

**APP-004066**

**STORAGE AND HANDLING OF RADIOACTIVE SOURCE MATERIAL ON ERF  
3954, SWAKOPMUND, ERONGO REGION**

**ENVIRONMENTAL RADIATION MANAGEMENT PLAN**



**Assessed by:**

**Assessed for:**



**Namaquanum Investment  
Two CC**

July 2024

<b>Project:</b>	<b>STORAGE AND HANDLING OF RADIOACTIVE SOURCE MATERIAL ON ERF 3954, SWAKOPMUND, ERONGO REGION: ENVIRONMENTAL RADIATION MANAGEMENT PLAN</b>	
<b>Report Version/Date:</b>	Final July 2024	
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<b>Cite this document as:</b>	Faul A, Bosman Q, Pelser E. July 2024. Storage and Handling of Radioactive Source Material on erf 3954, Swakopmund, Erongo Region: Environmental Radiation Management Plan	
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## **1 BACKGROUND AND INTRODUCTION**

Namaquanum Investment Two CC (the Proponent) has an existing workshop on erf 3954, Einstein Street, in the industrial area (Extension 10) of Swakopmund, Erongo Region. The Proponent plans to refurbish the workshop and to construct a dedicated storage facility for radioactive source material used to calibrate and test logging while drilling (LWD) equipment used in the oil and gas exploration industry. Clients from the exploration industry will utilise the workshop and source materials on erf 3954, to perform the necessary calibrations and tests on their LWD equipment. In general, project development and operations of the facility involve:

## **2 ENVIRONMENTAL MANAGEMENT AND RADIATION PLAN**

The ERMP provides management options to ensure impacts of the facility is minimised. An ERMP is a tool used to take pro-active action by addressing potential problems before they occur. The ERMP is partly based on the operator specific operational procedures and radiation management plan (RMP). The ERMP and RMP should limit the corrective measures needed, although additional mitigation measures might be included if necessary. The environmental management measures are provided in the descriptions below. These management measures should be adhered to during the various phases of the operation of the facility. This section of the report can act as a stand-alone document. All personnel taking part in the operations of the facility should be made aware of the contents in this section, so as to plan the operations accordingly and in an environmentally sound manner.

The objectives of the ERMP are:

- ◆ to include all components of construction activities (construction, upgrades, maintenance, etc.) and operations of the facility;
- ◆ to prescribe the best practicable control methods to lessen the environmental impacts associated with the project;
- ◆ to monitor and audit the performance of operational personnel in applying such controls; and
- ◆ to ensure that appropriate environmental training is provided to responsible operational personnel.

### **2.1 IMPLEMENTATION OF THE ERMP**

Various potential and definite impacts will emanate from the construction, operations and decommissioning phases. The majority of these impacts can be mitigated or prevented. The impacts, risk rating of impacts as well as prevention and mitigation measures are listed below.

Impacts related to the operational phase are expected to mostly be of medium to low significance and can mostly be mitigated to have a low significance. The extent of impacts are mostly site specific to local and are not of a permanent nature. Due to the nature of the surrounding areas, cumulative impacts are possible and include groundwater contamination and health risks and radiation impacts.

#### **2.1.1 Planning**

During the phases of planning for future operations, construction and decommissioning of the facility, it is the responsibility of Proponent to ensure they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to and during all phases, to ensure potential impacts and risk are minimised. The following actions are recommended for the planning phase and should continue during various other phases of the project:

- ◆ Ensure that all necessary permits from the various ministries, local authorities and any other bodies that governs the construction and operational activities of the project are in place and remains valid.
- ◆ Ensure all appointed contractors and employees are enter into an agreement which includes the ERMP. Ensure that the contents of the ERMP are understood by the contractors, sub-contractors, employees and all personnel present or who will be present on site.
- ◆ Make provisions to have a radiation safety officer (RSO) on site who will be responsible for implementation of relevant standards for the storage, use and shipping

of radioactive sources. The RSO oversees the local radiation monitoring program for the area and personnel and ensures all local personnel are trained as per global requirements

- ◆ Make provisions to have a health, safety and environmental (HSE) coordinator to implement the ERMP and oversee occupational health and safety as well as general environmental and radiation related compliance at the site.
- ◆ Make provisions to have a community liaison officer on site who will handle complaints and community input, and through whom, where reasonable, monitoring data can be requested. Communicate the contact details of the community liaison officer to interested and affected parties when the project is initiated.
- ◆ Have the following on site, reasonable, to deal with all potential emergencies:
  - Radiation management plan / ERMP / emergency response plans and HSE manuals
  - Emergency response equipment, first aid kits, fire detection and firefighting equipment, dosimeters, security systems, etc.
  - Adequate protection and indemnity insurance cover for incidents.
- ◆ If one has not already been established, establish and maintain a fund for future ecological restoration of the project site should project activities cease and the site is decommissioned and environmental restoration or pollution remediation is required.
- ◆ Establish and / or maintain a reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the ERMP.
- ◆ Prepare and submit environmental monitoring reports as per the conditions of the environmental clearance certificate.
- ◆ Appoint a specialist environmental consultant to update the environmental assessment and ERMP and apply for renewal of the ECC prior to expiry.

The typical main RSO and HSE tasks of international companies who may utilise the LWD tool calibration and testing facility are presented in

**Table 2-1 Main RSO and HSE tasks at country, regional and global level**

Level	Position	Task
Country	RSO	Implementation of relevant standards for the storage, use and shipping of radioactive sources. The RSO oversees the local radiation monitoring program for the area and personnel and ensures all local personnel are trained as per global requirements.
	HSE	Responsible for ensuring all radioactive activities are conducted as per local HSE requirements as outlined in the local emergency response plan.
Region	RSO	Reviews country quarterly audits, ensure training requirements are as per standards.
	HSE	Supports the country HSE in implementing HSE standards and reviewing local emergency response plan.
Global	RSO	Implements and reviews global standards, ensure RSO training is active and appointment letters for RSO are approved. Responsible to reviewing any non-conformance events. Oversees the radiation monitoring program implemented in each country
	HSE	Communicates the company strategy relating to radioactive source usage

### **2.1.2 Employment**

Appointment of consultants already realises during the planning phase. This include those responsible for design, engineering and permitting (e.g. town planning and environmental). During the construction phase, various contractors will be appointed to, among others, transport building materials and equipment to the site, upgrade, construct and install various components of the warehouse and related support infrastructure, installation of services, etc. Local consultants, contractors, and their employees, are thus supported, and their livelihoods sustained, during the planning and construction phases. Some aspects may require expertise not locally available, in which case foreign consultants or contractors may be used.

As the proposed project is a completely new venture, it will require appointment of a completely new employee base. This will include unskilled, semi-skilled and specialist employees to perform all tasks from site cleaning, security, office administration to the highly specialised activities involved with testing and calibration of LWD equipment. Employment will be sourced locally, however specialised skills may not be locally available and may be sourced from outside of Namibia.

**Desired outcome:** To maximise the appointment of Namibian consultants, contractors and employees to contribute to the reduction in overall unemployment.

#### **Actions**

##### **Enhancement:**

- ◆ Employ local Namibians as far as practically possible. If the skills exist locally, employees must first be sourced from the town, then the region and then nationally.
- ◆ Appointment of highly specialised foreign contractors must be in line with the requirements of the Ministry of Home Affairs, Immigration, Safety and Security.

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Labour Act
- ◆ Immigration Control Act
- ◆ Bi-annual summary report based on employee records with employee contracts on file.

### **2.1.3 Skills, Technology and Development**

During the various phases of planning, construction and operations, knowledge sharing and skills transfer will take place. Training will be provided to a portion of the workforce to be able to maintain and operate various features of a facility according to the required standards. Skills may be transferred to an unskilled workforce for general tasks. The technology required for the development of the facility is new to the local industry. International experts will thus be involved and local contractors and employees will be exposed to their knowledge and expertise. Development of people and technology are key to economic development.

**Desired outcome:** To see an increase in skills of local Namibians, as well as development and technology advancements in associated industries.

#### **Actions**

##### **Enhancement:**

- ◆ If the skills exist locally, contractors and employees must first be sourced from the town, then the region and then nationally. Deviations from this practice must be justified.
- ◆ 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.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ Records should be kept of training provided.
- ◆ Ensure that all training is certified or managerial reference provided (proof provided to the employees to improve their future employability) inclusive of training attendance, completion and implementation.

#### **2.1.4 Revenue Generation and Economic Development**

The change in land use will lead to changes in the way revenue is generated and paid to the national treasury. An increase of skilled and professional labour has already, and will continue to take place, due to the planning, construction and operational phases of the facility. As such, payment of income tax to the National treasury increases. The Proponent will also support local businesses and contractors for the procurement of services and goods. The presence of the facility may ultimately contribute to local opportunities for new businesses to establish and thus growth and economic development in the town's business sector.

**Desired outcome:** Contribution to national treasury and sustaining of livelihoods of local Namibian businesses and employees.

##### **Actions**

###### **Enhancement:**

- ◆ Employ local Namibian contractors and employees as far as practically possible. If the skills exist locally, contractors and employees must first be sourced from the town, then the region and then nationally.
- ◆ Remuneration of employees, contributions to social security, payment of taxes, etc. in line with Namibian legislation.
- ◆ Support local businesses and suppliers of services if available.

###### **Responsible Body:**

- ◆ Proponent

###### **Data Sources and Monitoring:**

- ◆ Labour Act, Income Tax Act
- ◆ Employment and financial records kept on file



## **2.2 IDEALS AND ASPIRATIONS FOR THE FUTURE**

During the environmental assessment, public consultation was conducted with neighbours and interested and or affected parties. Information shared with the parties resulted in concern for their aspirations for the future. This was mainly due to misunderstanding the proposed project and/or the spread of misinformation on social media and the press. The main concern raised were that the facility will create a dangerous environment to work or live in and that, as a result of this, the local tourism industry will be negatively affected, thereby impacting livelihoods of many local businesses. The words “nuclear” and “radioactive” immediately raises concerns and if that is coupled to “waste” it is even more concerning.

It is often the “unknown” that causes concern. Various items encountered during your normal comings and goings may contain radioactive isotopes that one is not even aware about. As it is, equipment containing radioactive sources are used and stored throughout Namibia, often under much less stringent safety and security measures than what is proposed for the Proponent’s facility. Such equipment include handheld gamma radiography equipment, a non-destructive testing method used to validate the integrity of poured concrete and welds on fluid vessels, pipelines, or critical structural elements; handheld x-ray fluorescence analysers used for example in the mineral exploration industry; and radioisotopes used for the treatment of certain types of cancer.

For another sector of society, the proposed project has a positive impact on their ideals and aspirations for the future. These are those who may benefit from employment in the oil and gas sectors and who sees these sectors as potentially benefiting the whole of Namibia. For them, the support industries that will assist the oil and gas industries to realise, are beneficial, even if they themselves do not directly benefit from such support industries.

**Desired Outcome:** Continued sharing of accurate and easily understandable information and planned activities with IAPs and governing agencies to address fears and misinformation. Maintaining an open door policy with neighbours and employees.

### **Actions**

#### **Enhancement:**

- ◆ Information sharing about the proposed project that addresses misinformation and explain in laymen’s terms the potential risks and the safety and security measures preventing or mitigating these risks. This report being a main contributor to the sharing of such information.
- ◆ Major changes in operations, proposed expansions and or decommissioning activities should be made available to governmental agencies and interested and affected parties.
- ◆ Open communication regarding future development and employment opportunities to employees, through employees’ management structures.

#### **Responsible Body:**

- ◆ Proponent

#### **Data Sources and Monitoring:**

- ◆ Records kept of all information shared with authorities, neighbours and employees.

### **2.2.1 Demographic Profile and Community Health**

The project is reliant on labour during the construction and operational phases. The scale of the project is limited and it is not foreseen that it will create a change in the demographic profile of the local community (in-migration). Community health may be exposed to factors such as communicable disease and alcoholism/drug abuse associated with increased spending power of employees and the potential influx of foreigners into the area.

**Desired Outcome:** To prevent the in-migration and growth in informal settlements and to prevent the spread of communicable diseases and prevent / discourage socially deviant behaviour.

#### **Actions:**

##### **Prevention:**

- ◆ 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 for the various facilities and sanitation requirements.

##### **Mitigation:**

- ◆ Educational programmes for employees on communicable diseases, alcohol and drug abuse and general upliftment of employees' social status.
- ◆ Appointment of reputable contractors.

#### **Responsible Body:**

- ◆ Proponent

#### **Data Sources and Monitoring:**

- ◆ Facility inspection sheet for all areas which may present environmental health risks, kept on file.
- ◆ Bi-annual summary report based on educational programmes and training conducted.
- ◆ Bi-annual report and review of employee demographics.

### 2.2.2 Radiation from Radioactive Isotopes

During the operational phase of this facility, radioactive isotopes will be stored and used in a designated areas. Radioactive isotopes, if not handled correctly, have the potential to cause serious harm to people and the environment through the ionising radiation it produces. However, the risks are well understood and effective risk prevention methods and equipment are available. These have and continue to allow radioactive isotopes to be used worldwide within populated areas and the workplace to the benefit of humanity. A common example is the radioactive isotopes used to treat cancer patients.

**Desired outcome:** To ensure radiation exposure remains within the prescribed levels and prevent potential incidents that may increase the probability of radiation related exposure among workers or the public.

#### Actions

##### **Prevention:**

- ◆ Adhere to the Health and Safety Regulations of the Labour Act and the Regulations of the Atomic Energy and Radiation Protection Act aimed at the protection of workers against ionizing radiation.
- ◆ Implement the ERMP and ensure that all employees or contractors who are present on site or who will handle the sources are trained in the implementation of the ERMP.
- ◆ Develop and implement an emergency response plan.
- ◆ Only suitably qualified persons may handle radioactive sources and no female employee who is, or who is likely to be pregnant, may work in any area where she may be exposed to ionizing radiation.
- ◆ Regular toolbox talks should be conducted.
- ◆ Transport of radioactive sources should at all times be by an authorised transport company with a verified track record.
- ◆ The bunker must be constructed (and maintained) according to the specifications as specified in this report or better.
- ◆ The appropriate signage must be placed on the bunker and its fence to warn of the potential hazard of its contents. Signage should be multilingual in order to cater for the most common native languages spoken.
- ◆ Strict, 24 hour security measures inclusive of intruder alarms and security personnel should be on site to prevent the possibility of theft of the sources.
- ◆ Keep radiation decontamination kits on site, inclusive of a backup water supply in case of water supply interruptions and a contamination event coincides.
- ◆ All sources must at all times be stored within their applicable pigs with the correct shielding (i.e. lead for Cs-137 and polyethylene for Am-241Be) and in the bunker.
- ◆ Only one source should be removed from the bunker at a time for purposes of calibration and testing of LWD tools.
- ◆ The source should be taken to the workshop inside the pig and only removed immediately before it will be used and with the correct handling tool.
- ◆ The source should be returned to the pig immediately after its use and returned to the bunker.
- ◆ The bunker should be surveyed for radioactivity each time before a pig is removed and after it is returned.
- ◆ Regular leak tests should be performed on the pigs according to industry standards.
- ◆ Provide all employees with required and adequate personal protective equipment (PPE).
- ◆ All persons on site, who may potentially be exposed to radiation, especially those working with the sources, must wear radiation monitoring devices (e.g. dosimeters) and radiation exposure reports must be prepared regularly to ensure radiation exposure levels are not exceeded.
- ◆ Radiation monitoring devices should be placed on at least the boundary wall between the Proponent's erf and direct neighbours. Radiation exposure reports must be prepared regularly to ensure radiation exposure levels are not exceeded. This will not

only ensure the safety of the public, but will also provide the Proponent with information to present to the public should concerns regarding radiation be raised.

- ◆ Implement a maintenance register for the bunker and all equipment whose failure may result in accidental ionizing radiation.
- ◆ Any source that becomes obsolete must be returned to its manufacturer for disposal and all safety and security procedures must continue to be implemented in its storage and handling until it is returned to the supplier.

**Mitigation:**

- ◆ Selected personnel should be trained in first aid and a first aid kit must be available on site. The contact details of all emergency services must be readily available.
- ◆ Minimize radiation exposure for those workers working with the sources by using the three common methods of, distance from the source, shielding from the source and time working with and in proximity to the source.
- ◆ Medicals for those workers exposed to radiation at intervals of every six months or as directed by the NRPA.
- ◆ Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool, which includes: colour coding of pipes, operational, safe work and medical procedures, permits to work, emergency response plans, housekeeping rules, MSDS's and signage requirements (PPE, radiation etc.).
- ◆ Implement the ERP and notify the NRPA should any incident occur that puts workers or the public at risk.
- ◆ In case a leaking SRS has been identified during post surveys or leak tests, the following steps shall be taken by an authorized person:
  - A. Prevent the spread of contamination of the accident by applying the S.W.I.M. method as follows:
    - I. Stop the source of the leak.
      - a. Place the source in its transport shield or container and lock the container.
      - b. Do not move the transport shield or container.
    - II. Warn other personnel in the area to evacuate the area immediately.
    - III. Isolate the area and establish contaminated and clean zones.
      - a. To prevent the spread of contamination, perform a radiation survey of all personnel entering and exiting the area verifying the source of any radiation exposure identified.
      - b. Quarantine any personnel that could be contaminated in a restricted area immediately outside the contaminated area.
    - IV. Minimize exposure by restricting your access to the contaminated zone and increasing the distance between personnel and the radioactive material. Do not leave the source unattended during this time.
  - B. Immediately notify the GRISO of the location, time, source, and extent of the leakage.
  - C. Don protective clothing, nitrile gloves, safety glasses and shoe covers.
  - D. Survey the affected area to identify and document any contaminated personnel or areas.
  - E. Circle any identified contaminated area or personnel using waterproof felt tip marker.
  - F. Begin decontamination with areas of lowest contamination first and work from the edges inward.
    - I. In a water deficient environment, gently brush surface of contaminated area to remove and dislodge contamination.
    - II. In a water sufficient environment, wash contaminated area (or have patients/victims wash themselves) with tepid water and soap, without damaging or abrading contaminated surface.
    - III. Add mild soap (neutral pH) to water to emulsify and dissolve contamination.
    - IV. Direct contaminated wastewater directly into a collection receptacle rather than over uncontaminated areas.
    - V. Use disposable washcloths, gauze pads or surgical sponges to avoid recontamination.

- VI. Place all cloths, pads, or sponges used on the contaminated employee or area into a single, airtight container (e.g. property bag) and label with:
- a. Employee's name (if applicable)
  - b. Date and time of collection
  - c. Location of collection
  - d. Radiation warning label
- G. Store property bags, contaminated water, and other contaminated supplies in secure location designated by RSO for appropriate disposal.
- H. Perform two decontamination cycles with a radiation survey after each cycle.
- I. Repeat this process until the release limits are below set action limits as provided by the NRPA.
- J. Wrap the transport container or shield in a non-permeable plastic cover such as shrink wrap or garbage bags and seal closed using duct tape or similar product.

**Responsible Body:**

- ◆ Proponent
- ◆ Contractors

**Data Sources and Monitoring:**

- ◆ Health and Safety Regulations of the Labour Act
- ◆ Regulations of the Atomic Energy and Radiation Protection Act
- ◆ Record should be kept of all training provided to workers.
- ◆ Records should be kept of dosimeter cumulative radiation exposure monitoring and all radiation related surveys (e.g. leak tests).
- ◆ Records should be kept of radiation monitoring at areas around the facility and radiation hotspots.

### 2.2.3 Health, Safety and Security (Excluding Radiation)

Construction and operations requires the handling of various products and equipment that can potentially harm the handler or nearby persons. This include working at heights, heavy lifting, moving parts, handling chemicals, tripping and falling, etc. Security risks are related to unauthorized entry, theft and sabotage.

**Desired Outcome:** To prevent injury, health impacts and theft.

#### **Actions**

##### **Prevention:**

- ◆ All Health and Safety Regulations specified in the Labour Act should be complied with.
- ◆ Ensure that all personnel receive adequate training on operation of equipment / handling of hazardous substances.
- ◆ Clearly label dangerous and restricted areas as well as dangerous equipment and products.
- ◆ Provide all employees with required and adequate personal protective equipment (PPE).
- ◆ Implementation of maintenance register for all equipment and fuel/hazardous substance storage areas.
- ◆ Equipment must be locked away on site in a way that does not encourage unauthorised access and / or criminal activities (e.g. theft).
- ◆ Security procedures and proper security measures must be in place to protect workers and clients.
- ◆ Strict security that prevents unauthorised entry during construction and operational phases.

##### **Mitigation:**

- ◆ Selected personnel should be trained in first aid and a first aid kit must be available on site. The contact details of all emergency services must be readily available.
- ◆ Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool, which includes: colour coding of pipes, operational, safe work and medical procedures, permits to work, emergency response plans, housekeeping rules, MSDS's and signage requirements (PPE, flammable etc.).

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ Any incidents must be recorded with action taken to prevent future occurrences.
- ◆ A report should be compiled every 6 months of all incidents reported. The report should contain dates when training were conducted and when safety equipment and structures were inspected and maintained.

#### **2.2.4 Traffic**

The presence of the facility may increase traffic flow to the site during both construction and operations. An increase in traffic to the and from the site may, but probably will not, increase congestion and increase the risk of incidents and accidents.

**Desired Outcome:** Minimum impact on traffic and no transport or traffic related incidents.

#### **Actions**

##### **Prevention:**

- ◆ Erect clear signage regarding access and exit points at the facility.
- ◆ Trucks delivering equipment may not block entrances or parking areas of nearby businesses.

##### **Mitigation:**

- ◆ If any traffic impacts are expected, traffic management should be performed to prevent these.

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Any complaints received regarding traffic issues should be recorded together with action taken to prevent impacts from repeating itself.
- ◆ A report should be compiled every six months of all incidents reported, complaints received, and action taken.

### 2.2.5 Fire

Construction and operational activities may increase the risk of the occurrence of fires as a result of storage of fuel (diesel in the standby generator) and chemicals (e.g. solvents for painting during construction) or the creation of sparks by equipment such as grinders. The site is located in an industrial area and is easily accessible for firefighting trucks and teams. The nature of the operation does not pose a significant fire risk.

**Desired Outcome:** To prevent property damage, possible injury and impacts caused by uncontrolled fires.

#### **Actions:**

##### **Prevention:**

- ◆ A holistic fire protection and prevention plan is needed. This plan must include an emergency response plan, firefighting plan.
- ◆ Fire extinguishers must be placed throughout the facility. Although a fire at the bunker is highly unlikely (it is not constructed from any flammable materials), a fire detection and suppression system dedicated to the bunker is still recommended.
- ◆ Train selected personnel in firefighting at a level adequate for the products and operations on site.
- ◆ Ensure all chemicals are stored according to MSDS instructions.
- ◆ Maintain regular site, mechanical and electrical inspections and maintenance.
- ◆ Maintain firefighting equipment, good housekeeping and personnel training (firefighting, fire prevention and responsible housekeeping practices).

##### **Mitigation:**

- ◆ Implement the emergency response plan and firefighting plan and notify emergency services.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ 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 themselves.
- ◆ A report should be compiled every six months of all incidents reported. The report should contain dates when fire drills were conducted and when fire equipment was tested and training given.



### 2.2.6 Noise

Noise pollution will exist due to heavy and light motor vehicles accessing the site during the construction and operational phases. Construction (maintenance and upgrade) may generate short term excessive noise.

**Desired Outcome:** To prevent any nuisance and hearing loss due to noise generated.

#### **Actions**

##### **Prevention:**

- ◆ Follow Health and Safety Regulations of the Labour Act to protect workers and World Health Organization (WHO) guidelines on community noise (Guidelines for Community Noise, 1999) to prevent nuisances to neighbours.

##### **Mitigation:**

- ◆ Hearing protectors as standard PPE for workers in situations with elevated noise levels.
- ◆ All machinery must be regularly serviced and placed on vibration dampers where required to ensure minimal noise production.
- ◆ All vehicles of the contractors and Proponent's must have adequate noise dampening installed and should not be left idling for prolonged periods.
- ◆ Forklifts and other vehicles on site can be fitted with white noise audible warning systems and flashing / strobe lights to minimize the noise impacts typically created by the typical audible signals of these equipment.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ Health and Safety Regulations of the Labour Act and WHO Guidelines.
- ◆ Maintain a complaints register.
- ◆ Bi-annual report on complaints and actions taken to address complaints and prevent future occurrences.

### 2.2.7 Waste Production

Various forms of waste are produced during the construction and operational phases. Waste may include hazardous waste associated with the decommissioning of radioactive sources and any material accidentally contaminated by radioactivity. Under normal operations, the facility will produce no radioactive waste other than possibly obsolete sources. Domestic waste is generated by the facility and related operations. Waste presents a contamination risk and when not removed regularly may become a fire hazard. Construction waste may include building rubble and discarded equipment contaminated by hydrocarbon products. Hydrocarbon contaminated soil and water is considered as a hazardous waste.

**Desired Outcome:** To reduce the amount of waste produced, and prevent pollution, especially radioactive in nature, and littering.

#### **Actions**

##### **Prevention:**

- ◆ A waste management plan should be developed and implemented.
- ◆ Waste reduction measures should be implemented and all waste that can be re-used / recycled must be kept separate.
- ◆ Ensure adequate temporary waste storage facilities are available.
- ◆ Ensure waste cannot be blown away by wind.
- ◆ Prevent scavenging (human and non-human) of waste storage.
- ◆ Ensure obsolete radioactive sources remain stored and handled in a similar way as those still in use (i.e. in pigs and in the bunker) until they can be shipped back to the supplier.

##### **Mitigation:**

- ◆ Waste should be disposed of regularly and at appropriately classified disposal facilities, this includes hazardous material (empty chemical containers, contaminated rugs, paper water and soil).
- ◆ See the material safety data sheets available from suppliers for disposal of contaminated products and empty containers.
- ◆ Liaise with the municipality regarding waste and handling of hazardous waste.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A register of hazardous waste disposal should be kept. This should include type of waste, volume as well as disposal method/facility.
- ◆ Any complaints received regarding waste should be recorded with notes on action taken.
- ◆ The oil water separator must be regularly inspected and all hydrocarbons removed once detected. Outflow water must comply with effluent quality standards.
- ◆ All information and reporting to be included in a bi-annual report.

### **2.2.8 Ecosystem and Biodiversity Impact**

The nature of the operational activities is such that the probability of creating a habitat for flora and fauna to establish is low. No significant impact on the biodiversity of the area is predicted as the site is currently void of natural fauna and flora. Impacts are therefore mostly related to pollution of the environment.

**Desired Outcome:** To avoid pollution of and impacts on the ecological environment.

**Actions.**

**Mitigation:**

- ◆ Report any extraordinary animal sightings 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.
- ◆ Prevent scavenging of waste by fauna.
- ◆ The establishment of habitats and nesting sites at the facility should be prevented where possible.

**Responsible Body:**

- ◆ Proponent

**Data Sources and Monitoring:**

- ◆ All information and reporting to be included in a bi-annual report.

### **2.2.9 Groundwater, Surface Water and Soil Contamination**

Operations entail the storage and handling of various radioactive sources which may present a contamination risk if the container of the source fails. Such material may contaminate surface water, soil and groundwater. Similarly, diesel oil or hydraulic fluid spills can also contaminate soil where concrete surface cover is not present.

**Desired Outcome:** To prevent the contamination of water and soil.

#### **Actions**

##### **Prevention:**

- ◆ Training of operators of equipment must be conducted on a regular basis.
- ◆ All products that can potentially pollute water or soil must be stored according to their MSDS instructions and industry accepted standards.
- ◆ The procedures followed to prevent environmental damage during service and maintenance, and compliance with these procedures, must be audited and corrections made where necessary.

##### **Mitigation:**

- ◆ Any radiation leaks must be reported to the relevant authorities and the ERP implemented.
- ◆ Refer to section 2.2.2 for procedures if a leak is detected.
- ◆ Surfactants (soap) may not be allowed to enter the oil water separator e.g. soap usage on spill control surfaces.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A report should be compiled bi-annually of all spills or leakages reported. The report should contain the following information: date and duration of spill, product spilled, volume of spill, remedial action taken, comparison of pre-exposure baseline data (previous pollution conditions survey results) with post remediation data (e.g. soil/groundwater hydrocarbon concentrations).

### **2.2.10 Visual Impact**

This is an impact that not only affects the aesthetic appearance, but also the integrity of the facility. As the facility is located in an industrial area, the visual impact is relatively low.

**Desired Outcome:** To minimise aesthetic impacts associated with the facility.

#### **Actions**

##### **Mitigation:**

- ◆ Regular waste disposal, good housekeeping and routine maintenance on infrastructure will ensure that the longevity of structures are maximised and a low visual impact is maintained.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A report should be compiled every six months of all complaints received and actions taken.

### 2.3 DECOMMISSIONING AND REHABILITATION

Decommissioning is not foreseen during the validity of the environmental clearance certificate. Decommissioning was however assessed as construction activities include modification and decommissioning. Should decommissioning occur at any stage, rehabilitation of the area may be required. Decommissioning will entail the complete removal of non-permanent infrastructure. Any pollution present on the site must be remediated. Radioactive material is not supposed to be present on site at this stage as all leaks should be cleaned as soon as it is detected. The impacts associated with this phase include noise and waste production as structures are dismantled. Noise must be kept within Health and Safety Regulations of the Labour Act limits and WHO guidelines for community noise and waste should be contained and disposed of at an appropriately classified and approved waste facility and not dumped in the surrounding areas. All radioactive sources will have to be returned to their manufacturers in their country of origin. Future land use after decommissioning should be assessed prior to decommissioning and rehabilitation initiated if the land would not be used for future purposes. The ERMP for the facility will have to be reviewed at the time of decommissioning to cater for changes made to the site and implement guidelines and mitigation measures.

### 2.4 ENVIRONMENTAL MANAGEMENT SYSTEM

The Proponent could implement an Environmental Management System (EMS) for their operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- ◆ A stated environmental policy which sets the desired level of environmental performance;
- ◆ An environmental legal register;
- ◆ An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- ◆ Identification of environmental, safety and health training needs;
- ◆ An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy;
- ◆ Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS; and
- ◆ The ERMP.

## 3 CONCLUSION

The ERMP should be used as an on-site reference document for the operations of the facility. Parties responsible for transgressing of the ERMP should be held responsible for any rehabilitation that may need to be undertaken. The Proponent should use an in-house health, safety, security and environment management system and an emergency response plan in conjunction with the ERMP. All operational personnel must be taught the contents of these documents.

Should the NRPA and Directorate of Environmental Affairs (DEA) in the MEFT find that the impacts and related mitigation measures, which have been proposed in this report, are acceptable, the necessary authorisations and ECC may be granted to the Proponent. The ECC issued, based on this document, will render it a legally binding document which should be adhered to.