Environmental Management Plan (EMP) for In Situ Leaching (ISL) Pilot Test Mining under the Geological Exploration Activities at Wings Project, on Farm Tripoli 546, Omaheke Region.

Prepared for

Prepared for

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1. Introduction

Headspring Investments (Pty) Ltd (HSI), the proponent, is proposing to operate a test mining work demonstration at Farm Tripoli No. 546 in the Omaheke Region.

The Environmental Management Plan (EMP) is planned for implementation throughout the project life cycle of the pilot test mining from commissioning, In-Situ Leaching (ISL) test mining, decommissioning, remediation and restoration, through an Environmental Management System (EMS) which provides a systematic framework and approach to minimize risk and manage environmental aspects (i.e., activities that cause impact) and impacts (i.e., affect change to the environment from activities).

1.1 Purpose of EMP

The environment management plan is prepared with a view to facilitate effective environmental management of the project, in general and implementation of the mitigation measures in particular. The EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted in the operation of the ISL demonstration unit. For each stage of the programme, the EMP lists all the requirements to ensure effective mitigation of every potential environmental, biophysical and socioeconomic impact identified in the Environmental Impact Assessment (EIA). For each impact or operation, which could otherwise give rise to negative impact, the following information is presented:

- A comprehensive listing of the mitigation measures (actions) that project proponent will implement.
- The parameters that will be monitored to ensure effective implementation of the action.
- The timings for implementation of the action are also included to ensure the objectives of mitigation get fully met.

2. Background

The proposed measures are due to positive and negative potential impacts resulting from the "Envelope" field experiment proposed for the “in situ Leaching” mining on the demonstration cell site located on Tripoli Farm as part of the continued geological exploration activities being conducted at the Wings Project.

Four ISL processes at Wings Project are going to be tried in order to determine the most optimum process for the Wings Project. The four processes proposed included the following:

1. **Oxygen Process:** This process involves the injection of a solution of oxygen into the water and uranium bearing sandstone. 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.
2. **Acid Process:** This process involves the injection of a complex agent solution of sulfuric acid into the water and uranium bearing sandstone. 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 sandstone is fully recovered.

3. **Oxygen/Sulfuric Acid:** The third process to be tested at Wings involves the combination of oxygen and acid into the solution used in the leaching of the uranium.

Chemical Process: Initially, the water is slightly carbonate with a total mineralization of 0.5 - 1 g / l, pH = 8-9. When oxygen is supplied, uranium is oxidized, uranium is tetravalent, insoluble, becomes hexavalent, soluble in the form of a carbonate complex, $UO_2 CO_3$. Up to 20% of uranium is leached in the laboratory. The salt composition practically does not change.

With weak acid leaching, the pH is reduced to 5.5. In solution, uranium is mainly in the form of bicarbonate complexes, $UO_2(HCO_3)_2$

The salt background increases to 1-3 g/ l, mainly due to sulfates, carbonates-bicarbonates, magnesium, aluminum, calcium.

50-70 % of uranium is leached when acid leaching pH = 1.5-2, the salt background grows to 10 g / l and half is a sulfate ion, the rest: chlorine from anions, cations - iron, magnesium, calcium, aluminium.

4. **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 key attention is paid to negative impacts in the course of the environmental assessment activities. The reason for that is to ensure that those negative impacts are eliminated by employing adequate and proper measures designed to reduce the negative impacts, so that the impacts' significance is taken under control, and as for the project driven positive effects they are enhanced, improved and increased to their maximum effect. Below is the list of positive and negative potential impacts found during the geological exploration activities:

Positive impacts are as follows:

- Obtaining the required subsoil and subsurface geological data and information for the purpose of assessing the economic potential of the region,
- Exploring the aquifer,
- Assessing the impact of natural radionuclides,
- Testing the In-Situ Leaching method of mining so that it is further introduced and implemented for commercial mining purpose as the most harmless and waste-free method to extract uranium under theWings Project,

- Socio-economic development of the region by opening new jobs (primary, secondary and tertiary employment) and transferring relevant skills,
- Encouraging growth of the local economy and development of the regional economy,
- More support for local enterprises and ventures by purchasing consumables from them.

Negative impacts are as follows:

- Potential disturbance of pasture lands,
- Physical disturbance of the soil cover,
- Impact on local biodiversity (fauna and flora) and habitat disturbance, as well as possible illegal hunting of wild animals (poaching) in that area,
- Potential impacts on water resources and soils, especially as a result of pollution,
- Air quality issue: there might be dust formation resulting from the project implementation,
- Potential risks to occupational health and safety,
- Vehicle traffic safety and impact on the existing infrastructure, for example, local roads,
- The local residents might be unhappy because of the vibration and noise coming from the drilling activities and operations,
- Environmental pollution (solid waste and wastewater),
- Impact on archaeological resources and cultural heritage sites,
- Potential inconveniences and conflicts of a social nature (e.g. theft, robbery, damage to property, etc.).

3. Impact Assessment Methodology

The environmental assessment process is primarily designed to ensure that potential impacts, which may result from the project activities, are identified and eliminated using environmentally sound approaches and there is compliance with legal requirements. The impact assessment method used for this project complies with the Namibia Environmental Management Act (No. 7 dated 2007) and its Regulations dated 2012, as well as the International Finance Corporation Performance Standards (IFCPS). The identified impacts were assessed in terms of scale/extent (spatial scale), duration (temporal scale), magnitude (severity) and probability (probability of occurrence), as presented in Tables 1-4.

Each rating scale has its linked numerical value so that determination of the environmental significance is supported by the scientific approach. This methodology ensures uniformity and the possibility to have a standard consideration of potential impacts, which allows comparing a wide range of impacts. It is assumed that assessing the significance of a potential impact is a good indicator of the risk associated with this impact. The following process shall be applied to each potential impact:

- Delivering a brief explanation of the impact.
- Assessing the impact's significance prior to taking mitigation measures.
- Description of the recommended measures to mitigate the exposure.

The recommended mitigation measures provided for each of the potential impacts contribute to achieving environmentally sustainable project operating conditions applicable to various characteristics of the biophysical and social environment. The following criteria were used in the impact assessment:

3.1 Extent

Extent is an indicator of the physical and spatial scale of the impact. Table 1 shows an assessment of the impact based on the degree of spatial scale.

Table 1. Extent assessment

Low (1)	Low/Medium (2)	Medium (3)	Medium/High (4)	High (5)
The impact is localized within the site boundaries: Site only	The impact is beyond the site boundaries: Local	The impact on the biophysical and social environment Regional	The impact propagates far beyond the site: Regional	The impact propagates to national or international borders

3.2 Duration

Duration is the period during which it is supposed to have an impact, measured in relation to the project implementation period. Table 2 shows the impact rating based on the duration.

Table 2: Duration assessment

Low (1)	Low/Medium (2)	Medium (3)	Medium/High (4)	High (5)
Immediate mitigation measures, immediate progress	The impact is quickly reversible, short-term impact (0-5 years	Reversible over time; medium-term (5-15 years)	The impact is of the long-term nature	Long-term; after closure, permanent, irreplaceable or irreplaceable amount of resources

3.3 Intensity, magnitude / severity

Intensity is the degree or magnitude of the change in the functioning of an environmental element as a result of exposure. The magnitude of the change can be either positive or negative. These indicators were also considered when assessing the degree of impact. Table 3 shows an assessment of the impact based on intensity, magnitude, and severity.

Table 3: Intensity, magnitude/severity assessment.

Type of Criterion	H-10	M/H-8	M-6	M/L-4	L-2
Quality based	Very severe deterioration, large number of deaths, injuries, diseases / complete loss of habitat, complete change in ecological processes, rare species passing away	Significant deterioration, death, illness or injury of habitat/diversity or resources, sever change or disruption of important processes	Moderate deterioration, discomfort of habitat/biodiversit y or source, moderate change	Low deterioration, slightly noticeable change in habitat biodiversity slight loss of species number	Slight deterioration unpleasant sensations, slight change in species/habitat/biodiversit y or resources absence or very slight deterioration of quality

3.4 Probability of occurrence

Probability describes the probability of an impact occurring. This definition is based on previous experience in implementing similar projects and/or on professional judgment. Table 4 shows an assessment of the impact in terms of the probability of its occurrence.

Table 4: Occurrence probability assessment.

Low (1)	Medium/Low (2)	Medium (3)	Medium/High (4)	High (5)
Improbable; unlikely; rare. No known risk or vulnerability to natural or induced hazards.	The probability of occurrence from time to time. Low risk or vulnerability to natural or induced hazards	Probably, distinct possibility, frequent. Low or medium risk or vulnerability to natural or induced hazards.	Probably, unless risk mitigation measures are employed. Average risk of vulnerability to natural or induced hazards.	Certain (regardless of preventive measures), highly probable, permanent. High risk or vulnerability to natural or induced hazards.

3.5 Value

The significance of the impact is determined based on the synthesis of the above impact characteristics. The significance of the impact "without mitigation" is the main factor determining the nature and extent of the necessary measures required to reduce the impact. As indicated in the introduction to this section, the significance of the impact is measured for this assessment without the envisaged measures to reduce the impact.

Once the above factors have been ranked (Tables 1-4) for each potential impact, the significance of each of them is assessed as per the following formula:

SIGNIFICANCE POINTS (SP) = (MAGNITUDE + DURATION + SCALE) * PROBABILITY

The maximum value for each potential impact is 100 significance points (SP). The potential impact is assessed as high, moderate or low, based on the following scale of significance assessment (Table 5).

Table 5: Significance assessment

Significance	Points of ecological significance	Colour Code
High (positive)	>60	H
Medium (positive)	30 to 60	M
Low (positive)	1 to 30	L
Neutral	0	N
Low (negative)	1 to -30	L
Medium (negative)	-30 to -60	M
High (negative)	>-60	H

Positive (+) - favourable effects.

Negative (-) - harmful/adverse effects.

Neutral - neither favourable nor unfavourable effects.

For an impact having a high significance rating, it is recommended to employ measures designed to reduce the impact to a medium or low level, provided that the impact having an average significance rating can be sufficiently controlled using the recommended measures to reduce the impact. In order to maintain a low or medium significance level, it is recommended to monitor for a period, which allows confirming that the impact is low or medium and is under control.

The exploration activity stages are assessed for the purpose of stages which are before and after the adoption of measures designed to reduce the impact.

The risk/impact assessment is determined by three factors:

- **Source**: The cause or source of contamination.
- **Pathway**: The route whereby the source has reached a specific receptor.
- **Receptor:** A human being, an animal, a plant, ecosystem, a property or the controlled water source.

For the contamination to cause harm or have an effect, it must enter the receptor. The connection between pollutants occurs when the source, pathway and receptor exist together. The impact reducing measures are primarily aimed at preventing the risk, but if the risk is inevitable, then it is recommended to employ measures designed to minimize the impact. Once the exposure mitigating measures are employed, the identified risk is reduced to a less significant level (Booth, 2011).

This assessment focuses on three project phases: commissioning (exploration), operation and decommissioning. Measures designed to reduce the potential negative impacts caused by the proposed activities as part of the EPL project are described, evaluated and presented. Further measures designed to reduce the impact in the form of management action plans are presented in this Environmental Management Plan (EMP).

4 Assessment of Potential Negative (Unfavourable) Impacts

The significant negative consequences potentially associated with the proposed experimenting based on the in-situ leaching are summarised hereunder (assessed below).

The considered project stages/phases

a. The work site preparation stage (construction): it is the stage when the initiator brings, puts and places the main work site facilities, properties and/or objects, including foundation preparation, wells drilling.
b. The experimental phase / Environmental monitoring phase: it is the phase when mitigation measures are mandatory, and the monitoring plan is put into effect.
c. Decommissioning, site abandonment and reclamation: it is the stage when testing, experimental activities stop due to either bad test results, or loss of economic reasonableness for further exploration activities. Remediation measures shall be employed during the pilot test mining works and before decommissioning, otherwise decommissioning will start once the uranium in-situ leaching is completed.

Impact reducing measures.

In case of finding negative impacts, they are challenged to be reduced, and practical and achievable measures designed to minimize or eliminate such negative impacts are recommended. In the event that negative impact mitigation is impossible, such impossibility is subject to stating and justifying. In case of finding positive impacts, it is recommended to employ measures designed to strengthen them for the purpose of optimizing the benefits being received.

Monitoring

If, when and where necessary, it is recommended to apply requirements, including quantifiable standards, to monitoring in order to assess the effectiveness of impact reduction measures. They should state the required actions, person, entity requiring such actions, deadline and frequency of such actions. If and when necessary, it is required to additionally research and implement monitoring programs before, during and after the operation.

4.1 Impact on air quality: dust formation, flue gas emissions

4.1.1 Dust formation

At the stage of preparatory works and at the stage of decommissioning of the site (reclamation), the site-based excavation equipment as well as trucks and vehicles driving down gravel and dirt roads will be generating dust. Excavation works and well drilling activities are the main factors contributing to a short-term down-grade in air quality around the experimental site. In addition, the traffic of people, vehicles and excavation equipment at the site and down the roads may result in generation of dust. Hot and dry environment, loose and sandy nature of soils and sparse vegetation cover within the area also contribute to generation of dust. Wind-blown particles from naturally exposed surfaces may lead to significant dust emissions with a high concentration of solid particles near the source locations.

The pilot test mining works themselves are not going to serve as the source of dust. However, the major cause of dust will be transporting vehicles delivering materials and feedstock to the site area. The release of dust into the environment can be effectively localized by lowering the traffic intensity. In winter months due to strong winds blowing at speeds (>10m/s) are going to increase the level of dust in the air.

It is not only human beings that are affected by dust, but also flora and fauna. Dust deposition on vegetation may affect the rate of photosynthesis and transpiration in the long-term perspective. The dust-settled on leaves of plants may affect not only the functionality of vegetation, but also the vegetation-fed livestock.

Air pollution will be of a limited nature within a small area adjacent to the experimental site and dirt roads leading to the site. Nevertheless, if and where possible, a set of measures designed to minimize and control the adverse effects of dust emitted into the atmosphere are planned for.

4.1.2 Machinery Engines emitted gases

The machinery engines emitted exhaust gases contain a number of pollutants, including carbon dioxide (CO_2), carbon monoxide (CO), carbon hydroxide, nitrogen oxides (NO), sulphides and PM10. There are insignificant amounts of other pollutants such as lead, cadmium, nickel in exhausts. A power generator will be emitting similar pollutants into the atmosphere when its diesel engine is running.

The amount of each pollutant emitted depends on the type and amount of fuel used, engine capacity, vehicle speed and the installed emission control equipment. Once emitted, the pollutants are diluted and dispersed in the ambient air. The carbohydrates-combusted polluting vehicles is of a less concern because field vehicles are equipped with appropriate exhaust filters.

Due to the considerable remoteness of the pilot test mining work site from settlements and community places, there will be no concentration of pollutants harmful for human health on their territories.

4.1.3 Emissions of radioactive substances

Raw materials containing excessive amounts of radionuclides will be extracted to the surface during field experiment. Primary processing products also contain radionuclides.

The processing solutions and the final product contain the following substances: uranium-238, uranium-235 and its decay progenies, thorium and its decay progenies, and Radium-223.

During the field experiment, the operation will be using production solutions having a uranium content of 78.0 - 92.6 mg/l and sulfuric acid of no more than 1.0 g/l, a saturated sorbent having a uranium content of 22.5 kg/m^3 and uranium-containing end product having a uranium content of at least 50 g/l. The final product of the field experimental plant will be a sorbent having a uranium content of up to 40-50 kg/m^3.

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

- Aerosols emitting from technological 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.

The formation of aerosols from resins containing uranium compounds is **extremely low**. Therefore, it is assumed that uranium emitted jointly with aerosols from resins is **negligibly small**.

Processing solutions are transported through sealed pipelines, and there are no open surface or open cover containers having processing solutions therein at the experimental site.

Given that the formed water is weakly mineralized, when it evaporates, **almost no** harmful emissions (aerosols) are **formed**, except for radon. It is possible to expect an increase in radon emission from water within the ore interval, but significantly less and not exceeding the permissible value for residential premises at 100 Bq/l (WHO, 2007)

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. A certain amount of radon and its short-lived decay products dissipate immediately after release into the atmosphere, loses its activity, and does not pose a real danger in the future. Such aerosol pollution does not exceed the permissible limits and is just slightly higher than the ambient background.

Thus, the excessive internal radiation exposure for staff and personnel is impossible during normal operation at the experimental site and in the processing site premises.

Processing solution-contained accident spills and the accompanying entry of radionuclides jointly with vapours into the workplace ambient air are characterized by a relatively low radiation hazard.

The impact of the designed works on the ambient air slightly goes beyond the site, is reversible, short in terms of duration, leads to minor changes in the air environment and will occur from time to time. The impact is assessed as an impact of low significance, the probability of impact is reduced with the planned mitigation measures in place. Table 6 shows the impact assessment.

Table 6: Air quality impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M: -2	L/M: -2	M/L: -4	L/M: 2	L: -16
Post mitigation	L: -1	L/M: -2	L: -2	L: 1	L: -5

4.1.4 Mitigation measures to be implemented:

- All moving vehicles on the project will be regulated to travel at speeds not exceeding 40 km/h to avoid generating excessive dust in the site area.
- When doing earthworks, excavations and having traffic on dirt roads in dry and hot weather, dust will be suppressed by water irrigation or sprays.
- In strong wind conditions, the initiator must decide to stop work until the wind calms down.

- Daily inspection of dirt and gravel roads and excavation sites against possible dust removal, so that the dust suppression measures are employed.
- Regular maintenance and repair of vehicles and machinery will be made.
- Installation and maintenance of emission reducing devices on motor vehicles such as catalytic converters will be made.
- Pumping pregnant solutions out during the pilot test mining works will use submersible pumps instead of airlifts, thus eliminating dissemination of the production solution, giving opportunity for having extraction wells sealed and, as a result, sharply reducing the release of radon into the atmosphere. It is necessary to monitor extraction wells and processing pipelines against leakage on a regular basis.
- Restriction of access to places having high radiation and toxic hazards.
- Unauthorized persons are prohibited from entering the site area. Access into the site will be through access control systems installed on entrances to the project site.
- Fencing, and, if necessary, construction of separate isolated premises.
- Introduction of local hazard warning system at places (installation of warning and information signs) will be made on the project area.
- Regular monitoring of air pollution in premises wherein harmful sub-stances are separated, including exposure to Long-Lived Radioactive Dust (LLRD) and Radon and progeny
- When working with radioactive substances, personnel shall have personal protective equipment: overalls, underwear, hats, gloves, light shoes and, if necessary, respiratory protection.

4.2 Noise and vibration exposure

Vehicles and other equipment will be generating noise and vibration at the stage of preparatory works and during the transport traffic while doing the pilot works. The equipment used for drilling and excavation, as well as transport are of medium size and the noise level will be limited only to the site area. It is recommended that the transport traffic is restricted to normal daytime hours in order to prevent the anxiety factor for nocturnal animals.

Pumps and pumping equipment having a low noise level will be used during the pilot works.

The impact of noise and vibration slightly goes beyond the boundaries of the site and roads, is reversible, short term in terms of duration and will occur from time to time. The impact is assessed as an impact of low significance, the likelihood of the impact is reduced with the mitigation measures put in place. The impact assessed is summarised in Table 7 herein.

Table 7: Noise and vibration impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M: -2	L/M: -2	M/L: -4	L/M: 2	L: -16
Post mitigation	L: -1	L/M: -2	L: -2	L: 1	L: -5

4.2.1 Mitigation measures to be implemented.

- Noise generated by vehicles and equipment at site will be maintained at an acceptable level. Any vehicles or equipment generating excessive noise will be taken for maintenance.
- The time of excavation, drilling and transport traffic will be limited to daytime hours to avoid noise at nighttime.
- If and when necessary, the time of noise generating work shall be agreed with the landowner.

4.3 Disturbance of lands and soils

Preparatory work, including the layout of the site, other earthworks, drilling of wells lead to disturbance of land and soil at the site area. Therefore, the site land may be exposed to erosion. The impact can disrupt the structural composition and biological productivity of the topsoil, and if not taken care of, it can lead to land degradation. However, most of the site and the surrounding area is covered with grass and shrubs. The vegetation cover prevents wind and water erosion by covering and binding the soil with its roots.

The impact on land and soils does not go beyond the site and roads, reversible over a short time period, leads to insignificant noticeable changes, short in terms of duration, probably if mitigation measures are failed to be implemented. The impact is assessed as an impact of low significance, the impact degree is reduced provided that mitigation measures are put in place. The impact is assessed in Table 8 below.

Table 8: Land and soil impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	L/M: -2	M/L: -4	M/H: 4	L: -28
Post mitigation	L: -1	L/M: -2	L: -2	L: 1	L: -6

4.3.1 Mitigation measures to be implemented:

- It is planned that the area of the work site to be disturbed is minimized as far as practicable. At the excavation sites, the soil layer will be removed and stored separately from other soils for re-use on remediation.
- The formation of large piles of soil is prevented.
- The preserved soil layer and ground should be used for filling trenches, excavations, and any disturbed areas.
- The access road into the pilot work site will be established in agreement with the landowner.
- Car tracks, trenches, and other recesses will be restored to their initial relief and visual condition, as far as possible at decommissioning stage.
- The existing vegetation will be preserved as much as possible to minimize erosion.

4.4 Contamination of soil and water resources

During field experiment, 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.

Below are the potential sources of the soil layer contamination at the designated project sites:

- 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.

The surface of solution spills-contaminated earth may be polluted by sulphates and natural radionuclides of the uranium series (also known as the radium series), thus leading to the soil salinization and an increase in the level of gamma radiation. The effect of acidic uranium-containing solutions reduces to destructing soil carbonates, thus triggering intensification of soil acidification. The soil salinization is mostly of superficial nature, although it may go down as deep as 75 cm. The exposure of acidic solutions to soils results in transferring such soils to the category of salt marshes. When the soil surface is contaminated by the processing solution spills, the dose rate is mainly contributed by: Radium-226, including Radon-222 to Bismuth-214 decay products, Uranium-235 and Thorium-231 photonic radiation, which are constantly in balance, Actinum-227 and its short-lived decay products, including Bismuth-211. However, the risk of such contamination is of a local nature, restricted and limited to the experimental 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. Nevertheless, it is possible to have a certain degree of the surface contamination, which is why cleaning activities and set of remediation measures must be planned and scheduled from the very beginning, at the initial stage.

Therefore, it is very critical to employ strict supervision and control over the field experiment both during the in-situ leaching test mining stage and during further site reclamation and remediation activities. In some cases, it is necessary to restore the contaminated groundwater and/or implement the long-term monitoring programs to prevent further contamination propagating into the uncontrolled aquifers or other areas.

The planned activities are also associated with other soil contamination sources (lubricants, fuels and wastewater), which may contaminate soil and, ultimately, groundwater and surface water. In this case, hydrocarbons (oil) emitted from vehicles, machinery and equipment engaged in the project, as well as domestic wastewater will be serving as the expected potential source of soil and water contamination. However, one should note that the potential impact is of the relatively small scale.

Potential soil contamination by chemicals, hydrocarbons and wastewater will not go beyond the site and roads boundaries, short time-wise reversible, resulting in a moderate deterioration of soil condition. Should there be no mitigation measures employed, the likelihood of such impact is potential. The assessed impact is deemed to be of the medium significance. Should there be mitigation measures employed, the impact drops to low significance level. Table 9 describes the exposure assessment.

Table 9: Soil and water resources contamination assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	L/M: -2	M: -6	M/H: 4	L: -36
Post mitigation	L: -1	L/M: -2	L: -2	L: 1	L: -6

4.4.1 Mitigation measures to be implemented:

The pipelines and tanks must be continuously monitored against presence of defects and timely troubleshooting must be employed, if any. Wells must be maintained and applied well workover activities designed to prevent leakage of processing solutions caused by the loss of pipe sealing. The well workover activities are subject to scheduling and complying with such schedules: twice a month in case of injection wells, once a month in case of extraction wells.

Geotextiles and geomembranes will be used as the underlying materials designed to prevent soil and land from chemicals contamination, in the construction of building foundations, ponds tec.

- The acid storage site or facility is equipped with an accident spill catch pit or tray.
- Wastewater from the decontamination unit will be drained into a special container and once settled, returned for preparing solutions.
- Household wastewater will be disposed of in accordance with approved waste disposal or treatment practices, by independent contractors. Toilet containers must be emptied before reaching the maximum capacity.
- When machinery and vehicles are parked, dripping pans will be used to collect possible oil leaks.
- Vehicles should be refuelled at the nearest gas stations. Equipment that must stay at a worksite should be refuelled at a site-based refuelling area equipped with an impermeable cover (film, etc.).
- Any dangerous, harmful, or contaminating spills should be cured immediately. Contaminated soil should be immediately removed and placed in a special waste container designed for subsequent disposal or neutralization.
- Contaminated soil will be collected and transported from the site to an approved, authorized and properly classified hazardous waste processing facility. With the exception of radioactive contaminated soil, which will be kept on site in drum/ containers.
- Spill response tool kits will be readily available, and employees trained how to use those kits.
- An action plan should be designed to eliminate spills in the event of an accident.
- Regular monitoring of gamma radiation will be implemented.

4.5 Impact on terrestrial biodiversity

The development and transformation of lands for any purpose leads to the destruction of the biodiversity of specific sites, fragmentation of habitats, reduces their internal functionality and reduces the role of communication that undeveloped lands perform between different areas that are important for biodiversity. The change is taking place by way of physical disturbance of the habitat and the occurrence of an anxiety factor caused by the presence of a human being and running equipment at the site area. The biodiversity assessment is associated with the impact made by personnel on the surrounding fauna and vegetation. Some of the activities under the proposed project, such as the movement of vehicles, the movement of people, earthworks, excavation, and drilling activities pose a threat to the integrity of the original biodiversity, as well as the biological productivity of the site and adjacent lands.

4.5.1 Fauna

Earthworks, excavation, drilling activities may lead to land degradation, which will lead to habitat loss. The fauna representatives will be concerned by the physical presence of humans and running equipment. Due to the small size of the pilot work site, the impact will be in the form of migration of fauna representatives to neighbouring, more favourable sites and will not affect their community.

There are no endemic species on the site, and the planned activity will not lead to a violation of such species habitat nor to the risk of their extinction. The initiator must ensure that no animal is captured, killed or injured in any way by any of the workers. Poaching of wild animals will be strictly prohibited, as it is a crime, and anyone who is caught violating in this regard will be rejected from the project and bear responsibility.

4.5.2 Ornithofauna

It is expected that birds will be potentially disturbed at the site area. The consequences will be associated with the migration of birds to neighbouring areas and will not affect their community. When nesting sites are detected, measures will be taken to eliminate the anxiety factor in the immediate vicinity of the nesting site. When nesting sites of birds are threatened by the ornithofauna extinction, such as vultures, the initiator must notify the Ministry of Environment, Forestry and Tourism.

4.5.3 Flora/ Vegetation

Pollutants such as dust, gaseous emissions and airborne particles will settle on plants growing at the site and the adjacent area. Most of the dust particles effects on plants include the ability to block and damage stomata, which are affected by photosynthesis and respiration. This, of course, will affect the physiological activity of plants, especially those ones that are located around the site. The consequence of this situation is that some of the plants will experience growth retardation or will be destroyed. But the small size of the planned works site having sparse vegetation will make minor impact on vegetation. If particularly important species are found, their location should be recorded using GPS and reported to the Ministry of Environment, Forestry and Tourism. Such places will then be delimited and completely excluded. The impact on terrestrial biodiversity will be limited to a small area (no more than 5,000 m^2), timewise shortly reversible, having a moderate deterioration, discomfort, partial loss of the habitat/biodiversity. Should there be no mitigation measures employed, the likelihood of such impact is potential. The assessed impact is deemed to be of the medium significance. Should there be mitigation measures employed, the impact drops to low significance level. Table 10 describes assessment of impacts on terrestrial biodiversity.

Table 10: Terrestrial biodiversity impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	L/M: -2	M: -6	M/H: 4	L: -36

Post mitigation	L: -1	L/M: -2	L: -2	L: 1	L: -5

4.5.4 Mitigation measures to be implemented:

4.5.4.1 Flora

- It is planned to reduce the likely area that is going to be disturbed to a minimum practicable.
- The free of vegetation areas will be used to place the required equipment, park transport vehicles, stockpile feedstock, raw materials and waste.
- The free of vegetation areas will be used to run earthworks, excavation, well drilling activities.
- Off-road traffic will be prohibited, as it is required to drive down the available roads and on designated roads only.

4.5.4.2 Fauna

- The work site will be fenced to prevent large mammals and livestock from entering the work site.
- The site-based bird and animal disturbance factors (noise, vibrations, night lighting) will be reduced as much as possible.
- The work area will be explored against the presence of fauna representatives, and it will be determined whether animal species are impacted by the fragmented habitat, if and when necessary.
- There will be set of measures to ensure the organized garbage stockpiling and making it unavailable for animals so that wild animals and livestock are safe, secured and prevented from getting waste inside their organisms.
- Employees shall not be permitted to collect, catch or hunt any wild animals, nor destroy birds nesting sites or other wild animals' habitats.

4.6 Groundwater pollution

Kalahari and Auob aquifers are deemed to be objects in perception as part of this impact assessment.

4.6.1 The Kalahari Aquifer

The Kalahari aquifer is an object of perception having moderate sensitivity, it is not ore-containing horizon as there is no ore therein, respectively it will not be used as a production horizon, there is no connection with the production horizon from the hydraulic perspective, however local farmers use this aquifer most intensively for most of their water requirements.

There are confining layers isolating Auob production horizon from Kalahari aquifers and there will be no exposure to the quality of its water subject to normal and proper operation.

The Kalahari aquifer is located in the upper part of the aquifers and is most susceptible to accidental entry of contaminants resulting from the accident production and leaching solutions leakage or spills.

Most leaks and spills will likely occur in relatively small volumes, since a significant part of the contamination will remain in the soil or ground. The soil assessment impact is detailed in Section 4.2 of this report. The aquifer's water quality may reduce locally, but it is expected that over a short period water quality will gradually recover.

Contaminants will be propagating in minor volumes and over the medium-term period of time, because of the contaminants infiltrated through a bad quality or improperly constructed well.. Water quality may drop down but locally only.

The impact of these factors on existing water intakes is not predicted due to their remoteness.

Potential contamination of the Kalahari aquifer will be of a local nature, timewise shortly reversible, will lead to a moderate deterioration of the state of waters. Should there be no mitigation measures employed, the likelihood of such impact is potential. The assessed impact is deemed to be of the medium significance. Should there be mitigation measures employed, the impact drops to low significance level. Table 11 describes the impact assessment.

Table 11: The Kalahari aquifer contamination assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	L/M: -2	M: -6	M/L: 4	L: -36
Post mitigation	L: -1	L/M: -2	L: -2	L: 1	L: -6

4.6.1.1 Mitigation measures to be implemented:

- Making sure there is no loss of pipe sealing, and the production solutions pumping and transportation system operates without any troubles or problems.
- Proper control of the construction and installation process, including the establishment and compliance with the regulations designed for re-pair and maintenance of wells and pilot cell/mine unit facilities.
- Proper control of the construction and installation process, including the establishment and compliance with the regulations designed for repair and maintenance of wells and pilot cell/mine unit facilities.
- To minimize the consequences of accidental spills of production and leaching solutions, the accident must be eliminated within 1 hour by pumping the spilled solutions into a safe container and neutralizing it by using slaked lime or soda.
- To prevent the infiltration of contaminants into the upper aquifer along the borehole, it is necessary to ensure the reliability of well structures, implemented by monitoring the process of well construction and installation. There is a mandatory set of measures designed and employed to seal thread connections, control the quality of drilling mud and fluids, check the tightness of columns before putting the well into operation, and in case of defects or failure in casing columns – have such casing columns repaired, fixed and pressure tested by applying working pressure whith one and a half times higher.

4.6.2 The Auob aquifer

The Auob 3 aquifer is characterized by high sensitivity since it contains ore and local residents use groundwater from this aquifer.

In case of the preliminary assessment of groundwater according to the "background anomaly" principle, followed by the measurement of individual EPH activities in them, one may apply the value of the integral specific alpha activity 0.5 Bq/L, which, according to the revealed dependence, corresponds to an approximate effective dose of 0.1 mSv/year, or corresponds to a control level.

Such value of the specific total alpha activity is close to the standard established by the WHO (2011), according to which its values, excluding uranium, should not exceed 0.5 Bq/L.

The limiting conditions for classifying groundwater as excessively radionuclides- contaminated groundwater is the concentration of such radionuclides, which provide a total dose-forming effect of ≥ 0.2 mSv/year and a specific integral alpha activity of 1.1 Bq/L. Waters with such characteristics can be confidently and classified as liquid radioactive waste.

- Uranium deposits are usually accompanied by an increased content of radionuclides in groundwater. Below are the indicators of drinking water radiation safety from WHO: Total (Gross) α-radioactivity ≤0.5 Bq/l;
- Total (Gross) β -radioactivity ≤1.0 Bq/l

The groundwater analysis results in all hydrogeological wells of theWings Project have demonstrated that the requirements applicable to the drinking water radiation safety in terms of radionuclide content were exceeded (Figure 1, Figure 2).

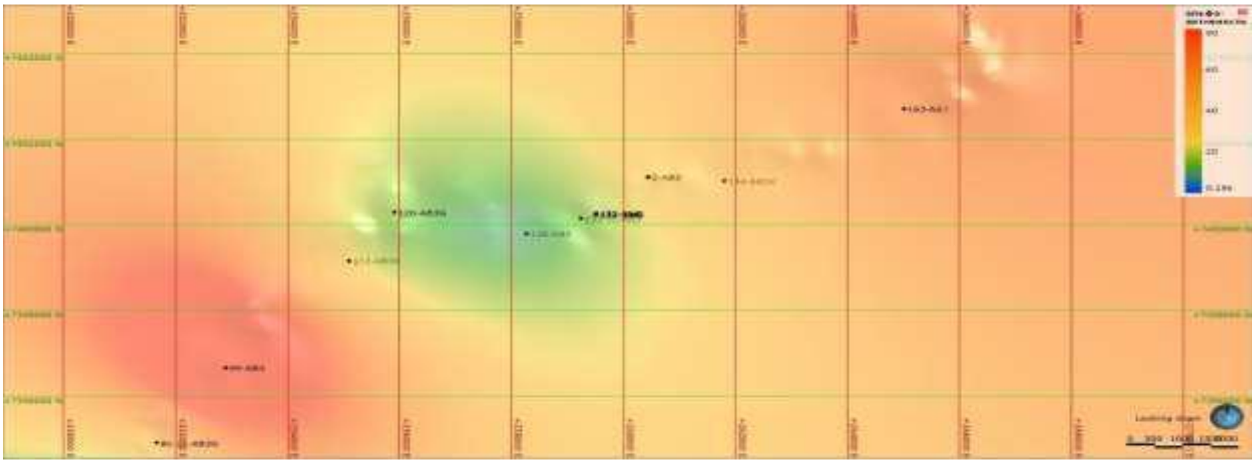

Figure 1. Alpha activity distribution based on experimenting hydrogeological wells of the Wings Project.

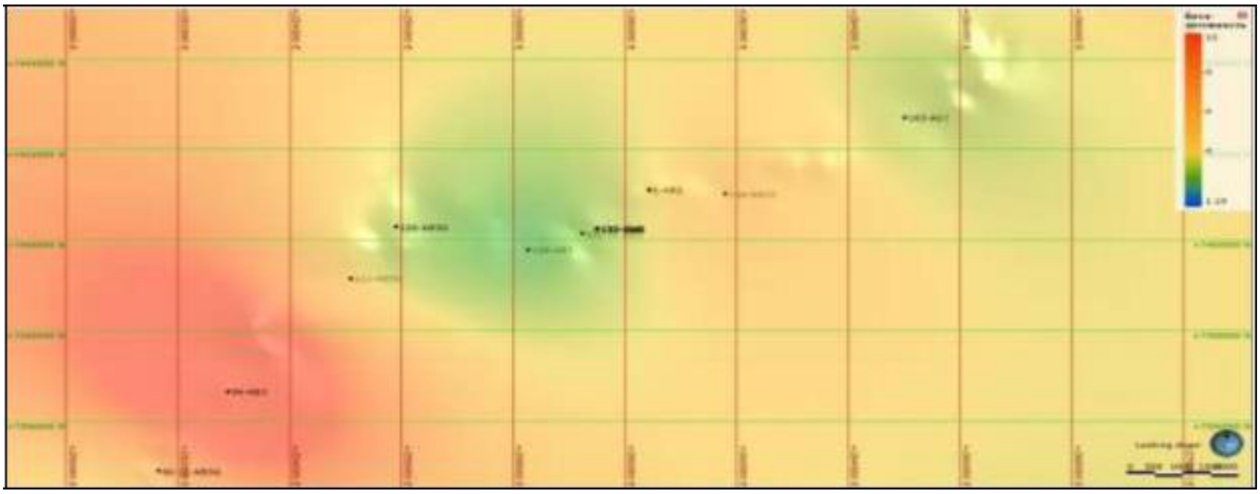

Figure 2. Beta activity distribution based on experimenting hydrogeological wells of theWings Project.

The maximum total α-radioactivity (172.9 ± 2.7 Bq/l) and β-radioactivity (21.34 ± 0.58 Bq/l) is noted in well 94-AB3.

In terms of the content of Na and Br- (in all wells), U, Mn, I-, Se, Fe total (for individual wells) in groundwater, groundwater belongs to Group B "Water of acceptable quality", according to the classification of Namibia [9]. In terms of the "Turbidity" indicator for individual wells, the water is assigned to Group C and Group D.

Ideally, the water is supposed to be of excellent quality (group A) or acceptable quality (group B), but in practice many indicators can go beyond these groups. If water is classified as low-risk water for health (group C), one should pay attention to this problem, although often the situation is not that critical. If water is classified as water with an increased risk to health (group D), one should pay immediate and urgent attention to that issue.

The pilot works are associated with the injection of chemical reagents into the production aquifer and, therefore, is certainly accompanied by contamination of groundwater in the area of operation of the pilot cell/mine unit wells.

When using sulfuric acid, almost all elements existing in rocks in quantities exceeding the maximum permissible concentrations for drinking water supply are more or less transferred to the solution. The total mineralization of groundwater increases to 10 g/l (it increases to 25 g/l after several years of operation)

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. The simulation results are stated in the appendix to this report.

The concentration of all polluting components in the process of underground leaching using sulfuric acid will decrease rapidly while distancing from boundary technological wells.

The concentration of polluting components in the subsurface starts decreasing during chemical interaction with rock minerals, neutralization of the environment, ion exchanging processes, sorption, diffusion.

The pilot cell/mine unit is supposed to operate in the balance between solutions being injected and extracted, however there is no decrease or rise in the ground-water level outside the pilot cell/mine unit. The leaching rate is determined by the pressure gradient.

Given the technological spreading of processing solution flow, the pilot cell/mine unit area will increase from 202 m^2 to 450 m^2. The pilot cell/mine unit's width will increase from 14.2 meters to 21 meters, which is the width of the pollution halo, because of such technological spreading of processing solution flow.

The modelling has explored the most negative option of the pilot cell/mine unit demineralization with the utmost possible contamination scenario. It has explored the case when activities and works at the pilot cell/mine unit, for some reason, would be suspended amid the technological solutions mineralized to the maximum extent, including 10 g/l of sulfuric acid concentration and 100 mg/l of uranium concentration. This option is considered as the most negative one from a theoretical standpoint. In practice, usually it does not happen as the cell/mine unit is completely leached and extracted. This option is considered only for the purpose of assessing the "contaminated" horizon's demineralization under the most negative conditions.

According to the considered option, it will take 18.5 years to have sulfuric acid neutralized and completely demineralized, while the contamination spot will move off only by 37 meters of the active cell/mine unit and self-remediated by then (this does not contradict the statement whereby "the pollution halo will not exceed 100 meters off of the pilot cell/mine unit contour").

Following completion of the pilot works, the generated subsoil manmade residual brine lens travels within the aquifers. In the absence of an artificially created pressure gradient, processing solutions will be travelling at the speed of natural groundwater flow from northwest to southeast direction.

Along the filtration way, the metals-enriched acidic solutions are neutralized by interacting with new volumes of fresh rocks, and metal hydroxides or carbonates are precipitated because of the hydrolysis reaction.

As the groundwater flow displaces the lens, the lens will be travelling at a speed lower than the front fluid flow's speed. The sulfuric acid brine lens in this case will be gradually shrinking until it is completely disappeared under the neutralization processes impact.

As an alternative, there was modelling made for the purpose of demonstrating the remediation process effect on the spread of acid-containing solutions. For modelling purposes, it is assumed that the pilot cell/mine unit has operated for 3 years and thereafter there will be an extraction well only, which will continue running, during the remediation activities.

According to the results, the propagation distance and neutralization time in case of these solutions are not dangerous, nor harmful for the local community. The maximum expansion of acid-containing solutions will not be exceeding 20 m, and it will take about 6 months for the groundwater aquifer to recover following the pilot cell/mine unit abandonment.

4.6.2.1 Radiation impact on the Auob 3 aquifer

There will be almost no impact on the underground waters beyond the mined blocks as a result of the pilot test mining works. It is not expected to have radionuclides spreading along with the groundwater flow beyond the pilot cell/mine unit's contour.

The concentration of the associated radioactive elements during the uranium sulfuric acid leaching is low. For example, radium transfers to a solution in an amount of no more than 2% of its total content in the ores. It migrates over short distances (several tens of meters), since the presence of the SO_4^2 ion in the water leads to the formation of poorly soluble gypsum, as well as practically insoluble barium, lead, and strontium sulfates, which causes the co-deposition of radioactive elements.

At the end of mining the blocks, when pH = 5.5 is reached, uranium precipitates off solutions, thus facilitating the radiological situation improvement. The estimated time for the uranium content to reach the background levels in water, according to the experience at ISR uranium mines in the Republic of Kazakhstan is no more than half a year following completion of works.

The Auob aquifer's water will be locally contaminated within the tested and observed site's area, reversible over time, medium-term in duration, will lead to a serious deterioration of the state of waters. The probability of occurrence is very high. The assessed impact is deemed to be of the medium significance. Should there be mitigation measures employed, the impact drops to low significance level. Table 13 describes the impact assessment.

Table 12: The Auob aquifer contamination assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	M: -3	M/H: -8	H: 5	H: -60
Post mitigation	L: -1	L/M: -2	M/L: -4	M: 3	L: -21

4.6.2.2 Mitigation measures to be implemented

- Ensuring that solutions use cycle is close and sealed off (closed loop). The in-situ leaching method-based cell/mine unit is leached subject to mandatory balancing between the injected and the extracted solution volumes, in order to prevent production and leaching solutions from spreading beyond the cell/mine unit contour. It is allowed to have spread for technological/processing purposes at a distance of half the distance between the injection and extraction wells, in this case it is by 5 meters, but that is due to the pressure gradient being built.
- Ensuring prevention of accident, disaster and emergency situations by way of observing and complying with the established well workover, repair and maintenance regulations.
- The final stage of pilot works must be providing for "washing out sub-surface" using non-acidified recycled barren solutions. The experimental site is subject to decommissioning upon completion of the field testing, control drilling and "washing out subsurface".
- All technological/process wells are subject to decommissioning other than monitoring wells, which are part of the long-term pattern of monitoring the restoration process amid the natural demineralization environment.
- The washing out stage must be followed by measures such as follows:

- injection and extraction wells must be washed out by water in a volume equal to as much as double-volume of the well.
- all technological/process wells must be sealed from bottom to the surface.
- the spacing going above the production formation top must be clay-cemented; further, the spacing between surface of the well and depth of 1.0 m must clay-filled, cemented or filled up with the recycled clay solution.
- the 1.0 m deep wells must be filled with wooden plugs to depth of 0.5 m;
- 1.0 m in diameter to 0.5 m in depth of the well surrounding soil must be excavated; 0.5 m of the casing pipe must be cut off from the surface.
- the resulted funnels around the wellhead must be filled up with clean soil all the way up to the ground surface level.

4.6.2.3 Control Measures

- Construction of two monitoring wells - 132-3N and 132-4N along the groundwater flow and two wells 132-1N and 132-2N within the site's contour at the initial stage of activities. Monitoring wells are designed to monitor and control the solutions spreading both in the horizontal and vertical directions.
- Monitoring mode and balance of technological/process wells in operation, sampling technological/process wells in operation for the purpose of monitoring the uranium content in solutions, monitoring the in-situ leaching progress and chemical aspects in leaching uranium.
- All aquifers in the area of the experimental site, surface atmospheric sediments collections, as well as container tank containing production solution (PS) and container tank containing leaching solutions (LS) solutions are all subject to control and monitoring.
- The monitoring system is based on sampling the above-listed monitoring sources using special monitoring wells, systematising geophysical monitoring data, running analysis, including subsequent development of the required and necessary measures.
- The main objectives of the applied and employed monitoring system are as follows: determining the primary chemical composition and water level; controlling over changes in the chemical composition and dynamic level of solutions in the mined production horizon as a result of the ISL and after mining; controlling over the ISL solutions halo spreading both horizontally and vertically; controlling over the ISL process, improving the mining technology in order to exclude the technological/processing solutions spreading beyond the mined areas.

4.7 Waste generation

The in-situ leaching is in fact a waste–free mining process carried out at the place of occurrence of ore bodies without any quarrying activities to break the existing natural subsurface and surface conditions.

There will be household and industrial wastes generated at the site area at the stage of preparing, experimenting and decommissioning activities.

The low-radioactive waste generated at the site (e.g. soil containing production solutions spills, soil containing sorption spills, fumigation unit's sediments, etc.) are accumulated at the specially equipped low-radioactive waste site, which is a hydro-protection coated platform, with the equipped bucket container thereon. The waste containing big bags are put and stored in the bucket container. Radioactive waste will be kept on site in the container. The emergency waste spills will be cured and eliminated immediately and right away. The documented and provided method of handling low-level radioactive waste will prevent land, surface and groundwater from contamination by the waste containing hazardous and harmful substances. It is supposed to sign a service contract/agreement in respect of disposing all waste from the site with a properly certified and registered waste management company.

Industrial wastes are generated as a result of and during fixing, repairing and maintaining equipment (scrap), including further sorting out and storing them separately depending on their types for further disposal purposes.

There are lids equipped 1,000 litres capacity plastic containers designed to collect and store household waste at the site. Only dry household waste is stored in the container. Eating food at the site is prohibited, hence no food waste is generated. The household waste is removed to the landfill area once a month.

The potential contamination and littering of the land plot will be limited to the adjacent small area. In terms of its duration, the impact is short in duration and reversible, leading to a partial moderate deterioration of the land condition. Should there be no mitigation measures employed, the likelihood of such impact is potential. The assessed impact is deemed to be of the medium significance. Should there be mitigation measures employed, the impact drops to low significance level. Table 13 describes the environmental waste impact assessment.

Table 13: The environmental waste impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M: -2	L/M: -2	M: -6	**M: 3**	L: -30
Post mitigation	**L: -1**	**L/M: -2**	**L: -2**	**L: 1**	L: -6

4.7.1 Mitigation measures and waste management recommendations:

- The site-based employees will be instructed about their responsibilities for proper waste management on the project site.
- Storage of waste and other garbage outside the designated areas is strictly prohibited.
- Every day at the end of working hours, there must be housekeeping followed by clearing off of the abandoned waste from the land plot.
- It is prohibited to bury or incinerate any kind of waste at the site and beyond the site.
- The experimental site must be equipped with containers for storing industrial, low-radioactive and household wastes in a separate way.
- One must be giving priority to reducing, reusing and recycling the generated waste during the pilot test mining works.

4.8 Occupational health and safety risks

ISL pilot test mining leaching involves risks to health and safety of the site-based workers and employees. Out of the chemical reagents used in the pilot test mining, the concentrated sulfuric acid is the most dangerous and harmful in terms of the degree of exposure to human beings. The project initiator will be responsible for ensuring the safety of all personnel at the site and that must be observed in accordance with the requirements of the Labor Law (No. 11 of 2007) and the Health Protection Law (No. 36 of 1919). The direct contact of a person with sulfuric acid or inhalation of its vapours represents risk to his/her health. Usually, occupational exposures are also associated with people having their skins contacting fuel and inhaling fuel vapours while handling such products.

Dangerous and hazardous parts of equipment/mechanisms represent the risk of an accident when operators are poorly trained or out of control. This circumstance increases the likelihood of injury, and the responsible supervisor must be informed of the potential risks of injury at the site. The initiator must ensure that all necessary facilities, toolkits and instruments for urgent emergency care, including first aid kits, are available at the site. All health and safety standards specified in the Labor Law (No. 11 of 2007) must be observed.

The use of heavy equipment, especially during drilling, and the presence of petroleum products in the areas can lead to accidental fire outbreaks. This may pose a safety risk to persons, equipment and transport vehicles.

In the event that machines and equipment are not stored properly, the safety risk can be very high for workers, employees and the environment.

Radiological accidents include situations where there is an outflow of radioactive products and/or ionizing radiation levels exceeding the limits set for normal operation of the project, which may expose or have exposed people to radiation due to exceeding the set limits or radioactive environmental contamination.

Given that the low radioactive natural uranium serves as the substance polluting the pilot test site and the environment, there is no forecasting of exposure levels with potential deterministic (threshold) effects of radiation exposure on personnel in case of an accident.

Radiological accidents that may occur during work do not require the adoption of urgent protective measures designed to protect the personnel and the community at the pilot test site and beyond it. The emergency rescue team and the decontamination division eliminate the accident as per the standard working procedure.

Strict radiation safety measures are applied and employed when performing any operations at the site. Monitoring of external and internal exposure due to radiation will be implemented. The use of hygiene practices and methods to avoid cross-contamination is mandatory.

Should there be no mitigation measures employed, the likelihood of such impact is potential. The assessed impact is deemed to be of the medium significance. Should there be proper mitigation measures employed, the impact drops to low significance level. Table 14 describes the impact assessment, including the set of mitigation measures taken to mitigate the impact.

Table 14: Health and safety impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M: -2	M: -3	M: -6	M/H: 4	L: -44
Post-mitigation	L/M: -2	M: -3	M: -6	M/H: 4	L: -10

4.8.1 Mitigation measures to be implemented:

- During the pilot test mining works at the site, the proponent will provide for measures designed to prevent and localize accident, disaster and emergency situations which may potentially evolve during the tenure of the test mining work.
- These will include measures providing for sanitary and fire clearances; the industrial site fencing using a wire fence to prevent from people and animals; general working and emergency lighting systems; outdoor lighting systems; communication and alarm systems; fire-fighting measures; lightning protection.
- When launching the pilot test mining work site, the proponent will provide for the following: specifying a list of equipment to be launched, protective fittings, their technical condition, the level of production solutions in technological/process tanks, the equipment startup procedure; availability and serviceability of safety fences on rotating parts of equipment, grounding and safety devices and means; availability and serviceability of personal protective equipment: gas masks, overalls, gloves.
- Personnel must be informed of the potential risks of injury within test mining work site.
- The proponent will ensure that emergency facilities are available at the site, including first aid kits and sets.
- The heavy vehicles, machinery, equipment, fuel and hazardous materials storage areas must be properly fixed, and where possible, appropriate warning signs must be installed.
- Drilled wells that will no longer be used or will be used later after drilling must be properly marked for visibility and fully covered/closed.
- The personnel and visitors at the experimental site will be fully inducted of all measures applicable to occupational safety, safety and accident, disaster, and emergency situations on the site.
- When performing dangerous and hazardous operations, personnel must be provided with all of the required and necessary personal protective equipment.
- Monitoring of external and internal exposure due to radiation will be implemented

4.9 Visual impact

The implementation of pilot test mining works is associated with a slight change in the landscape expressed in the form of placing equipment, light structures, laying roads. Such landscape changes detract from the aesthetic appeal of the project landscape.

Changing the landscape because of off-road driving is a serious problem, especially with regard to the uncontrolled employment of heavy vehicles.

The pilot test mining site is located south of the C23 motor way at more than 200 m from it. The experimental site's distance from the motor road will not significantly affect the overall view since most of the visual receptors will be focused on trees and shrubs growing between the site and the motor way.

The impact is expected to be low. This impact is assessed in table 15 below, including the envisaged set of mitigation measures.

Table 15 Visual impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	L/M: -2	L: -2	L/M: 2	L: -10
Post mitigation	L: -1	L/M: -2	L: -2	L/M: 2	L: -10

4.9.1 Mitigation measures to be implemented.

- The access road to the site will be laid in agreement with the landowner, one must ensure that the existing roads are predominantly employed.
- Upon completion of the pilot test mining works, the natural state of the area must be restored, all recesses, pits should be filled in, and wells must be closed off when they are no longer in use.
- The restored site should not differ from the surrounding environment in terms of its visual nature, vegetation cover and topography, and any negative visual impacts must be eliminated.

4.10 Road use and traffic safety

The pilot test mining site is accessible via the C23 motor road, which is the main transport route for all road transport in that area and connects the experimental site with other settlements. Due to the insignificant consumption of feedstock and raw materials at the experimental site, the volume and quantity of traffic down the C23 motor road will slightly increase. Road users will not feel any noticeable changes in traffic on the motor road. Additional traffic on the motor road will not affect safety.

The impact is expected to be short-term, infrequent and therefore of low significance. This impact is assessed in table 16 below, including the set of mitigation measures.

Table 16: The road use and traffic safety impact assessment

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L/M: -2	M: -3	M: -6	M/H: 4	L: -44
Post mitigation	**L: -1**	**L/M: -2**	**L: -2**	**L/M: 2**	L: -10

4.10.1 Mitigation measures to be implemented:

- Loads for heavy trucks must comply with the maximum permissible speed limit applicable to the corresponding vehicles when transporting materials and equipment down the public and access roads (40 km/h).
- The vehicle drivers at all project stages must be having valid and proper driving licenses and complying with road safety regulations and standards.

- Drivers must be driving slowly and keeping an eye on livestock, domestic animals and wild animals, as well as residents/travellers.
- The initiator must ensure that the access roads to the site are well equipped with temporary road signs for servicing vehicles heading to and from the site throughout the test mining period.
- The vehicles in use must be in roadworthy condition and regularly maintained and serviced in order to avoid accidents due to mechanical malfunctions.
- Heavy trucks or vehicles associated with the pilot test mining works must be parked inside the site boundaries.
- The delivery of feedstock, raw materials and equipment to the site will be carefully planned and scheduled. It is optimally to have all delivery to the project site on weekdays, between 8 am and 5 pm.

4.11 Violation of the archaeological and historical resources

There is no data on any archaeological resources that are protected by the National Heritage Act, 2004 (Act No. 27 of 2004) under the National Heritage Council of Namibia directly in the experimental site.

From a regional perspective, there is probably evidence of an early colonial period associated with the trading, missionary and indigenous activities of the tribes.

The initiator is aware that, in accordance with the National Heritage Act, 2004 (Act No. 27 of 2004), information about any items protected in accordance with the definition of heritage found during the work must be reported to the National Heritage Council.

The detailed field survey should be carried out in the event that the alleged archaeological resources have been discovered in the course of implementing works.

The potential damage to archaeological sites may be caused as a result of unintentional destruction or damage as a result of the traffic movement, earthworks, vehicles, traces and actions of contractors, employees.

The assessed impact is deemed to be of the low-level significance, should there be no mitigation measures employed. Table 17 below describes assessment, including the set of mitigation measures.

Table 17: The archaeological and historical resources impact assessment.

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	L/M: -2	M/L: -4	L: 1	L: -7
Post mitigation	L: -1	L: -1	L: -2	L: 1	L: -4

4.11.1 Mitigation measures to be implemented.

The place where archaeological objects may be found must be marked using a flag ribbon, and GPS coordinates must be recorded.
In the event of archaeological finds, all activities must be terminated, the initiator must immediately notify the National Heritage Council.
The initiator must involve an archaeologist to survey the site before the work begins.

4.12 Summary

Table 18 is a summary of the project main risks with their impacts and mitigation measure.

Table 18: Project risks

Item No, type and place of accident, disaster, emergency	Potential consequences	Measures to protect personnel and the environment, elimination of accidents, disasters emergencies
1. Loss of sealing in production/pregnant solutions pipelines	Excess contamination of the pilot test mining site's surface	i. Evacuate people out of the zone having 10 m off the pipeline radius. ii. Report the incident to the operation management, the dispatcher. iii. Call the emergency response team members as per the notification scheme. iv. Use radiation detection equipment to determine the radiation hazardous zone wherein the dose rate exceeds 1 mSv/h above the level of the site natural background. v. Install fences and radiation-hazardousness warning signs at the radiation-hazardous zone border. vi. According to the company-wide order establish the root-cause analysis committee and draft a prompt operating plan designed to investigate the accident, disaster, emergency and eliminate consequences thereof. vii. Monitor the individual radiation exposure to the personnel engaged in the accident, disaster, emergency elimination activities. viii. Take measures to restore controllable conditions for using ionizing radiation sources, repairing pipelines. ix. Take measures designed to remediate the site, collect and export radioactive waste for disposal.

2. Disabling or reducing the ventilation system efficiency running in the production solutions processing premises, shops and plants.	Excess air pollution	i. Evacuate people out of a plant, premise and shop wherein the excess air pollution is detected. ii. Report the incident to the operation management, the dispatcher. iii. Call the emergency response team members as per the notification scheme. iv. According to the company-wide order v. Monitor the individual radiation exposure to the personnel staying in the plant, premise or shop wherein the excess air pollution is detected, if and when needed, have such personnel sent for medical checkup. vi. Take measures designed to restore the ventilation system running efficiency.

3. Loss of sealing, break of airtightness in the technological/process equipment.	Excessive contamination of pilot test mining premises and equipment surfaces.	i. Evacuate people out of a plant, premise, and shop wherein the excessive contamination of industrial premises and equipment surfaces is detected. ii. Report the incident to the operation management, the dispatcher. iii. Call the emergency response team members as per the notification scheme. iv. According to the company-wide order establish the root-cause analysis committee and draft a prompt operating plan designed to investigate the accident, disaster, emergency and eliminate consequences thereof. v. Monitor the individual radiation exposure to the personnel staying in the plant, premise or shop wherein the excessive contamination of industrial premises and equipment surfaces is detected, if and when needed, have such personnel sent for medical checkup. vi. Take measures to restore controllable conditions, in accordance with the prompt operating plan designed to eliminate the accident, disaster, emergency, repair.

4. Fire in the area herein radioactive substances (hereinafter the RS) are located or stored	External and internal irradiation of personnel, contamination of surface of equipment, premises, territories, environment.	i. In case of a fire, eliminate the sources of ignition and other heat releasing sources near the RS. ii. Remove the RS from the fire zone, if impossible, have the RS-containing tanks and/or containers cooled down using water or protected with fireproof materials. iii. If necessary, call the fire brigade and/or fire department. iv. Report the same to the operation management, the dispatcher. v. Call the person responsible for radiation safety and control, and other emergency response team members as per to the notification scheme. vi. Monitor the individual radiation exposure to the personnel involved in the elimination of accident, disaster, emergency.

5. Acid spills within the storage facility area	Excessive contamination of the pilot test mining site surface.	i. The spilled acid is pumped out into the container tank. ii. Acid residues at the site are neutralized using lime or soda. Neutralized solutions are pumped back to the process after settling in container tanks.

6. Pumping sulfuric acid solution into the pilot test mining cell/mine unit is suspended due to force majeure circumstances.	Contamination of groundwater and potential spreading of a mineralized spot	i. Refining solutions extracted from the subsurface and pumped into the container tank by using a reverse osmosis unit during the operation of all technological/process wells and maintaining balance of solutions. ii. Control over the chemical composition of the extracted solutions. iii. Monitoring over changes in the chemical composition of groundwater in monitoring wells. iv. Reverse osmosis-based refining of solutions is followed by the forced filtration. The water is pumped from the monitoring well located 30 m off the cell/mine unit contour at the east side to the injection wells located at the west side of the cell/mine unit. v. Monitoring over changes in the chemical composition of groundwater in monitoring wells. Wells are decommissioned upon completion of demineralization monitoring according to a local project designed internally by the operation.

The operation will have the drafted and approved action plan designed to protect personnel from a radiological accident, disaster and consequences thereof, providing for main sections as follows:

i. Forecast of potential accident, disasters, emergencies at a radiation-hazardous facility subject to the probable causes, types and scenarios of the accident, disaster, emergency, as well as the predicted radiation situation in case of various types of accident, disasters, emergencies.
ii. Criteria for making decisions on implementing protective measures.
iii. The list of organizations to cooperate with when eliminating the accident, disaster, emergency and consequences thereof.
iv. Arranging monitoring activities to monitor over the radiation situation following the accident, disaster, emergency.
v. Assessment of the nature and size of the radiological accident, disaster, emergency.
vi. The accident, disaster, emergency response plan implementation procedure.
vii. Notification and information procedure.
viii. Personnel behaviour during the accident, disaster, emergency.
ix. Duties of officials during the accident, disaster, emergency response operations.
x. Measures to protect personnel during the accident, disaster, emergency response operations.
xi. Fire prevention measures.
xii. Measures to protect the community and the environment.
xiii. Providing victims of accident, disaster, emergency with medical aid and medical assistance.
xiv. Measures designed to localize and eliminate radioactive contamination sources (sites).
xv. Accident, disaster, emergency operations drill and training programs arranged for personnel.

All radiation-hazardous facilities must have the drafted and approved "Personnel Emergency Response Regulations". There must be first-aid kits, including a set of necessary first aid equipment for the accident, disaster, emergency victims at production sites, in the sanitary checkpoint and health centre of the radiation-hazardous facility, and also at those facilities wherein radioactive substances are openly handled, including the replenished stock of sanitary treatments for the contaminated persons.

In all cases of detecting a radiological accident, disaster, radiation emergency, the company administration shall report it to the government bodies and agencies authorized to regulate and control compliance with radiation safety. In this case the National Radiation Protection Authority.

In accordance with the "Method for the Development of Emergency Response Preparedness for Nuclear or Radiological" (IAEA, 1998), radiological accidents that may occur during the pilot test mining cell/mine unit operation do not require taking urgent protective measures to protect personnel and community at the test mining site and beyond it.

The arrangement, organization and implementation of measures designed to protect personnel from radiation ensure that workers are limited to radiation exposure from all external and internal radiation sources in a total dose not exceeding the basic dose limits set for the corresponding category of persons. In the event of violation of occupational sanitary and hygienic, and environmental standards, it is mandatory to conduct official investigations. Such violations include:

- violations of the organizational and licensing documentation renewal deadlines.
- violation of the radioactive sources accounting and storage regulations acid, leaching and production solutions spills onto the soil resulted from the loss of sealing in pipelines, injection and extraction well caps at wellfield-based acidification houses, destruction of the walls of solutions container tanks and sludge pits, overflows, radioactive waste spills during handling, loading and unloading of packaging kits at the operation's site , leading to soil contamination to levels not exceeding acceptable or controlled thresholds.
- violation of the finished product and radioactive waste packaging regulations and rules, or violation of shipping documentation registration.
- unauthorized changing in the finished products or other radioactive sources transportation route.
- loss of tightness in the transport package and the resulted contamination thereof or contamination of the vehicle above the permissible level, which did not lead to radiation exposure to personnel or community representatives above the limits set by the radiation safety standards.
- damage to packages during handling, loading and unloading operations without breaking package integrity and radioactive contamination of the outer surface.
- emissions of radioactive substances into the atmosphere in quantities exceeding the permissible emission limits approved by the environmental regulatory authorities.
- In all cases, when radiological accidents and their consequences are eliminated, it is mandatory to do the following:
  - Monitoring radiological exposure to personnel.
  - Using personal protective equipment.

Radiological monitoring includes individual dosimetry of personnel by way of using dosimeters and radiation survey meters. the long-lived alpha-nuclides and radon decay progenies in the air are also measured.

In the event of repairing container tanks with processing solutions, it is recommended to ensure that repairmen are provided with supply ventilation.

It is only sulfuric acid, which is characterized by a significant toxic hazard, out of all chemical reagents employed at the ISL pilot test mining cellunit. In most cases, when working with processing solutions of the technological cycle, the acid concentration may not cause exceeding MPC levels in the work zone air. That is why the processing solutions-containing spills do not significantly affect personnel. The exception is the concentrated sulfuric acid-containing spills resulted from the destruction of sulfuric acid storage tanks. This type of spills is localized in the acid storage tank trays. When eliminating sulfuric acid-containing spills, it is mandatory to use:

- individual respiratory protection equipment.
- special acid-resistant clothing, workwear and shoes.

The analysis of the most probable accident situation scenarios supports that it is possible to have an accident of a local nature, which will not lead to catastrophic or irreversible consequences. Timely employment of the project planned and scheduled measures designed to localize and eliminate the consequences of accident situations will additionally reduce their potential negative environmental effects, reduce the environmental risk levels. In general, the environmental risk of accidents at the pilot test mining cell/mine unit is practically excluded. Consideration of the accident consequences caused by the unauthorized distribution of harmful chemical and radioactive substances shows that their dangerous impact on the community does not go beyond the site or facility area. In accordance with the classification of radiological objects in terms of the potential hazard, the sorption processing plant is classified as category radiological object, which is the site or facility having radiological exposure limited to the site or facility area.

5 Socio-Economic Consequences Assessment

5.1 Positive impacts

Public awareness of the consequences.

The planned pilot test mining works will allow clarifying, refining and optimizing the technology of uranium extraction based on the ISL method of mining based on the Wings Project conditions, as the safest and waste-free method of uranium mining. One of the work objectives is to determine the project specific safety parameters of the in-situ leaching for the environment, social environment, and public health.

The data obtained during the pilot test mining works will lead to further designing of mining operations with in-depth understanding of the hydrogeological and other natural conditions of the area to the maximum extent to prevent negative impacts on public health and the environment. Without going through the pilot test mining works, ISL will significantly increase the risk negative impacts on the environment as site specific parameters required for the design will still not be clear. Waiver of the planned pilot test mining works will significantly increase the risk of aquifer contamination used by the local community.

In addition, the pilot test mining works will allow obtaining additional data on the actual condition and quality of aquifers used for water supply.

Consultations with the public, community, which are planned to take place at all stages of designing will allow informing the community about the actual state of water resources and potential threats during the implementation of the planned activity or abandonment thereof.

Improvement measures:

Promoting up to date information about the state of water resources and raising public awareness and community understanding of the planned activities' aspects.
Ensuring permanent and continuous opportunities for bilateral dialogue with the project stakeholders through a wide range of programs and communication channels.
Providing local stakeholders with access to up to-date and accurate information on the state of water resources and planned activities.
Better understanding of local interests, priorities, concerns and problems, as well as ensuring their adequate solution when designing and implementing the planned activities.

Job Creation

It is the aim of Headspring Investments to involve and employ local residents during and after the pilot test mining stage. It is envisaged that on mining operations startup, The Wings Project will employ considerable number of local residents and other skills within the national boundaries. Involving and employing local residents will be encouraged, especially if and when the project starts commercial production. There will be different types of jobs, including skilled, semi-skilled and unskilled ones. During the pilot test mining works it is envisaged there will be 5 to 10 temporary jobs offered for the community members.

Improvement measures:

It is proposed that local community members from the surrounding areas are first considered for employment. Especially, where no special skills are required. The project is likely to raise the general levels of incomes of the local communities around Wings Project.

5.2 Economic benefits

Production of minerals is utmost essential to achieving Namibia's development goals, contributing to meeting the ever-increasing global demand for minerals and national prosperity. The successful exploration and confirmation of the safety of uranium in-situ leaching method of mining will lead to the production of uranium minerals, which can contribute to the achievement of goals as part of the national development plans.

Due to the decreasing quality of extracted mineral using conventional mining methods, new methods of exploiting these low grades mineral resources are becoming more and more important if the sustainability of the national economy has to be met. Namibia is a host of large low grade uranium Mineral Resources in the form of sandstone ore which are commercially mined using ISL mining method. Newer mining methods to economically mine these low grades deposits continue to be developed globally hence the increase in the use of ISL mining methods worldwide.

In modern conditions, when deposits with increasingly poor ores are being mined, prices for energy commodities, materials, equipment, and transport have increased significantly - uranium production is becoming less efficient with open pit and underground mining and in some cases unprofitable, despite uranium prices being good. ISL mining method employ much simpler technology in terms of equipment and has general low surface impact on the environment.

At the same time, the traditional trend for the entire mining industry towards a decrease in the quality of extracted ores due to the depletion of resources is also typical for the uranium mining subindustry. There are rather large uranium reserves in the form of sandstone ores concentrated in Namibia. In modern conditions, when deposits with increasingly poor ores are being mined, prices for energy commodities, materials, equipment, and transport have increased significantly - uranium pro-duction is becoming less efficient, and in some cases unprofitable, despite uranium prices.

In this regard, amid continuing negative trends and increased environmental requirements, the conventional methods of mining uranium become less cost-effective. Solution out of this situation can be found only if and when switching to the in-situ leaching (the ISL) method of mining. The following advantages of the ISL, such as: low energy intensity, much simpler technological equipment and a very local impact on the environment can play a decisive role in the further development of uranium production.

On top of that, according to the legislation of Namibia, operating companies must pay taxes. The initiator will pay tax to the government, therefore, the whole nation will benefit therefrom, given that the money received from taxes is redirected by the state to the community.

The economic benefits resulting from the implementation of the planned activities and subsequent extraction include:

- receipt of foreign direct investment.
- support of local products sales by purchasing consumables.
- gaining potential income for local and national government through land lease fees, license rental fees and various tax structures.

5.3 Negative consequences

5.3.1 Pasture lands disturbance

The pilot test mining cell/mine unit, wherein the pilot test mining works will be carried out, is located south of C23 road at the of Tripoli farm No 546. The farmers in this area use land mainly for pastures. Preparatory work for conducting field experiments at the pilot test mining cell/unit's site, such as clearing the site, laying roads, drilling, can lead to local disturbance of pasture lands. Since the farmer is heavily dependent on these types of agriculture for natural and commercial purposes (income generation), this can have an impact on his livelihood activity through potential feeding/grazing of animals and possible losses.

The area of the pilot test mining cell/mine unit will be 202 m^2. Taking into account the monitoring wells, placement of necessary equipment, the pilot work area will not exceed 4,300 m^2. The area of access roads to the site will not exceed 1,300 m^2. Thus, no more than 6,000 m^2 of pastures will be involved in the pilot test mining works.

The temporary use of this insignificant area for the pilot works cannot interfere with animal husbandry in this area. The loss of pastures for livestock and wildlife is not predicted, the number of animals on the farm will not decrease and it does not lead to the loss or reduction of the farmer's livelihood. The assessed impact is deemed to be of the low significance. Should there be proper mitigation measures employed, the impact drops to low significance level. Table 20 describes the impact assessment, including the set of mitigation measures.

Table 20: Assessment of preparatory and pilot works impact on pastures

Mitigation Status	Extent	Duration	Intensity	Probability	Significance
Pre mitigation	L: -1	L/M: -2	L: -2	L: 4	L: -20
Post mitigation	L: -1	L/M: -2	L: -2	L: 2	L: -10

5.3.2 Mitigation measures to be implemented.

- Any unnecessary damage or destruction of pasture lands as a result of the pilot works will be avoided.
- It is necessary to fence out the pilot test mining works site in order to prevent unauthorized access of animals to the pilot works area.
- Vegetation found on the site, but not affected during the preparation of facility grounds, will not be destroyed, but kept for preserving biodiversity and pasture lands.
- Workers of the proponent will refrain from driving outside the established highways designated roadways and disturbing surface soil thus causing the loss of pasture lands.
- Workers of the proponent will be encouraged and trained on the importance of preserving pastures for local livestock.

6 Mitigation Measures and Remediation Recommendations

The pilot test mining cell unit remediation will include, but not be limited to the following:

- Dismantling all surface equipment and temporary structures.
- Filling of all recesses in such a way that the ground is filled in first, and the top layer of soil is filled in last.
- Abandonment and decommissioning of all wells that were not employed at the production stage (when making a decision on production).
- Removal of all waste generated at the site after completion of all works, including remediation ones.

Environment Management Plan

The environmental management plan (EMP) provides a delivery mechanism to address potential adverse impacts identified during the assessment of the In Situ Leaching of uranium at Wings Project test mining cell. The EMP will help to instruct workers and contractors, and to introduce standards of good practice to be adopted for the full commercial uranium mining operations. For each phase of the ISL programme, the EMP lists all the requirements to ensure effective mitigation of significant impacts be they geophysical, biophysical and socio-economic impacts identified in the EIA. The EMP help to stipulate the roles of the project proponent, proponent's contractors, and employees. A comprehensive listing of the mitigation measures (actions) has been prepared for implementation during the test mining work. Also included in the EMP are the various parameters that will be monitored to ensure effective implementation of the mitigations measures actions.

7 Conclusion

Based on the experience gained on working on uranium deposits using the In Situ Leaching (ISL) method in other countries such as Australia, Canada, Kazakhstan, Russia and USA it can be stated that low grade uranium deposits can be exploited in a friendly manner with man-made impacts being managed well, zones of contaminated groundwater will be restored to their original state. However, it is important that real data on the physical and chemical interaction of residual solutions used in ISL, with host rocks is accurately tested and recorded for reliable prediction of the behaviour of deposit /area to solutions used in the test mining work of ISL mining be obtained during the test mining and monitoring at the pilot test mining site. The monitoring of direction of the pollution area (halo) movement allows accurate determination of location of observation (monitoring) wells to track the pollution area spreading and help in instituting control measures that quickly allow for natural demineralization.

It is strongly recommended that an Independent Environmental Practitioner is appointed to carrier out monitoring of the pilot test mining work through analyses of groundwater quality for the surrounding farms water wells. At the end of the pilot test mining work the collected data will help in the development of the full-scale commercial activities. The development of the Wings Project deposit will hinge on the result of the pilot test mining work carried out on Tripoli Farm No 546. The environmental impacts will be monitored at all stages of the development of the pilot test mining cell which include construction of test wells, production, decommissioning and remediation. All the stages of development will be monitored with effective mitigation measures put in place to limit environmental impacts. It is hoped that the field pilot test mining cell development will provide critical information for the design of the wells which do not allow the man-made solutions to flow into adjacent aquifers.

The pilot test work will prove beneficial in that more environmental data will be collected which will be used in the general design of the commercial ISL mining and on measures to undertake in order to monitor the likely environmental impacts of the full scale ISL mining operation.

Notwithstanding the fact that no In Situ Leaching mining of uranium has taken place in Namibia this method of uranium extraction has proved itself in other countries. If this test work proves itself environmentally it would open doors for the exploitation of huge low grade uranium resources of Namibia. Detailed environmental assessments of likely impacts of the ISL mining have been conducted and detailed list if impacts assessed before and after mitigation measures taken to manage them. Comprehensive ongoing environmental monitoring programmes have all been designed to effectively manage these mitigation measures instituted to reduce the impacts.

8 Recommendation

Recommendations for Environmental Clearance Certificate Based on the results of this updated Environmental Impact Assessment (EIA) and Environmental Management Plan report, it's hereby recommended that the proponent be issued with the new Environmental Clearance Certificate for In Situ Leaching mining for the test mining work cell to be located on Tripoli Farm No 546. This certificate is issued on condition that the proponent further engages an Independent Environmental Practitioner (EP) who will help the DEP to collect geophysical and chemical data on the groundwater resources during the test mining work. At the end of the test mining work the EP will produce an assessment report for the proponent and for the DEP and the community.

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