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ROSATOM

(Propietary) Limited Headspring Investments

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18 December 2023

NB23-52

To: Mr. Axel Tibinyane
The Director
Atomic Energy and Radiation Protection Regulator
P/Bag 13198
Windhoek

Dear Sir,

Subject: Submission of approval for a Radiation Management Plan for a Pilot Test Mining

Headspring Investments (Pty) Ltd (HSI) has been exploring for uranium in the Omaheke region. In order to complete the exploration stage HSI planned to conduct a pilot test mining site of In-Situ Recovery (ISR). The primary objective of the pilot test plant is to determine the optimum necessary conditions required for effective uranium leaching and mining.

The pilot test plant site is located on the territory of Tripoli farm No 546, south of the C23 highway at a distance of 15 km west of the village of Leonardville.

Herewith attached is the Radiation Management Plant that describes the organizational and technical arrangements pertaining to radiation safety and protection measures to be employed during the pilot test mining for your consideration and approval. HSI will submit an annual report for the activities of the year 2022/23 in February 2024.

Please do not hesitate to contact Mr. Aldo Hengari at Aldo.Hengari@uranium1.com, Mobile number +264813215002 should you require any additional information.

Yours Sincerely,

Mr. Kirill Egorov-Kirillov
MD-HSI

WINGSPROJECT

HEADSPRING INVESTMENTS (PTY) LTD

RADIATION MANAGEMENT PLAN

FOR

PILOT TEST MINING PLANT

NOVEMBER 2023

VERSION 1

DOCUMENT CONTROL

Document Name and number	Radiation Management Plan for pilot test plant HSI_TPRMP_001
Version	1
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Approval	HSI Management
Distribution	HSI Management and test plant staff, NRPA

Table of Contents

ABBREVIATIONS

α	Alpha
β	Beta
ARSO	Assistant Radiation Safety Officer
HSI	Headspring Investments
ISL	In-Situ Leaching
ISR	In-Situ Recovery
IX	Ion Exchange
LLRD	Long Lived Radioactive Dust
LS	Leaching Solutions
PPE	Personal Protective Equipment
RMP	Radiation Management Plan
NRPA	National Radiation Protection Authority
RO	Reverse Osmosis
RGM	Radon Gas Monitors
RDP	Radon Daughter Products
SABS	South Africa Bureau of Standards
TDS	Total Dissolved Solids
RSO	Radiation Safety Officer

1. INTRODUCTION

1.1 Background

Headspring Investments (Pty) Ltd (HSI) has been exploring for uranium in the Aranos basin on EPL's 4654 to EPL 4657 and EPL 6780 to EPL 6783 (Figure 1). As part of the geological exploration stage, HSI planned to conduct a pilot test mining of In-Situ Recovery (ISR). The primary objective of the pilot test plant/cell is to determine the optimum necessary conditions required for effective uranium leaching and mining.

The pilot test cell site is located on the territory of Tripoli farm No 546, south of the C23 highway at a distance of 15 km west of the village of Leonardville.

These Radiation Management Plan (RMP) describes the organizational and technical arrangements pertaining to radiation safety and protection measures to be employed during the pilot test mining. The RMP was compiled in line with the requirements under the Atomic Energy and Radiation Protection Act (Act No of 2005, herein referred to as the Act); and the Radiation Protection and Waste Disposal (Regulation 221 of 2011, herein referred to as Regulations).

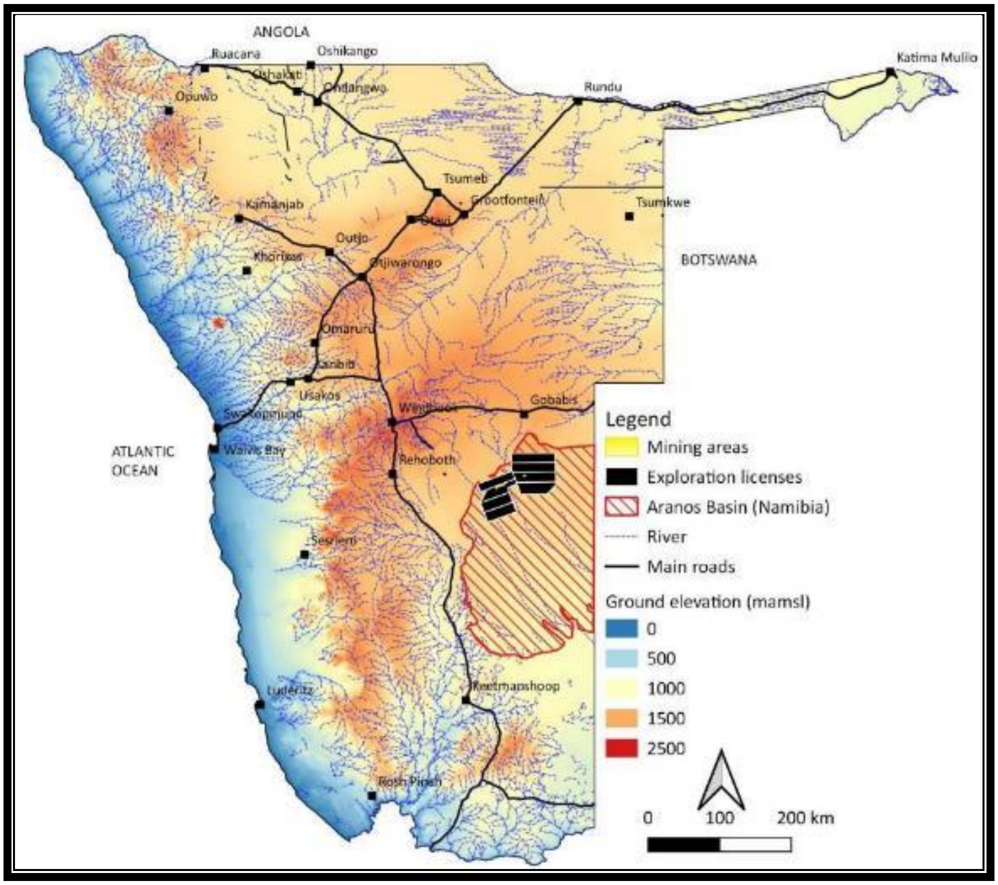

Figure 1: Project Area Layout

1.2 Overview of the proposed test mining

1.2.1 In Situ Recovery Method

In-Situ Leaching (ISL) mining, also called In-Situ Recovery (ISR) mining (these terms are considered to be synonymous in this RMP) is a process whereby, weak lixiviant (leaching solutions) are pumped underground through an array of wells into the ore body. The uranium-rich solutions are pumped to the surface, where the uranium is extracted. The uranium in the lixiviant solution is extracted using ion exchange resins in the majority of ISL operations or directly through solvent extraction.

The solutions are then chemically refortified and pumped back into the ore body to recover additional uranium. A schematic diagram of ISL process is indicated in Figure 2.

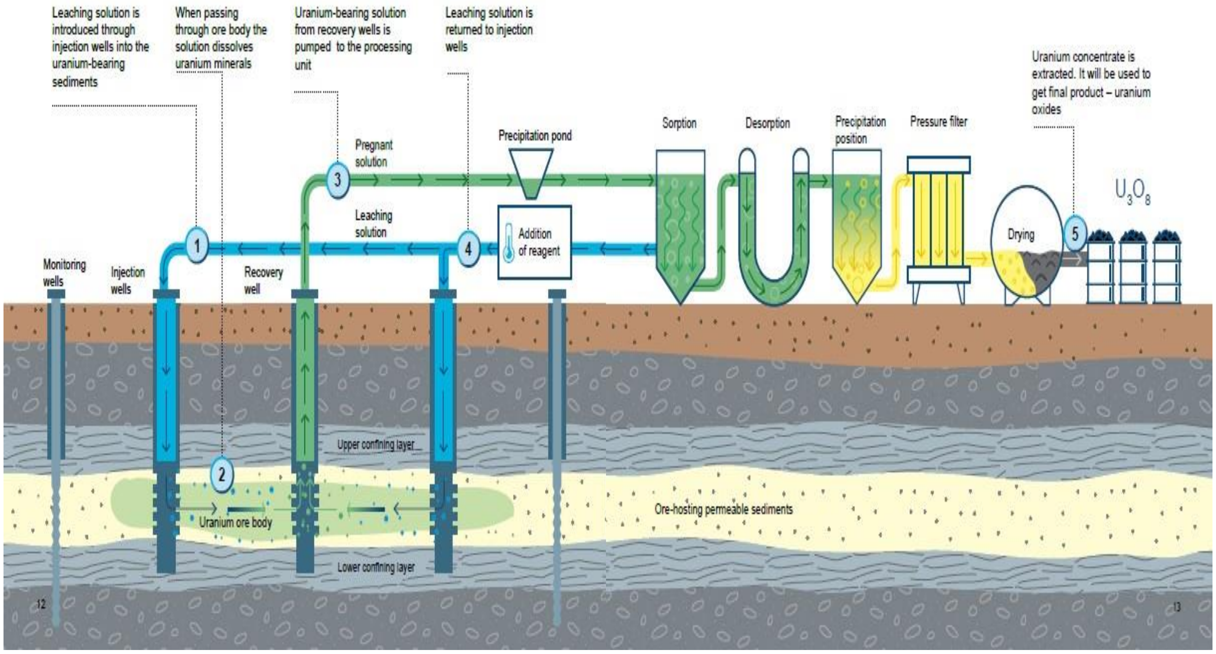

Figure 2: Scheme of the ISR Technology

The most common injection/pumping patterns are a typical 5-spot pattern that contains four (4) injection wells and one (1) recovery well. The dimensions of the pattern vary depending on the mineralized zone, but the injection wells are generally between 12 – 45 meters apart. In order to effectively recover the uranium and also to complete the ground water restoration, the wells are often completed so that they can be used as either injection or recovery wells.

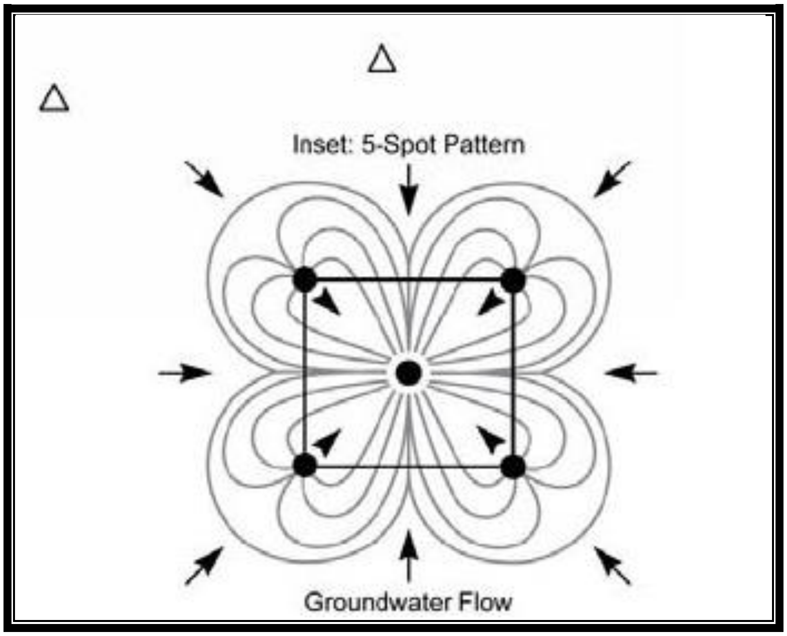

Figure 3: A typical well arrangement using 5-star pattern

1.3 Area of Pilot Test Cell/Plant

The pilot cell test site covers an area of 202 m^2. The injection wells have filters with length of 4 meters and the extraction well has a filter length of 6 meters. The distance between the injection and extraction wells is 10 meters and the distance between the injection wells is 14.2 meters. Wells are cased and grouted to ensure that leaching fluids only flow to and from the ore bearing aquifer and do not affect the overlying or underlying aquifers. Figure 3 shows longitudinal cross section of the test cell.

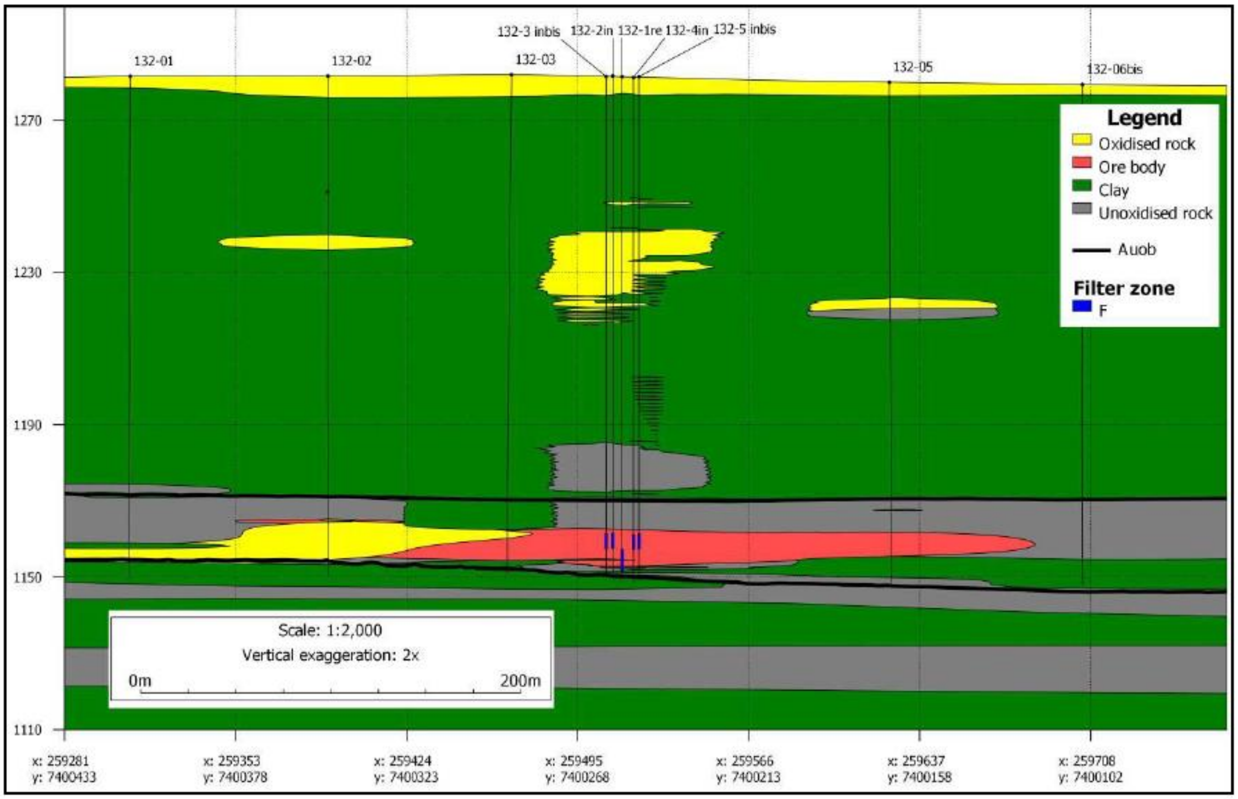

Figure 4: Longitudinal section of the Test well

1.4 ISL process at HSI Pilot Test

Four ISL processes are going to be tried in order to determine the most optimum process for the leaching and extraction of uranium. The selection of the leaching solution is driven by uranium recovery efficiencies and the ability to achieve satisfactory groundwater quality restoration.

The four processes proposed for HSI test plant are as follows:

- **Oxygen Process:** This process involves the injection of a solution of oxygen into the orebody. As the uranium comes into contact with oxygen it dissolves into the solution to become what is referred as the pregnant solution which is then pumped out of the ground to the surface plant where the uranium is recovered. This process is repeated several cycles until the uranium in the sandstone is fully recovered.

- **Acid Process:** This process involves the injection of a complex agent solution of sulfuric acid into the orebody. As the uranium and other minerals comes into contact with the sulfuric acid it dissolves into the solution to become what is referred as the pregnant solution. The solution with uranium and other minerals which is then pumped out of the ground to the surface plant where the uranium and other mineral are taken out is recovered to leave a barren solution. The barren solution is fortified again with the sulfuric acid to the concentration required and the process is repeated several cycles until the uranium in the orebody is fully recovered.
- **Oxygen/Sulfuric Acid:** This process involves the combination of oxygen and acid into the solution used in the leaching of the uranium.
- **Alkaline Process:** This process involves the injection of a complex alkaline solution (carbonate) into the orebody. As the uranium and other minerals comes into contact with the solution, it dissolves into the solution to become what is referred as the pregnant solution. The solution with uranium and other minerals which is then pumped out of the ground to the surface plant where the uranium is recovered to leave a barren solution. The barren solution is fortified again to the concentration required and the process is repeated several cycles until the uranium in the orebody is fully recovered. It is worth noting that, if there is significant calcium in the orebody (as limestone or gypsum, more than 2%), alkaline (carbonate) leaching must be used.

The pregnant solution from the injection wells will be collected in a water tank container (Figure 4). The pregnant solution will go through four Ion Exchange (IX) resin columns. The IX columns are located inside a container. Once the uranium is extracted from the solution, the barren solution flows through a water-treatment tank container (Figure 5), after which the barren solution is fortified and returned to the ground through injection wells for recirculation. The waste residues will settle at the bottom of the container. The wells will be controlled by a series of pumps (Figure 7).

The resin loaded with uranium will be temporary stored on site in 1000 L container.

Figure 4: Pregnant solution container

Figure 5: Barren solution container

Figure 6: Controlling pumps

Figure 7: Example of an injection well

1.5 HSI Radiation Related Activities During the ISL Test Mining

The main radiation hazards associated with the ISL test mining are:

- External gamma radiation,
- Internal exposure due to alpha (LLRD)
- Internal exposure due to Radon and Radon Progeny's (RDP)
- Internal exposure via surface contamination

Compared to normal uranium mining methods, the footprints of ISL mines are significantly smaller as they have no ore handling, crushing and grinding. In turn, this reduces the risk from some exposure pathways, namely Long-Lived Radioactive Dust (LLRD) and Radon and Radon Progeny's (RDP).

HSI's pilot test plant activities include the following radiation-related aspects and sources:

- The radionuclide mixture brought into the processing tank container (during the ion exchange process) that can become airborne and/or produce surface contamination resulting in potential worker exposure to LLRD and RDP.
- The resulting external gamma exposure sources due to concentrations of Radium-226 and progeny in process components (e.g. valves, pipes, tanks, filters, clarifiers) and associated wastes (e.g. Barren solution container).
- Loading of loaded resins in storage containers resulting in potential exposure to external gamma radiation.

1.6 Exposure pathways

1.6.1 External exposure (gamma)

Radiological sources which can cause elevated external exposures are primarily associated with radium concentrates in certain process components and wastes. There can be extremity exposure from gamma particularly during maintenance activities involving the penetration of systems.

1.6.2 Long lived Radionuclide Dust

This pathway is almost exclusively associated with the final product drying and packaging areas, since up to the drying step, the ISR process is essentially aqueous and the risk of significant dust generation elsewhere in the process is low. However, during pilot test mining, the final product will be aqueous resins loaded with the uranium. There is however a risk of exposure to LLRD anywhere in the process container if spills of process materials are not expeditiously and adequately cleaned up before they dry.

1.6.3 Inhalation of radon and radon progeny's

Radon gas is also released during the decay of Radium. The concentrations of radon in occupied areas can be of significance in the absence of adequate ventilation. However, radon progeny concentrations may be low because of the disequilibrium with the fresh radon resulting from the time needed for ingrowth from the radon parent. Since radon can be released from the lixiviant and radium can build-up in pipework and vessels, maintenance activities inside vessels could result in exposure to radon and radon progeny.

1.6.4 Internal exposure via surface contamination

Surface contamination can become a potential inhalation or ingestion exposure pathway owing to poor housekeeping and allowing spilled solutions to dry and suspend material into the air in the process container.

2. PRE-OPERATIONAL SAFETY ASSESSMENT

The geotechnical work conducted during exploration indicates the uranium ore grade is estimated at 300-500 ppm. The deposit is sandstone and mainly located in the Auob 3 aquifer. Exploration activities conducted indicated that the best method to mine the ore body is via ISL.

Pre operational safety assessment included the following measurements:

- Gamma radiation dose rate measurements
- Long-Lived Radioactive Dust (LLRD)
- Radon and thorium
- Radionuclide concentration in ground water concentration

Note: This data was collected during the exploration stage, HSI will conduct an extensive monitoring program during the pilot test phase as described in sections 4 and 5.

Gamma radiation surveys were conducted using a portable radiation survey meter. The LLRD and Radon concentration measurements were conducted with SARAD poCAMon continuous air sampler.

2.1 Exposure to Gamma Radiation Dose

The areas surveyed and the results are indicated in Table 1. The highest gamma dose rate of 0.66 µSv/hr was measured on contact of the core samples during the exploration. The dose rates measured at the pilot test plant site area and at Farm Tripoli workshop area are comparable with an average dose rate of 0.15 µSv/hr and the maximum dose rate of 0.16 µSv/hr.

Table 1: Results of Gamma radiation monitoring

Area	Data Samples	Average dose rate (µSv/hr)	Range (µSv/hr)
Farm Tripoli workshop area	10	0.15	0.12-0.16
Pilot test cell location	10	0.15	0.13-0.16
Core sample storage area	10	0.30	0.20-0.50
Core samples on contact	10	0.34	0.22-0.66
Leonardville area HI offices	10	0.14	0.13-0.16

2.2 Exposure due to Long-lived Radioactive Dust

The results of LLRD are tabulated in Table 2. The average exposure due to LLRD measured was in range 0.450-0.478 Bq/m^3.

Table 3: Results of average LLRD concentration

Area	Data Samples	Average Concentration (Bq/m^3)	Range (Bq/m^3)
Pilot test cell location	10	0.450	0.172-0.752
Outside Core sample storage area	10	0.130	0.103-0.148
Leonardville area HI offices	10	0.478	0.223-0.811

2.3 Exposure to Radon

The results (outdoor radon) are tabulated in Table 3. The results (outdoor radon) are tabulated in Table 3. The outdoor radon concentration is below 10 Bq/m^3 specified UNSCEAR (2000).

Table 3: Results of Radon Concentrations

Area	Data Samples	Average concentration (Bq/m^3)	(Bq/m^3)
Pilot test cell location	10	2.806	1.828-3.738
Outside Core sample storage area	10	1.589	1.389-1.731
Leonardville area HI offices	10	1.045	0.283-1.507

2.4 Radioactivity in Water

To date 10 water samples from boreholes in Farm Tripoli were analysed for radionuclide concentrations, gross alpha and beta concentrations. The results are tabled in Table 4. The groundwater analysis results in all hydrogeological wells of the HSI have exceeded the WHO drinking water guidelines for gross alpha and beta in below.

- Total (Gross) α-radioactivity ≤0.50 Bq/L
- Total (Gross) β -radioactivity ≤1.0 Bq/L

Table 4: Results of the average radionuclide for groundwater samples

No	7	8	9	14	15	21	22	23	24	25
Gross α	12.33 ± 0.24	2.61 ± 0.08	5.64 ± 0.13	2.371 ± 0.084	5.43 ± 0.12	8.87 ± 0.18	15.11 ± 0.28	6.49 ± 0.14	16.66 ± 0.30	9.22 ± 0.19
Gross β	3.18 ± 0.25	1.70 ± 0.20	2.06 ± 0.20	2.15 ± 0.23	2.13 ± 0.18	2.34 ± 0.21	2.86 ± 0.22	2.38 ± 0.19	3.31 ± 0.21	1.56 ± 0.18
Radium-226 (^{226}Ra), Bq/kg	8.25 ± 0.36	1.78 ± 0.08	2.99 ± 0.15	0.836 ± 0.04	1.95 ± 0.1	14.2 ± 0.8	11.1 ± 0.6	12.1 ± 0.6	12.4 ± 0.7	15.7 ± 1.4
Uranium-234 (^{234}U), Bq/kg	1.17 ± 0.24	0.228 ± 0.046	2.8 ± 0.6	0.57 ± 0.12	6.7 ± 1.6	11.0 ± 3.2	2.0 ± 0.4	1.95 ± 0.40	1.58 ± 0.38	1.28 ± 0.26
Uranium-235 (^{235}U), Bq/kg	0.041 ± 0.008	0.0079 ± 0.0016	0.113 ± 0.022	0.01700 ± 0.0038	0.35 ± 0.08	0.54 ± 0.10	0.064 ± 0.012	0.072 ± 0.014	0.055 ± 0.012	0.040 ± 0.008
Uranium-238 (^{238}U), Bq/kg	0.890 ± 0.18	0.172 ± 0.034	2.43 ± 0.48	0.37 ± 0.08	7.6 ± 1.6	11.3 ± 2.2	1.40 ± 0.28	1.56 ± 0.32	1.19 ± 0.26	0.87 ± 0.18
Lead-210 (^{210}Pb), Bq/kg	0.022 ± 0.010	0.072 ± 0.030	0.27 ± 0.10	<0.01	0.038 ± 0.018	0.060 ± 0.026	0.029 ± 0.014	0.035 ± 0.016	0.030 ± 0.016	0.038 ± 0.016
Polonium-210 (^{210}Po), Bq/kg	<0.0075	<0.005	0.061 ± 0.024	<0.005	0.020 ± 0.012	<0.011	<0.008	<0.008	<0.008	<0.005

3. ORGANIZATION ARRANGEMENT

3.1 Organisational Structure

The organisational arrangement pertaining to the radiation management of HSI is depicted in Figure 8. The legal person for HIS is Mr Kirill Egorov-Kirillov, the Managing Director of Headspring Investments. He has the overall responsibility to ensure the safety and security of all the radiation sources of HSI.

The appointed Radiation Safety Officer (RSO) for HSI is Ms. Svetlana Bauer a mining geologist. Ms Bauer has over 30 years of working experience the mineral exploration and mining industry. HSI has also designated Mr. Aldo Hengari, a mining engineer and Director of Operations as the Assistant Radiation Safety Officer (ARSO) who will oversee the management of the radiation safety programme during pilot test mining and will liaise with the RSO in all radiation aspects related to the test mining. Both Ms Bauer and Mr. Hengari has attended the Radiation Safety Officer Course 1 that is offered through the Namibian Uranium Institute.

The RSO and ARSO reports to the technical and exploration manager Mr. Anton Korobkin, who leads and operates the exploration activities and ensures legal compliances with all regulatory requirements.

In addition to the management staff indicated in Figure 8, test mining process will have a support team of 10 staff as indicated Table 5.

Table 5: Additional staff compliment for Test cell

	Position	**Number of Personnel**	**Description of Work**
1	Operator	6	Operation, Monitoring Samples collection
2	Electrician	1	Oversee electrical maintenance, compliance and safety
3	Laboratory technician	2	Samples collection
4	Supervisor / Test Mining Manager	1	Oversee all processes, safety and health standards
	Total:	**10**	

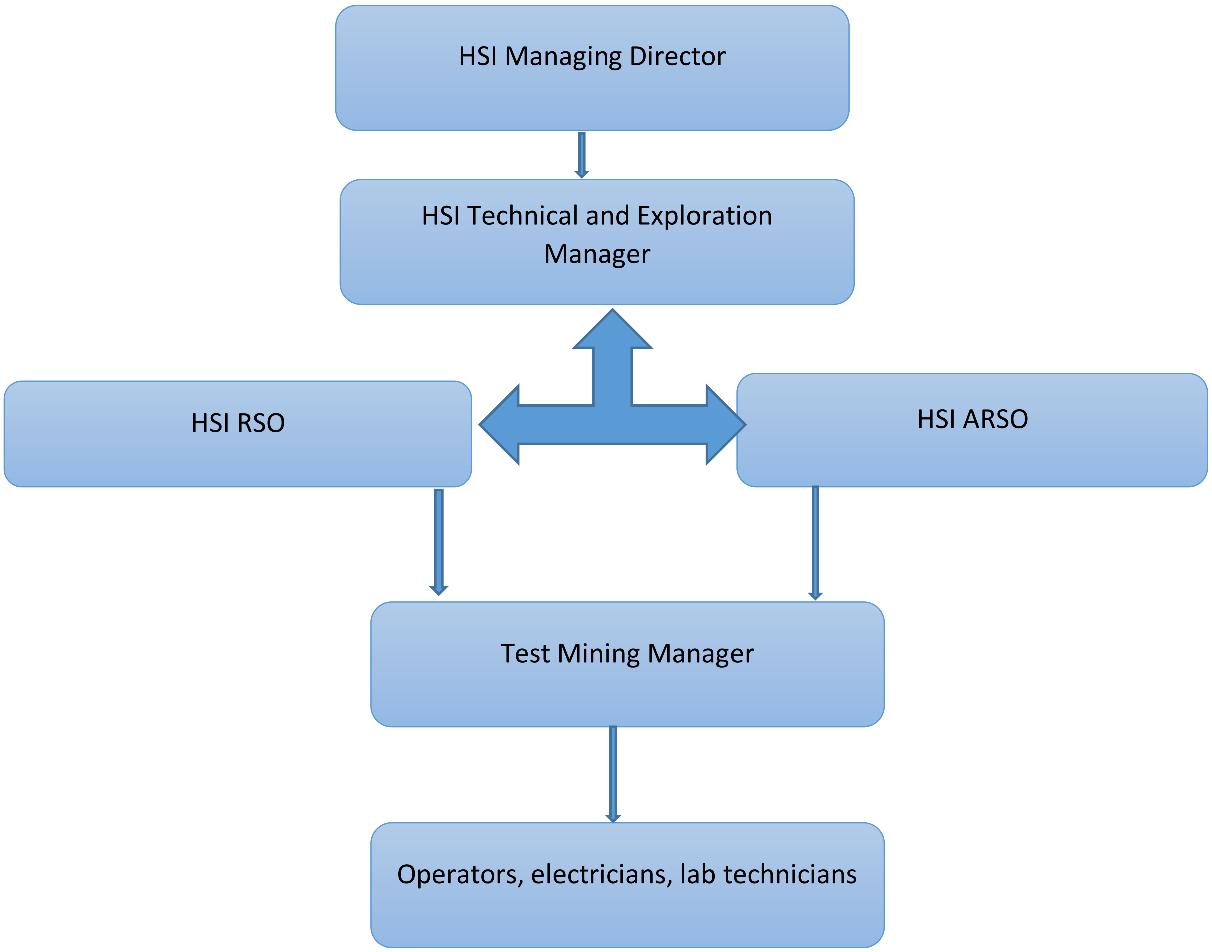

Figure 8: HSI Organisational Structure pertaining to radiation management for test plant

3.2 Radiation Safety Offices Duties

HSI RSO is delegated to implement the duties and responsibilities as outlined in Section 30 of the Atomic Energy and Radiation Protection Act, Act 5 of 2005. In addition to that, HSI RSO duties as outlined in the Radiation Management Plan for Exploration 2021 are as follow:

- Maintaining and implementation of the RMP
- Ensuring that the radiation activities are consistent with the principle of ALARA (As Low As Reasonable Achievable)

- Ensure that all radiation monitoring activities are undertaken
- Ensure employees are provided with radiation awareness
- Implement and report all radiation –related monitoring data
- Establishing and keeping current and maintain the company's exposure records and data
- Ensure that HSI radiation safety procedures remain up to date
- Liaise with the National Radiation Protection Authority on all matters pertaining to radiation safety.

4. OCCUPATIONAL RADIATION EXPOSURE CONTROL PROGRAMME

4.1 Types of Radiation Hazards

The potential radiation hazards that will be encountered at HSI test mine are described in section 1.6 and summarised in Table 6 below:

Table 6: HSI potential radiation occupational exposure hazards during test plant

Potential activity	Type of Radiation	Exposure pathway
• Maintenance of pipes, valve in the processing container • Loading and transporting of loaded resins in containers • Working in the vicinity of the barren solution and pregnant solution containers	Gamma	External
• Spills in the processing container	LLRD	Internal
• Maintenance of pipes, valve	Radon and RDP	Internal

4.2 Classification of Work Areas

The total area for test pilot plant is 202m^2. The area consists of:

- 4 injection boreholes
- 1 production borehole
- Pregnant solution collection with residue collection at the bottom container
- Container with the flowmeters
- Process container with Ion exchange columns,
- Barrens solution container
- Resin storage container and office container

The entire test plant will be classified as a controlled area and appropriate radiation signage will be posted at the various areas on the test plant site. Only designated test plant employees will be on the plant.

All employees entering the controlled area (test mine site) will be classified as radiation workers.

4.3 Monitoring and dose assessment

With ISR mining operation, most of the orebody's radioactivity remains well underground and there is, therefore, minimal increase in radon release and no ore dust.

The two goals of radiation monitoring are to confirm that the radiation levels remain within the expected range and to assess the dose to workers. Employees will be monitored for all the pathways External (gamma radiation), Radon and radon progeny and monitoring of Long-Lived Radionuclide Dust.

External (gamma radiation)

Gamma radiation will be assessed using individual passive monitoring dosimeters. The dosimeters will be sourced either from Radical Physics in Windhoek or South Africa Bureau of Standards (SABS). Personal (electronic) direct reading dosimeters will be also used to provide daily exposure.

Gamma surveys and contamination surveys will be conducted in work area using a portable gamma and contamination monitor (Figure 9).

Figure 9: SARAD Continuous Air Sampling devices

Monitoring of long-lived radionuclide dust, Radon and radon progeny

LLRD Radon and radon progeny will be monitored by using way of area sampling, using continuous air sample Sarad poCAMon (Figure 10). Statistically valid sample sizes will be collected monthly for each SEG that is present at the test mine. Quarterly radon gas monitors (RGMs) will be placed at fixed locations around the test site, and at the nearby localities of Leonardville and surrounding farms.

Figure 10: Sarad Continuous Air Sampling devices

4.4 Dose Management and Records

The HSI will apply the dose limit for workers and members of the public stipulated in the Radiation Protection and Waste Disposal Regulations (MoHSS, 2011) indicated in Table 7. HSI will also implement a dose constraint of 5 mSv/annum for all the employee at test mine site and a monthly investigation level of 0.5 mSv.

Table 7: Occupational and dose limits

	Occupational exposure	**Public exposure**
Effective dose	20 mSv per year on average for any consecutive 5 years, but no more than 50 mSv per year	1 mSv per year on average for any consecutive 5 years, but no more than 5 mSv per year

- All radiation workers will be provided with summary of the annual occupation exposure.
- The annual occupational exposure will be documented in the annual report.
- Monthly work place monitoring records will be compiled.

4.5 Control mechanisms (Local rules and Procedures)

Employees' exposures to radiation will be controlled in accordance with As Low As Reasonable Achievable (ALARA) principles. This will include the following:

(a) Maintaining adequate ventilation in general process areas, including consideration for local exhaust on vessels and tanks, to contain and remove potential releases of radon (minimizing the potential for ingrowth of radon progeny) and LLRD from process vessels and systems.

(b) Minimizing worker time in process areas and in a practical way maximizing the distance between workers and large sources of radioactive materials such as:

- Ion exchange columns;
- Pregnant solution container;
- Barren solution and waste container collection;
- Resins storage container

(c) Providing adequate containment in the event of spills and leaks (sumps and berms adequate to contain associated maximum tank or vessel volumes), given the aqueous nature of ISR processes.

(d) Considering the potential for radium to build up within the pipework and vessels in the aqueous portion of the processing plant, controls include appropriate cleaning and purging of these systems will be implemented.

(e) Applying general hygiene including washing hands prior to eating or smoking, and eating only in designated areas.

4.6 Personnel Protective Equipment

Employee's will not only rely on the PPE but will be required to implement the radiation safety procedures. With the exception of gamma radiation exposure, alpha and beta radiation exposures can be minimised with the use of correct PPE and implementing radiation safety procedures.

All employees will be provided with the following PPE's.

- Full overall (jacket and suit)
- Dust masks
- Safety glasses
- Safety shoes
- Safety gloves

4.7 Radiation Awareness and Training programmes

Prior to commencement of work at the test plant site all employees and all contractors will undergo a site induction programme, which takes in account all the safety and hazards identified on site. Part of the induction will include a 45-minute presentation on radiation awareness.

All employees and contractors on the test plant will attend a mandatory annual refresher induction. A register will be maintained for all employees that attend the induction training.

The radiation awareness training will cover the following topics:

- Introduction to radiation
- Description of the types of radiation
- Introduction to the biological effects of radiation
- Description of the main exposure pathways
- Radiation protection principles (justification, optimisation of protection, dose limits);
- Occupational and public exposure limits
- Basic quantities and units used in radiation protection;
- Basic hygiene procedures

4.8 Health Surveillance Programme

Employee's will undergo appropriate health surveillance based on the general principles of occupational health as designed to assess the initial and continuing fitness of the employees.

HSI will contract qualified occupational health practitioner to carry out the occupational health surveillance of the employees.

Employee terminating his/her employment with the HSI will undergo an exit medical examination.

5. PUBLIC EXPOSURE CONTROL

5.1 Exposure Pathways and Critical groups

The test plant is situated on Farm Tripoli. The critical public exposure group which serves as potentially exposed members of the public are the HSI personnel members on farm Tripoli these are the security guard, office administrative staff and general workers, the Leonardville community members and the surrounding farms.

Radiation exposure of members of the public as a result of test mining can potentially occur along the following possible pathways:

- Direct exposure to gamma and the aquatic pathway (External exposure)
- via atmospheric dust (Internal exposure due to inhalation)
- via radon gas (Internal exposure due to inhalation and ingestion)

The direct external exposure pathway due to gamma radiation is not insignificant as long as members of the public do not access the test plant sites and the transport containers does not impact areas that are accessible to the public.

5.2 Ground Water –Aquatic Pathway

The main concern of the ISL method is the escape of the leached uranium to leak into the other aquifers, resulting in migration of radionuclides in the groundwater. Radionuclides in groundwater can then lead to the uptake of radioactive material through direct water consumption, through the consumption of crops that have been irrigated with the groundwater, or by the ingestion of animal products from animals using the groundwater as drinking water.

To avoid any possible contamination to the ground water the following will be implemented at the test plant site:

Monitoring (observation) wells will be drilled, which will monitor the state of groundwater outside the test cell. Monitoring wells are designed to monitor and control the conditions of pregnant solutions formation, geochemical state of the ore-bearing horizon, flow of technological solutions beyond the production areas and their possible flows into the horizons above and under the ore. The size of the monitored area will be 4 733m^2. The design of monitoring wells is similar to injection and production wells.

Six main monitoring wells will be drilled as follow:

- First well is above the Auob 3 aquifer in the Kalahari aquifer;
- Second well is below the Auob 3 aquifer in Auob 2-1;
- The third, fourth, fifth, sixth wells are at the corners of the contour of the pilot test cell at a distance of 25 meters from the injection wells along the direction of the underground water natural movement.

Addition 4 monitoring wells will be drilled along the perimeter of the test cell. Monitoring wells are indicated by green dots in Figure 11:

The hydrogeological, engineering-geological situation of the Auob horizon, confirmed by the conducted modelling, suggests that the pollution halo progress will not exceed 100 meters from the pilot cell/mine unit contour.

Water quality assessment in the monitoring wells is planned once every six months and radionuclide contents in the monitoring well's water will be assessed annually.

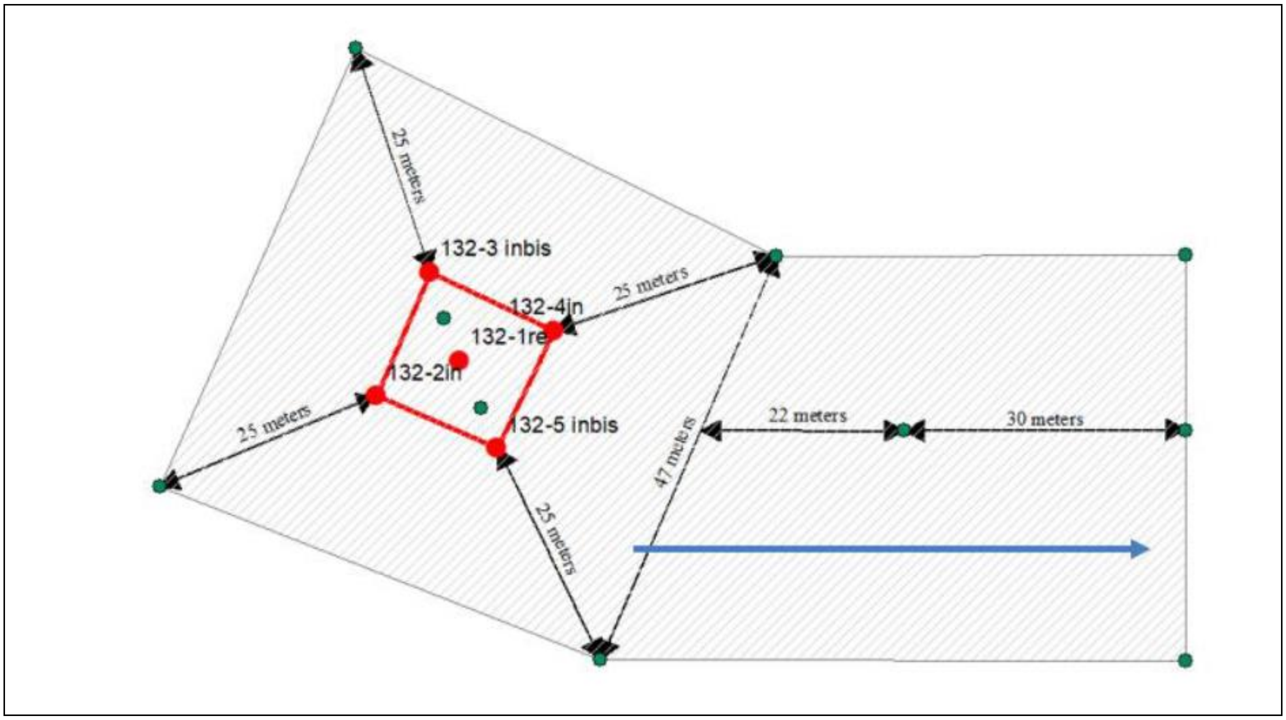

Figure 11: Observation network to the test cell

5.3 Atmospheric pathway -Emissions of Radioactive Substances

Raw materials containing excessive amounts of radionuclides will be extracted to the surface during pilot test. Primary processing solution also contain radionuclides.

Air polluting radionuclides could migrate into the environment. Possible ways for radionuclides to enter the air are as follows:

- Aerosols emitting from pregnant solutions.
- Release of dust with the increased radionuclide contents from the ground surface contaminated by uranium-containing spills.
- Release of radon from soils contaminated by uranium-containing spills.

Processing solutions are transported through sealed pipelines, and there are no open surface or open cover containers having processing solutions therein at the test site. The barren solution is kept in a closed container and thus possess no risk of evaporation.

Submersible pumps, which are used for pumping solutions out, allow having extraction wells and pipelines sealed. The sealed wells and pipelines contribute to a sharp reduction in radon emissions into the atmosphere.

Quarterly radon gas monitors (RGMs) will be placed at fixed locations around the test mining site, and at the nearby localities of Leonardville and surrounding farms.

Continuous Radon and LLRD air monitor will also be used to quantify the public exposure quarterly.

5.4 Control of visitors

All visitors entering the test mining site will register at the security gate. Visitors' induction will be provided. HSI will ensure that the exposure to the members of public will not exceed the prescribed annual dose limit of 1 mSv specified in the Radiation Protection and Waste Disposal Regulations of 2011.

6. SAFETY AND SECURITY OF RADIATION SOURCES

The main radiation source at HSI test mining site will be the loaded resins after the ion exchange process.
The resins will be collected in 1000L container and will be temporary stored onsite in a designated ISO container.

Access to the test site will be restricted only to the employees. The access to Farm Tripoli is 24/7 mannered by the security guard and limited to those with authorised access.

Appropriate radiation signage will be placed at access points to the test plant site.

7. TRANSPORTATION OF RADIOACTIVE

Activities involving transport if radioactive sources are:

- Transporting sample to the onsite laboratory
- Transporting of the loaded resin samples for offsite analysis

All transportation will be done in accordance with the IAEA SSR6 Transport Regulations.
Offsite transportation will be contracted to an approved transporter of radioactive material.
Appropriate packaging and placarding will be placed on the transport company.

8. EMERGENCY PREPAREDNESS AND RESPONSE

8.1 Main Risk of Emergency at Test Mining Site

Below are the potential sources of the accident at the designated test mining site:

- Emergency leakage of processing solutions caused by the loss of pipelines sealing.
- Spills of sulfuric acid solutions.
- Discharge of solutions and suspensions during well cleaning activities.

8.2 Contamination of soil and water resources

During pilot test mining, the main risk of soil contamination and, as a consequence, surface water contamination and upper aquifers contamination is associated with chemicals, which are used for leaching, as well as with metals existing in production solutions.

However, the risk of such contamination is of a local nature, restricted and limited to the test site. Leakage of leaching solutions from the defective, damaged or malfunctioning pipelines, spills from open injection wells, in the course of discharging solutions from wells for well cleaning or sampling purposes, or when dumping processing solutions straight on the ground rather than doing it into special tanks may cause the surface contamination.

It is possible to have contamination to the minimum extent provided that there is effective environmental control. Therefore, it is very critical to employ strict supervision and control over the test site.

8.3 Mitigation measures to be implemented

- The pipelines and containers will be continuously maintained and monitored against presence of defects and timely troubleshooting will be employed, if any. Maintenance will be carried out twice a month in case of injection wells and once a month in case of production wells.
- The pregnant and barren solution containers are placed on a polyethylene liner that will capture any leaking liquid.
- Any contaminated soil should be immediately removed and placed in a special waste container designed for subsequent disposal or neutralization.
- Contaminated soils will be monitored of gamma radiation to determine the exposure level.
- Spill response tool kits will be readily available, and employees will be trained on how to use those kits.

9. WASTE MANAGEMENT PROGRAMME

The main radioactive waste program is well field remediation.

9.1 Well Field Remediation

After ISR pilot test mining is completed, the quality of the groundwater in the production zone will be restored to a baseline value determined before the start of the operation, so that the groundwater is suitable for any use that it was suitable for prior to pilot test mining.

Following the completion of the pilot test and determination of the environment's capacity to self-restore, the entire remaining volume of groundwater containing residual acidity and dissolved uranium, if still present will be removed by pumping the impacted groundwater from the test cell source of pollution through using some of the mining or monitoring wells, treated at the reverse osmosis (RO) unit, and such clean water will be injected back into the test cell area.

Contaminated water drawn from the aquifer is routed through RO and the clean water is re-injected. Upon decommissioning, all wells are sealed and capped, test plant facilities are removed and land re-vegetation will be implemented in line with the Environmental Management Plan.

The primary restoration technique may be a combination of several methods such as natural attenuation, groundwater sweep, and clean water injection.

With natural attenuation, the total dissolved solids (TDS) content of a plume of contaminated or perturbed groundwater is gradually altered by hydrodynamic dispersion and physical-chemical reactions between the fluids and host rock. The overall rate and effectiveness of natural attenuation depends on acid neutralization capability of the host rock, the ion exchange characteristics of clay minerals, and the hydraulic gradient of the aquifer.

Groundwater sweep involves withdrawing water from selected production and injection wells that draw uncontaminated natural groundwater through the leached area, displacing the leach solutions. Clean water injection involves the injection of a better quality of clean water in selected wells within the production area while pumping other production and/or injection wells, which again displaces the leaching solutions with the better-quality water. The source of the clean water may be from RO type.

Ground water quality will be monitored during the entire restoration process for major ions, trace metals and radiometric. When the sampling data indicate that the mined-out aquifer has been restored and stabilized, a report documenting the final results will be provided to the regulatory Authorities.

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