenges continue to be fully integrated into business decisions.
- Rationalising and streamlining environmental activities throughout the lifetime of the operations.
- Adding value and efficiency.
- Encouraging and achieving the highest environmental performance and response from all employees and contractors.
- Providing the standards for overall planning, operations, audit and review, and enabling management to establish environmental priorities.
- Ensuring that management efforts are proactive and focused by addressing potential problems before they occur.
- Supplementing the proactive approach with reactive measures to minimise the severity or significance of any impacts that cannot be prevented at source.

By formally documenting environmental management measures and commitments, the updated EMP serves a vital role in ensuring that potential negative impacts are minimised and positive impacts maximised. This updated EMP, therefore, is a tool that guides the management and monitoring of impacts inclusive of the proposed improvements.

5 THE IMPLEMENTATION OF THE EMP

5.1 MAJOR IDENTIFIED IMPACTS

During the original impact assessment, a number of potential environmental impacts have been identified. The following section provides a brief description of the most important of these impacts.

5.1.1 Health and Safety Impacts

Some health and safety risks are present on site and include moving vehicles and forklifts, exposure to steam or cold temperatures, slipping on wet surfaces, falling objects, injuries while working on processing lines, etc. Exposure to chemicals can occur at the boilers, compressor rooms (ammonia leaks) or during cleaning. Ammonia is corrosive and can cause freeze burns. Bacterial growth, specifically *Legionella* bacteria, can occur in water of cooling towers, water coolers, water reservoirs, etc. Inhalation of dangerous *Legionella* bacteria can occur where such contaminated water becomes airborne. Typical conditions favourable to *Legionella* growth include stagnant water between 20 and 45 °C with media such as scale build-up present.

5.1.2 Fire and Explosion

Diesel, old recycled oil and HFO, although not very flammable at ambient temperatures, are stored on site for use in boilers. These present a risk of fire. Ammonia is used as coolant for cold rooms. Should an ammonia leak occur in one of the compressor rooms, a mixture of 15% to 28% ammonia in air is explosive if an ignition source exists.

5.1.3 Waste Production

Waste is produced in the form of packaging material, waste water, typical office related and domestic waste. Hazardous waste is produced e.g. fuel and used oils. Organic waste in the form of fish offal are converted into fishmeal.

5.1.4 Noise Impacts

Noise impacts are mostly associated with the moving parts of the fish processing lines, low frequency droning noise from the boiler, compressors of freezers and cold rooms, moving vehicles, and audible warning signals of trucks and forklifts. During construction there may be more noise producing activities.

5.1.5 Air Quality Impact

Exhaust gasses from the boiler contributes to air pollution and emission of greenhouse gasses into the environment. Further impacts on air quality are related to odorous compounds emitted during activities such as fishmeal production. These odours may contain compounds such as

fatty acids, hydrogen sulphide, methyl mercaptan and ethyl mercaptan. In the event of an ammonia leak, temporary reduced air quality an occur either in the compressor rooms or immediately outside thereof.

During dredging it is possible that hydrogen sulphide and/or methane trapped in dredged sediments can be released. This may not only be a nuisance due to the foul odour, but can also be a health hazard. Hydrogen sulphide inhalation at 500 to 1,000 parts per million in air can lead to unconsciousness and death.

5.1.6 Traffic Impacts

During construction/maintenance activities and operations some traffic impacts can be experienced when trucks and delivery vehicles access the site. As the facility is in an area with multiple industrial operations, traffic is constant. If delivery trucks are parked outside of the facility, it may cause congestion.

5.1.7 Surface Water Contamination

Surface water contamination can occur when pollutants, including high organic loads, enter the ocean. Insufficient removal of fish waste products from the effluent water will increase the organic load of waste water disposed of into the ocean. This increases the chemical oxygen demand (COD) and biological oxygen demand (BOD) of the waste water. While the contribution of the Etosha Fishing fish factory and the fishmeal plant to the COD and BOD of the fishing harbour water may be insignificant, the cumulative impact of effluent from all fishing industries should be considered.

Leaking tanks and pipelines, as well as accidental spills or leaks during handling, transfer and storage of hydrocarbons may contaminate the marine environment. Ammonia leaks that is absorbed in water is toxic to the aquatic environment. This will negatively impact on marine fauna as well as surrounding industries utilising seawater.

The total suspended solids in the water column can increase during dredging as a result of agitation of the seafloor and spillage. This can reduce the water quality and may impact the Proponent's own seawater intake, but is not likely to reach other sensitive receptors suc has the lagoon or other users of seawater.

5.1.8 Impact of Lighting on Birds

Birds flying at night, for example flamingos, are disorientated by lights and this can result in bird collisions with manmade infrastructure. The urban environment of Walvis Bay has a strong cumulative impact in this regard, as most of the industrial and commercial areas are either near or in one or more of the flight paths. The Etosha Fishing premises is situated close to the flight path between Bird Island and the Walvis Bay Lagoon. Lights used at night to illuminate the yard may thus impact birds.

5.1.9 Socio-Economic Impacts

Operations at Etosha Fishing provide direct employment and significantly contribute to employment and economic development in Walvis Bay and Namibia. Employees also undergo training and skills development. True value addition and contribution to the Namibian Economy is achieved by processing and packaging all fish harvested and imported at the factory and then transporting the products to markets.

5.2 IMPACT SUMMARIES AND MANAGEMENT PLAN

Table 5-1 to Table 5-3outline the management of the environmental elements that may be affected by the different activities, grouped in each phase of development. These groups are as follows:

- Planning Phase
- Operational Phase
- Maintenance / Decommissioning Phase

The EMP is a living document that must be prepared in detail, and regularly updated, by the Proponent as the project progress and evolve. The tables below act as a guideline for the EMP to be

established by Etosha Fishing. Impacts addressed and mitigation measures proposed are seen as minimum requirements which have to be elaborated on. Delegation of mitigation and reporting activities should be determined by the proponent and included in the EMP.

All monitoring results must be reported on as indicated. These are important for any future renewals of the environmental clearance certificate and must be submitted to the MEFT on a bi-annual basis. This is a requirement by the Ministry.

Table 5-1 Planning phase

Activity	Objective	Action	Timing	Proof of Compliance	Responsible Body
Compliance	To continually comply with all legal requirements for the operations of the facility in Namibia.	Apply for / renew the necessary permits from the various ministries, local authorities and any other bodies that governs the operations of the proposed activity. These include the water abstraction and effluent disposal permits. Have the ECC available on site. Finalise negotiations and resolve any outstanding issues, if any, over the allocation of user rights and zoning of the property on which the proposed activity will be located.	Ongoing	All contracts, permits, certificates and other legal documents on file.	Proponent
Appointments	To appoint reputable contractors and operational personnel and establish the EMP, a legal requirement that forms part of the contract with the contractor and employees.	Appoint contractors and employees and enter into an agreement which includes the EMP. Ensure that the contents of the EMP are understood by the contractor, sub-contractors, employees and all personnel who will be present on site.	Ongoing	Contracts on file	Proponent
Management	Establish a management system to implement and monitor Health, Safety and Environment.	Make provisions to have a Health, Safety and Environmental Coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance at the site. Allocate the responsibility of liaison officer to a dedicated staff member who will be responsible for dealing with complaints and communication with neighbours and other potentially impacted parties (when required). Have emergency plans, equipment and personnel in place to deal with all emergencies (e.g. risk management plan, environmental management plan, emergency response plan and HSE manuals.	Ongoing	Documentation on file Personal Protective Equipment (PPE) on site Signage related to restricted areas, dangerous areas, and PPE requirements on site Emergency response material and equipment on site with records of when such material or equipment were serviced or replaced (e.g. fire extinguishers)	Proponent

Activity	Objective	Action	Timing	Proof of Compliance	Responsible Body
		Ensure adequate protection and indemnity insurance cover for incidents is available. Comply with the provisions of all relevant safety standards and the EMS.			
Restoration Fund/Insurance	To establish a fund/insurance for future environmental restoration or pollution remediation if ever required.	To establish a fund for future ecological restoration of the project site should project activities cease and the site is decommissioned and/or when environmental restoration or pollution remediation is required.	Ongoing	Financial statements/proof of restoration fund / insurance	Proponent; Independent Specialist Consultant
Reporting	To establish a reporting system to report on monitoring aspects of operations, maintenance and decommissioning as outlined in the EMP	Establish a reporting system to report on aspects of construction, operation and decommissioning as outlined in the EMP. Submit bi-annual monitoring summary reports to the MEFT in compliance with the conditions of the ECC and to allow for future ECC renewal.	Ongoing (every six months)	Bi-annual monitoring reports	Proponent
Environmental Clearance Renewal	To renew the ECC every three years	Appoint a specialist environmental consultant to update the EIA and EMP and apply for renewal of the ECC.	Prior to expiry of ECC	Renewed ECC	Proponent; Independent Specialist Consultant

Table 5-2 The operational phase

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
Employment	The Proponent is a significant employer. Employees are sourced locally while skilled labour/contractors may be sourced from other regions if not locally available.	If the skills exist locally, employees and contractors must first be sourced from the area, then the region and then nationally. Deviations from this practice must be justified.	Bi-annual summary report based on employee records.	Proponent
Skills, Technology & Development	Training will be provided to employees in order to perform various functions for successful implementation and execution of the project. Skills will be transferred to an unskilled workforce for general tasks. New technologies are often investigated and introduced into the industry. Development of people and technology are key to economic development.	Training and skills development must be focussed on Namibians. Skills development and improvement programs to be made available as identified during performance assessments. Employees to be informed about parameters and requirements for references upon employment.	Record should be kept of training provided. Ensure that all training is certified or managerial reference provided (proof provided to the employees) inclusive of training attendance, completion and implementation. Bi-annual report based on records kept.	Proponent
Revenue Generation	Wages and salaries increase the economic resilience and spending power of employees residing in the area. This has an overall economic benefit in the town and contributes to the national treasury through payment of taxes. True value addition is achieved through the processing of local and imported resources and its sale contribute to the economy and trade balance of Namibia.	Adhere to Namibian legislation pertaining to labour and payment of various taxes, levies, etc.	Audited financial statements on file.	Proponent
Demographic Profile and Community Health	The project relies on labour. It is not foreseen that the project will create a change in the demographic profile of the local community, as it is a long established business and no significant increases in employment are expected. The community may still to some extent be	Employ only local people from the area, deviations from this practice should be justified appropriately. Adhere to all municipal by-laws relating to environmental health, such as sanitation requirements. Educational programmes for employees on HIV/AIDs, alcohol and drug abuse, and general upliftment of	Bi-annual summary report based on educational programmes and training conducted.	Proponent

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
	exposed to factors such as communicable disease (e.g. HIV/AIDS) and alcoholism/drug abuse due to the work force's increased spending power and the trucking of goods to and from Etosha Fishing. This impacts on overall community health. Should an increase in foreign people (e.g. migrant workers) in the area take place, this may potentially increase the risk of criminal and socially / culturally deviant behaviour.	employees' social status. Appointment of reputable contractors.		
Ground Water, Surface Water and Soil Pollution	Operations entail the storage and handling of hydrocarbons which present a contamination risk. Surface water contamination can also occur when pollutants including high organic loads enter the ocean. Insufficient removal of fish waste products and oils / fats from the effluent water will increase the organic load of effluent disposed of into the ocean. This increases the chemical oxygen demand (COD) and biological oxygen demand (BOD) of the waste water. Contaminated water or oxygen poor water may negatively impact on aquatic ecosystems. Agitation of the seafloor and spillage during dredging can reduce the water quality of the water column.	All contaminated soil and groundwater should be remediated. Spills in the marine environment must be contained and spilled products recovered. Volatile spilled products must be recovered directly after spillage to reduce impact on air quality. Discharging of effluent must be according to the effluent disposal permit conditions. The discharge of wastewater into the sea must take place in such a manner and be of a quality as not to cause: ♦ any foaming ♦ any other nuisance such as smell ♦ any public health hazard, nuisance to the public or any deleterious effect on public health activities and ♦ any deleterious effect on marine life and/or the marine environment. Treat all industrial effluent in the Dissolved Air Flotation (DAF) plant and recycle the resultant scum from the DAF plant into the fish meal plant before disposing the excess into the harbour via the triple net filter/barrier system. Formulate a contingency plan to divert fish material and untreated industrial effluent from the marine environment in	Conduct effluent quality analysis as per the effluent disposal permit. Record must be kept of all intake and effluent water quantities as specified in the effluent disposal permit. Record Jar Test results. Compile all monitoring information in a bi-annual report and audit this report against the contingency plan. This report must also be submitted to the Department of Water Affairs as per the effluent discharge permit conditions.	Proponent; Contractors

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
		the event of equipment failures (e.g. DAF plant) or malfunctions. Immediately clean up any spillages that may enter storm water or effluent discharge channels. All chemicals and cleaning materials must be handled according to their respective material safety data sheet instructions, and environmentally friendly alternatives should continuously be investigated, and volumes used optimized to minimize impacts. The Jar Test must be used to determine optimum flocculent dosage. The compressor rooms must have structures (bunds) to contain any ammonia rich water which may be created if an ammonia leak is present and water is sprayed to absorb ammonia vapours. These should prevent contaminated water from entering the environment and importantly the ocean. Ammonia has a strong smell and leaks are typically quickly detected by smell only. However, leak detectors should be considered since personnel will not always be present in the compressor rooms. Regular inspection and maintenance of the plant and equipment and report on all leaks and spills. Appoint a suitably qualified dredging contractor who utilizes technologies that reduce spillage and agitation of the seafloor. Temporarily halt dredging if large sediment plumes become visible and proceed with dredging once the plume has dispersed.		
Cannery and Fishmeal Plant Maintenance	Maintenance of equipment does not only prevent downtime and reduced operational efficiency, but also protects workers from injury due to malfunctioning equipment.	Develop and maintain a cannery and fishmeal plant maintenance plan, laying out: Maintenance regime: ♦ Frequency of maintenance checks performed on various equipment in the cannery and fishmeal plant; ♦ Type of maintenance checks performed on various equipment in the cannery and fishmeal plant;	Daily visual inspection of plant and surrounding areas. Daily log of inspections and repairs Daily log of cannery and fishmeal plant cleaning	Proponent

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
		♦ Specifications with which equipment should comply. Cleaning regime: ♦ Frequency at which cannery and fishmeal plant will be cleaned during normal production; ♦ Abnormal circumstances under which cannery and fishmeal plant must be cleaned more frequently; ♦ Treatment and storage of product that is in the plant at the time of cleaning for later processing; ♦ Cleaning method and any chemicals used; ♦ Method of cleaning and disposing of spills. Clean plant at least: ♦ Between production runs, (e.g. when all fish at the plant has been processed); ♦ After a disruption or stoppage in the fishmeal production process; Regularly inspect all equipment in the cannery and fishmeal plant. Note and repair any leaks or malfunctions. Repair equipment as soon as possible. Slow down or stop fishmeal production if required to prevent any pollution reaching the marine environment or air.	activities. Compile all monitoring information in a bi-annual report and audit this report against the maintenance plan.	
Waste management	Various types of waste are produced during the construction and operational phases. Waste may include hazardous waste associated with the proposed construction activities and during operations of the factory and fishmeal plant. Domestic and other forms of waste are generated by the factory and related operations such as in offices. This include waste paper, old lightbulbs, broken or old electronics, packing material, etc. Containers contaminated with chemicals can pose health risks if discarded at regular disposal sites where it may be collected for re-use by people. Construction waste may include	Develop / maintain a waste management plan, laying out: ♦ Expected type and amount of waste; ♦ Measures to reduce waste; ♦ Type and expected volume of recyclable waste; ♦ Recycling facilities that will collect/receive waste; ♦ Type of storage for different waste types; ♦ Waste contractors that will collect waste; and ♦ Monitoring procedures to ensure the waste management plan is implemented. Ensure that no material used at the cannery and fishmeal plant (e.g. bagging) enters the marine environment. Prevent littering by staff at work sites by providing bins or waste bags in sufficient locations.	Maintain a complaints register Daily inspection of waste collection and disposal areas. Check and file hazardous waste disposal slips. Compile all monitoring information in a bi-annual report and audit this report against the waste management plan.	Proponent

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
	building rubble and discarded equipment. Hydrocarbon contaminated soil and water are considered as hazardous wastes.	Provide separate bins for hazardous / polluting materials and mark these clearly. Store hazardous / polluting materials on impermeable ground until it is disposed of / collected.		
Air Quality	The boilers are the principal emitters of noxious gases and of key concern are the "exhaust" gases: nitrous oxides, sulphurous oxides, hydrocarbons, carbon monoxide, carbon dioxide, and particulate matter, which are all considered to be sources of air pollution. Odorous compounds from the fishmeal plant include ammonia, amines, fatty acids, hydrogen sulphide, methyl mercaptan and ethyl mercaptan. These are foul smelling and can decrease the quality of life of residents of Walvis Bay.	Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes. Etosha Fishing's fish meal plant system minimises emissions by deodorising vapour and condensing the vapour to water which are then passed through the effluent plant. Boilers used by Etosha Fishing include fuel economisers to improve fuel efficiency and therefore limit gas emission levels. Recycled oil is typically used in boilers, but HFO will be used when the supply of recycled oil drops below demand. Regular maintenance of the boiler and pipe systems can ensure that emissions do not become excessive. Quality checks on the fuel used or purchased can be conducted through random testing at independent laboratories. Fish must be processed as fresh as possible. The most odorous (i.e. the oldest) material should be processed first. Fish pits must be cleaned after every off-loading event to prevent build-up of odorous deposits. The plant is cleaned regularly to avoid odours being generated from material left lying around and decaying in equipment and/or in and around the plant.	Daily inspection of visible exhaust fumes and dust plumes of the boilers. Quarterly quality checks on the fuel used. Maintain a complaints register. Conduct air quality monitoring of boiler emissions when valid complaints are received. Compile all monitoring information in a bi-annual monthly report.	Proponent; Contractors
Hazardous materials management	Certain chemicals and materials are considered to be hazardous and pose threats to employees and the environment.	Design and construct hazardous material storage facilities, especially fuel storage, with suitable impermeable materials and a minimum bund containment capacity equal to 110% of the largest container. Develop (or adapt and implement) procedures for the safe	Daily inspection of hazardous materials handling and storage areas and of vehicles. Report the number of	Proponent

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
		transport, handling and storage of potential pollutants. Keep Material Safety Data Sheets for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials. Undertake regular maintenance of vehicles and machinery (in designated areas with an impermeable surface) to identify and repair minor leaks and prevent equipment failures. Clean up any spills immediately, through containment and appropriate removal of contaminated soil. Keep spill containment and clean-up equipment at all work sites and for all polluting materials used at the site. The compressor rooms must have structures (bunds) to contain any ammonia rich water which may be created if an ammonia leak is present and water is sprayed to absorb ammonia vapours. These should prevent contaminated water from entering the environment and importantly the ocean. Ammonia has a strong smell and leaks are typically quickly detected by smell only. However, leak detectors should be considered since personnel will not always be present in the compressor rooms.	incidents of non-compliance with safety procedures concerning hazardous materials, including waste materials, the number of spills of hazardous materials, including waste materials. Hazardous waste disposal certificates on file. Compile all monitoring information in a bi-annual report.	
Noise	Certain aspects of operation can be noisy. The impact will mostly be limited to workers on site, but can be a nuisance to neighbours (e.g. audible signals on forklifts and during construction activities).	Adhere to the noise levels prescribed by the labour act for workers on site. Take conscience of the World Health Organisation's guidelines on community noise to prevent nuisances to the neighbours. Perform noise measurements if complaints regarding noise are received: ♦ Measure noise levels in surrounding areas attributable to the plant under various operating conditions and at various times; ♦ Investigate and, if required, implement further noise	Keep a register of all complaints received and remediation action taken. Compile all information in a bi-annual report.	Proponent

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
		reduction measures. Maintain all sound proofing, and other equipment in good working order to minimise excess noise.		
Ecological Impact	Ecological impacts will mainly be related to deterioration of seawater quality (pollution) and the impact of bright lights on birds flying at night (e.g. flamingos).	Report any extraordinary sightings of animals not normally encountered in the area or injured animals (land or sea) to the Ministry of Environment, Forestry and Tourism. Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should limit ecosystem and biodiversity impacts. All hazardous substances, including hydrocarbons, should be stored in bunded areas with proper spill control infrastructure and emergency response plans in place. Ensure waste cannot be blown away by wind. The establishment of habitats and nesting sites at the factory should be discouraged. Seawater intake points should have screens or screening boxes to prevent the intake and entrainment of larger marine organisms. Lights used at site should as far as is practically possible be directed downwards to the working surfaces to prevent blinding and disorientation of birds flying at night. The compressor rooms must have structures (bunds) to contain any ammonia rich water which may be created if an ammonia leak is present and water is sprayed to absorb ammonia vapours. These should prevent contaminated water from entering the environment and importantly the ocean. Ammonia has a strong smell and leaks are typically quickly detected by smell only. However, leak detectors should be considered since personnel will not always be present in compressor rooms.	Inspect the seawater intake monthly to ensure that the structure is intact and free of any obstructions. Ad hoc inspections should be conducted if an obstruction or other problem related to the inlet is expected. Record any extraordinary sightings of animals as well as bird collision with manmade structures Compile all monitoring information in a bi-annual report.	Proponent; Contractors

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
		Emergency response plans should be in place if leaks are detected		
Health, Safety and Security	Injury to employees, security related incidents, contaminated food products, etc.	Hazardous substances, compressed gas cylinders and chemical products must be properly labelled and securely stored in locked containers or areas to prevent mixing or water contamination that would result in noxious gases, explosions or other worker hazards. Ensure that all operators and or maintenance crews on-site are familiar with the company's emergency response plans. Conduct thorough safety training to personnel about the use of protective clothing, footwear, gloves and belts; safety goggles and shields; the correct handling of materials and the safe use of all equipment. First aid treatment, emergency treatment and medical assistance must be available immediately. A *Legionella* risk assessment and management plan should be compiled which includes bi-annual inspection and analysis of water sources potentially containing *Legionella*. Ammonia has a strong smell and leaks are typically quickly detected by smell only. However, leak detectors should be considered since personnel will not always be present in the compressor rooms. If an ammonia leak is detected, the in-house ammonia procedure must be followed which include evacuation, reporting and inspection. Evacuate all personnel if hydrogen sulphide gas is encountered during dredging. Strict security measures and access control to be implemented at all times.	A register must be maintained of all training provided to staff. A register must be maintained for all safety equipment and medical supplies kept on site. This should include date of purchase and date of service/replacement for items that can expire or deteriorate with age. A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat itself. Report on *Legionella* testing and recommendations. Compile all monitoring information in a bi-annual report.	Proponent
Fire and Explosion	Fuel handled on site is flammable. Ammonia present in air may result in explosive	Storage and handling of flammable products should be according to their MSDS instructions. Regular maintenance, good housekeeping and training of personnel reduces the risk	Number and type of fire related incidents	Proponent; Contractors

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
	conditions.	of fire. The cold storage compressors rooms must have emergency response plans specific to ammonia related fire risks if leaks or accidental release of ammonia occur. This include explosive proof lighting, extractor fans, PPE and water hoses with water diffusing nozzles. Water absorbs ammonia vapour if sprayed by a fine mist or droplets of water. Refer to MSDA and SANS 10147. Ammonia has a strong smell and leaks are typically quickly detected by smell only. However, leak detectors should be considered since personnel will not always be present in the compressor rooms. In addition to this, all personnel have to be sensitised about responsible fire protection measures and good housekeeping such as the removal of flammable materials including rubbish, dry vegetation, and hydrocarbon-soaked soil from the vicinity of the installation. Regular inspections should be carried out to check for these materials at the site. It must be assured that sufficient water firefighting equipment are available. A holistic fire protection and prevention plan is needed. This holistic plan must include an emergency response plan, firefighting plan and spill recovery plan. Regular surveys of the fire-fighting equipment and water supply should be carried out as per the EMP.	A register must be maintained of all firefighting training with training certificates provided to staff. A register must be maintained for all firefighting equipment kept on site. This should include date of purchase and date of service/replacement for items that can expire or deteriorate with age. A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat itself. Compile all monitoring information in a bi-annual report.	
Impacts on Utilities, Infrastructure and Seabed Scouring	Any damage caused to existing infrastructure and services supply like sewers, water or electricity where present. Additional demand for electricity and potable water and increased effluent discharges into sewers may add strain on the available services supply of the area. Scouring of the seabed caused by vessel propellers. This may lead to the upwelling of sediments, which in return may impact the	Appointing qualified and reputable contractors are essential. Emergency procedures available on file. The contractor must determine exactly where amenities and pipelines are situated before construction commences (utility clearance e.g. ground penetrating radar surveys). Liaison with the Municipality and suppliers of services is essential. Liaise with suppliers of water, electricity and sewers in terms of supply and demand statistics. Timely communication of significant increases in future usage of resources to allow for	Utility drawings (municipal) Supply and demand statistics for water and electricity. A bi-annual report should be compiled of all incidents of water and electricity disruptions reported or incidents of damage to utilities and infrastructure.	Proponent; Contractors

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
	depth of certain areas as well as impact on the structural integrity of jetties and quays.	planning and additional provision. Implement programmes to monitor consumption of water and electricity and programmes to ensure water and energy efficient strategies. Timely planning for temporary measures to supply electricity and water during shortages in their supply. Scour protection should be installed where necessary to protect the seabed from scouring and to prevent siltation of adjacent berthing areas. Regular water depth determination and maintenance dredging to be performed when necessary. Dredging activities must comply with the requirements of Namport. All drains leading directly into sewers must be closed off, and locked where possible, to prevent any unwanted products from entering sewers should an accidental spill, pipe burst, valve malfunction, etc. occur. Where drains are present to drain wash water, these should only be opened during times of washing and closed immediately thereafter.	This should include measures taken to deal with the situation and ensure that such incidents do not repeat themselves.	
Environmental awareness training	It is imperative that staff is not only told what to do or not in terms of environmental protection, but that environmental awareness and protection becomes part of their everyday outlook and actions.	Provide environmental awareness training to all personnel on site. Training should include discussion of: ♦ Potential impacts of cannery and fishmeal production process, e.g. on the marine environment and air quality, and as a result on other residents and businesses in the area; ♦ The need to minimise such impacts; ♦ How incidences and suggestions for improvement can be reported. Provide regular environmental awareness training during normal working hours, e.g. in toolbox talks. Choose varying topics for these talks, with a focus on the marine environment. Keep training attendance register. Observe whether activities are executed in line with EMP	Register of workers that completed environmental training Compliance of workers with EMP Compile all information in a bi-annual report	Proponent

Criteria	Nature	Enhancement / Mitigation	Monitoring	Responsible Body
		requirements.		
Cumulative Impact	Addressing each of the individual impacts as discussed and recommended in the EMP would reduce the cumulative impact.	Reviewing biannual reports for any new or re-occurring impacts or problems would aid in identifying cumulative impacts and help in planning if the existing mitigations are insufficient.	None	Proponent

Table 5-3 Maintenance/decommissioning phase

Criteria	Nature	Mitigation	Monitoring	Responsible Body
Employment	Regular maintenance activities will require permanent employees or contractors and thus employment is sustained. Decommissioning of the depot may lead to retrenchments or re-location of staff no longer required.	If the skills exist locally, contractors must first be sourced from the area, then the region and then nationally. Deviations from this practice must be justified. Training and skills development must be focussed on Namibians. Skills development and improvement programs to be made available as identified during performance assessments. Employees to be informed about parameters and requirements for references upon employment. Appoint reputable contractors. Plan in advance for meeting the Labour Acts requirements for retrenching of staff if required. Where possible staff can be relocated to another similar facility.	During normal operations, appropriate plans for handling of employees should be prepared, should the facility be decommissioned. The plans should include budgeting for retrenchments and possible alternative positions elsewhere.	Proponent
Waste Production	During maintenance and decommissioning waste will be produced in the form of building rubble, obsolete equipment and structures, obsolete or residual products and equipment or structures that can be used elsewhere or sold as scrap.	To reduce the amount of waste all re-usable equipment must be removed to another site or sold. Those items that cannot be used again must be scrapped in the appropriate manner. Upon demolition of the buildings and concrete the rubble must be removed from the property and taken to an approved dumpsite designated by the Walvis Bay Municipality. Rehabilitation if necessary are to be done using funds designated for the purpose.	Regular visual inspection. A register of waste produced and disposal methods should be maintained.	Proponent; Contractor
Ecological Impact	Operations spanning many years may create new habitat for fauna and flora. During maintenance and upon decommissioning these habitats may possibly be destroyed.	Etosha Fishing would have to ensure that no new habitat is created for flora and fauna. Before maintenance or decommissioning the site needs to be inspected to ensure that the dismantling and removal of any structure would not affect any organism that has become dependent on those structures for survival, shelter or breeding.	A bi-annual report should be compiled of any fauna and flora that established itself on the premises. The report should include all actions taken to relocate or deal with	Proponent; Contractor

Criteria	Nature	Mitigation	Monitoring	Responsible Body
		Where new habitats were created, that is now occupied by fauna or flora, Etosha Fishing must contact MEFT or other appropriate organizations to establish the conservation status of it. The possibility of relocating the fauna or flora must be investigated and executed. Should the species be listed as vulnerable to extinction, or worse, a meeting should be held with MEFT in order to determine the appropriate handling of the situation.	the situation.	
Dust	Dust may be generated during the maintenance and decommissioning and might be aggravated during periods of strong winds.	It is recommended that regular dust suppression be included during maintenance and decommissioning, when dust becomes an issue. Personnel should be issued with dust masks for health and safety reasons. Accumulation of rubble should not be allowed and must be taken to the dumpsite within reasonable time. A survey should be conducted of asbestos containing material and these should be handled appropriately.	Regular visual inspection. A complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon. Asbestos survey report. All information and reporting to be included in a bi-annual report.	Proponent; Contractor
Noise	Noise pollution may exist during maintenance and decommissioning due to equipment used and heavy vehicles accessing the site perform various functions.	Follow the Labour Act's noise levels for work environments and the World Health Organization (WHO) guideline on maximum noise levels. During maintenance and decommissioning noise levels might be higher. This will however be short lived. All personnel must be issued with hearing protectors and neighbours must be notified of the time and duration of decommissioning. Notice of the start of the decommissioning should be given to the local authorities with an invitation to give feedback at any time with regards the noise impact.	A complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon. All information and reporting to be included in a bi-annual report.	Proponent; Contractor
Visual Impact	This is an impact that affects the aesthetic appearance and is linked to poor	Visual impacts could be limited by keeping all maintenance and decommissioning areas clean and orderly at all times.	A complaints register must be maintained, in which any	Proponent; Contractor

Criteria	Nature	Mitigation	Monitoring	Responsible Body
	housekeeping and inadequate maintenance of the facility.	Good housekeeping also reduces the risk of injuries. Notice of the start of the decommissioning should be given to the local authorities with an invitation to give feedback at any time with regards the visual impact.	complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon. All information and reporting to be included in a bi-annual report.	
Groundwater, Surface Water and Soil Contamination	Close proximity to the ocean can result in pollution of the marine environment. Porous surface substrate can allow unwanted hazardous and ecologically detrimental substances to seep down to the water table. This, together with surface runoff may be an avenue for pollutants to enter the ocean.	All precautions are to be taken to prevent contamination of the soil as this could enter the ecosystem. Leakages from vehicles might occur especially if they are serviced on site. Care must be taken to avoid contamination of soil and groundwater. Groundwater might spread pollutants to neighbouring receptors and may create an impact on underground utilities (i.e. fresh water supply to buildings, sewerage system). Pollutants in the soil and building rubble must be transported away from the site to an approved, appropriately classified waste disposal site. Confirm MSDS information for any remaining chemicals such as fuels that must be discarded. Regulations on sewerage discharge and the chemicals that may and may not be put into the sewerage system must be followed.	Report form for all spills or leaks is to be completed by the contractor for Etosha Fishing. All information and reporting to be included in a bi-annual report.	Proponent; Contractor
Health, Safety and Security	During maintenance and decommissioning health and safety will be present. Risks will be similar as to those of the operational phase.	Maintenance and decommissioning activities require: ♦ Proper training of operators; ♦ First aid treatment; ♦ Medical assistance; ♦ Emergency treatment; ♦ Prevention of inhalation of fumes (fuel); ♦ Protective clothing, footwear, gloves and belts; safety goggles and shields; ♦ Manuals and training regarding the correct handling of materials and packages should be in place and updated as new or updated material safety data sheets become	A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat itself. All information and reporting to be included in a bi-annual report.	Proponent; Contractor

Criteria	Nature	Mitigation	Monitoring	Responsible Body
		available; Risks might be lower but still exist especially if tanks must be entered for inspections. Confined Space Training will be required. ♦ 24-hour security surveillance in case of opportunistic activities.		
Fire and Explosion Hazard	Residual hydrocarbons and other fuels could be present and might pose a risk to the teams maintaining or dismantling the various structures. Fire and/or explosion events are still possible.	Various international occupational health and safety performances should be consulted for specific regulations regarding maintenance and decommissioning of the facility to ensure all risks are mitigated. All relevant regulations and precautions should be in place as it was during the operational phase. In addition to this, all personnel have to be sensitised about responsible fire protection measures and good housekeeping such as the removal of flammable materials including rubbish, dry vegetation, and hydrocarbon-soaked soil from the vicinity of the fuel storage facility. Regular inspections should still be carried out to inspect and test firefighting equipment and pollution control materials at the fuel storage facility. All fire precautions and fire control at the fuel storage facility must be in accordance with SANS, or better. The holistic fire protection and prevention plan should still be utilised.	A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat itself. All information and reporting to be included in a bi-annual report.	Proponent; Contractor

6 CONCLUSIONS

The above updated EMP, if properly implemented will help continually minimise adverse impacts on the environment. Where impacts occur, immediate action must be taken to reduce the escalation of effects associated with these impacts. To ensure the relevance of this document to the specific stage of project, it needs to be reviewed throughout all phases.

The updated EMP should be used as an on-site reference document during all phases of the proposed project, and auditing should take place in order to determine compliance with the EMP for the proposed site, and Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken.

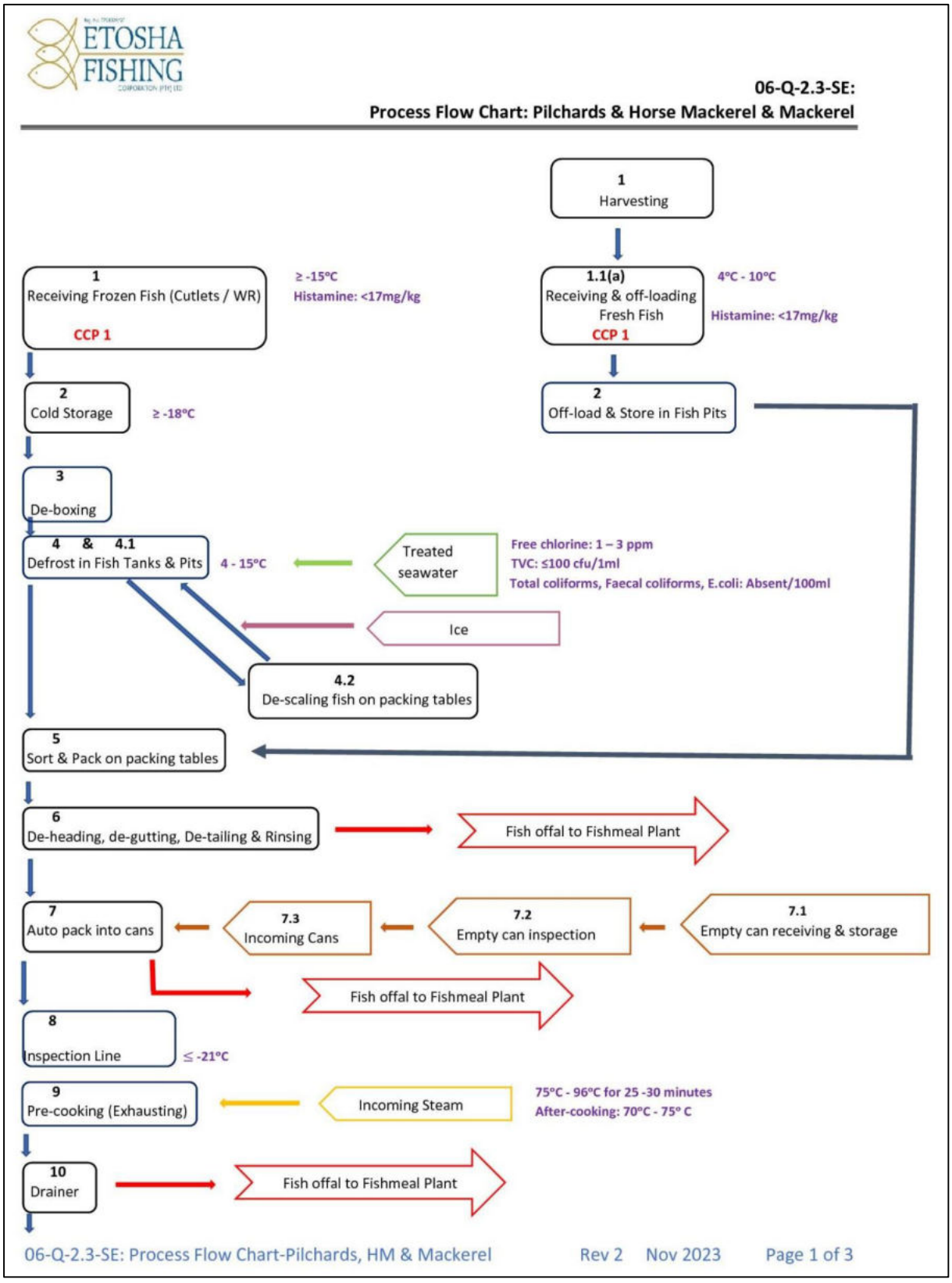
Monitoring reports must be submitted to the Ministry of Environment, Forestry and Tourism every six months to allow for the future renewal of the ECC.

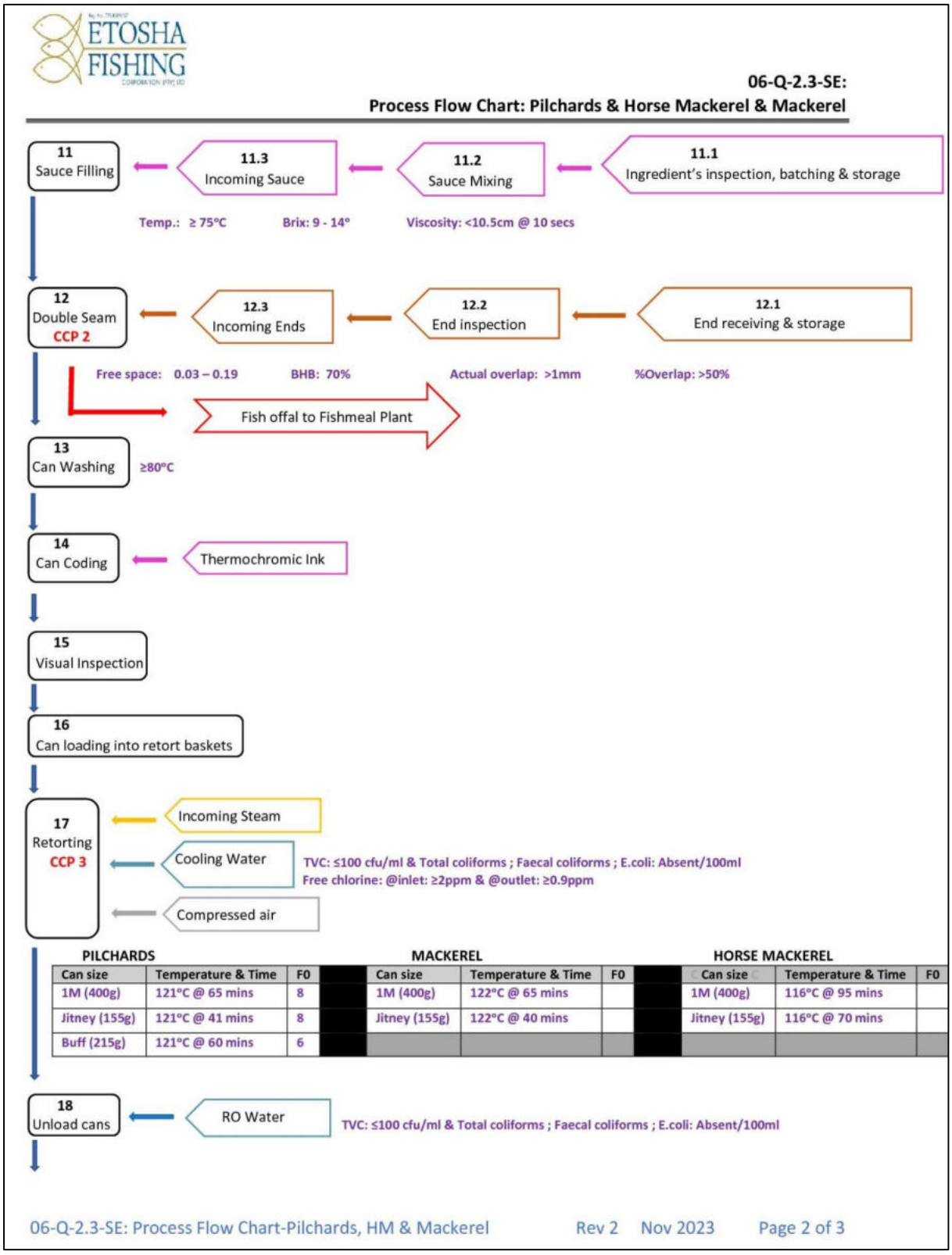
7 REFERENCES

Botha P, Faul A, Hooks P, Brews L; 2015 February; Updated Environmental Assessment Report for the Activities Associated with the Industrial and Manufacturing Processes at Etosha Fishing Corporation, Walvis Bay

Faul A, Botha P. 2018. Updated Environmental Management Plan for the Activities Associated with the Industrial and Manufacturing Processes at Etosha Fishing Corporation, Walvis Bay.

Appendix A Fish canning process flow diagram


ETOSHA FISHING
06-Q-2.3-SE:
Process Flow Chart: Pilchards & Horse Mackerel & Mackerel
1 Harvesting
1 Receiving Frozen Fish (Cutlets / WR)
CCP 1
≥ -15°C
Histamine: <17mg/kg
1.1(a) Receiving & off-loading Fresh Fish
CCP 1
4°C - 10°C
Histamine: <17mg/kg
2 Cold Storage
≥ -18°C
2 Off-load & Store in Fish Pits
3 De-boxing
4 & 4.1 Defrost in Fish Tanks & Pits
4 - 15°C
Treated seawater
Free chlorine: 1 – 3 ppm
TVC: ≤100 cfu/1ml
Total coliforms, Faecal coliforms, E.coli: Absent/100ml
Ice
4.2 De-scaling fish on packing tables
5 Sort & Pack on packing tables
6 De-heading, de-gutting, De-tailing & Rinsing
Fish offal to Fishmeal Plant
7 Auto pack into cans
7.3 Incoming Cans
7.2 Empty can inspection
7.1 Empty can receiving & storage
Fish offal to Fishmeal Plant
8 Inspection Line
≤ -21°C
9 Pre-cooking (Exhausting)
Incoming Steam
75°C - 96°C for 25 -30 minutes
After-cooking: 70°C - 75° C
10 Drainer
Fish offal to Fishmeal Plant
06-Q-2.3-SE: Process Flow Chart-Pilchards, HM & Mackerel Rev 2 Nov 2023 Page 1 of 3



PILCHARDS

Can size	Temperature & Time	F0
1M (400g)	121°C @ 65 mins	8
Jitney (155g)	121°C @ 41 mins	8
Buff (215g)	121°C @ 60 mins	6

MACKEREL

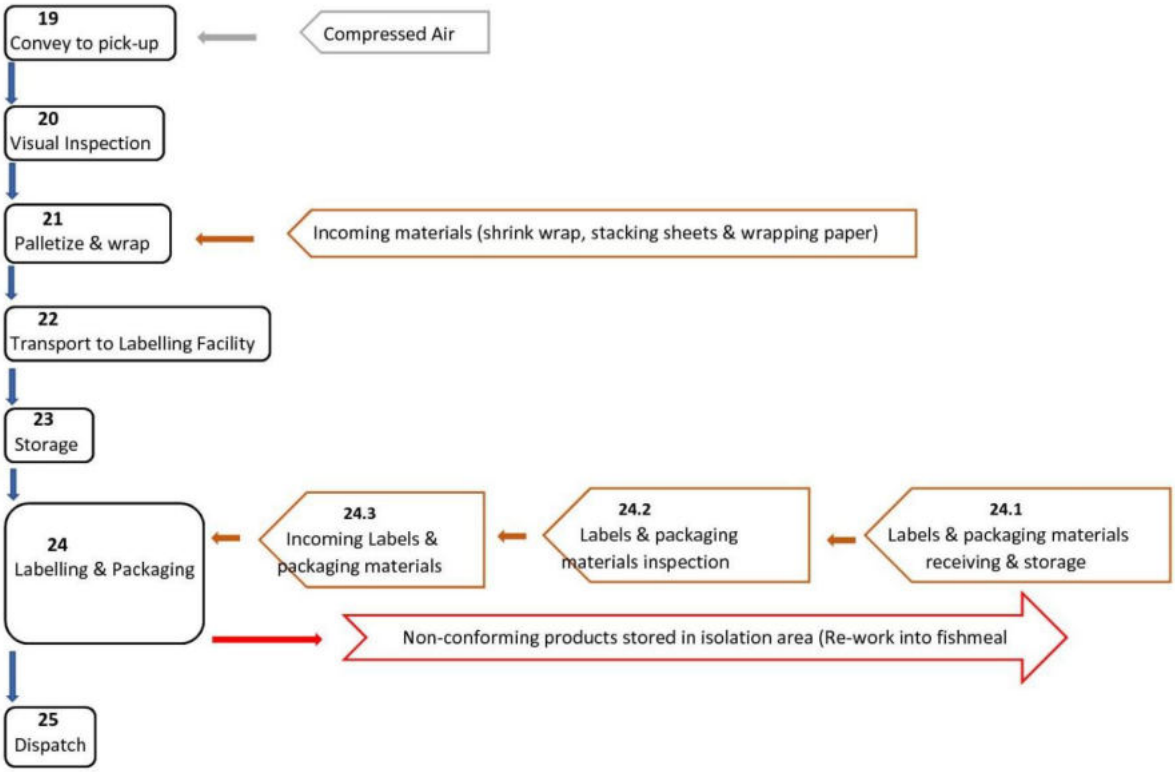
Can size	Temperature & Time	F0
1M (400g)	122°C @ 65 mins	
Jitney (155g)	122°C @ 40 mins	

HORSE MACKEREL

Can size	Temperature & Time	F0
1M (400g)	116°C @ 95 mins	
Jitney (155g)	116°C @ 70 mins	

ETOSHA FISHING

06-Q-2.3-SE:
Process Flow Chart: Pilchards & Horse Mackerel & Mackerel

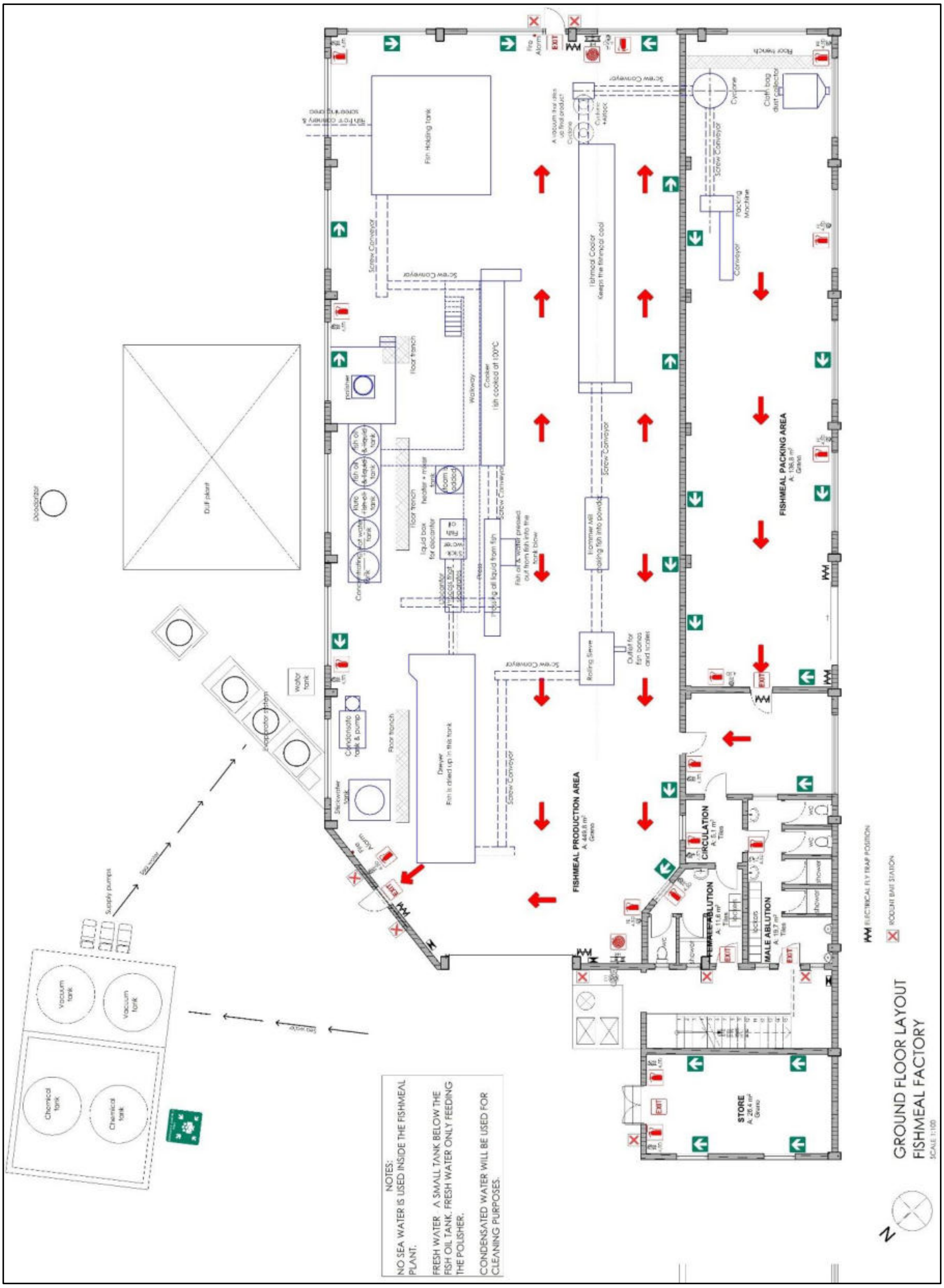


Verification & Approval By:

HACCP TEAM MEMBER	JOB TITLE	DATE	SIGNATURE

06-Q-2.3-SE: Process Flow Chart-Pilchards, HM & Mackerel Rev 2 Nov 2023 Page 3 of 3

Appendix B Fishmeal production layout and flow chart


GROUND FLOOR LAYOUT
FISHMEAL FACTORY
SCALE 1:100
FISHMEAL PRODUCTION AREA
FISHMEAL PACKING AREA
CIRCULATION
FEMALE ABLUTION
MALE ABLUTION
STORE
Dryer
Cooker
Fishmeal Cooler
Fish Holding tank
Duf plant
Rolling Sieve
Hammer Mill
Evaporator station
Vacuum tank
Chemical tank
ELECTRICAL FLY TRAP POSITION
RODENT BAIT STATION
NOTES:
NO SEA WATER IS USED INSIDE THE FISHMEAL PLANT.
FRESH WATER - A SMALL TANK BELOW THE FISH OIL TANK. FRESH WATER ONLY FEEDING THE POLISHER.
CONDENSATED WATER WILL BE USED FOR CLEANING PURPOSES.