## **Monitoring Plan**

**Construction period**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Environmental item** | **Item to be monitored** | **Monitoring site** | **Frequency** | **Method** | **Party in charge** |
| **Air quality** | H2S - CO2 | Borinquen Hotel and 4 sites (north, south, east and west) on the well base boundary | During testing period (weeks-one month): every three month (quarterly) and permanent monitoring station  | Field measurement | ICE |
| C:\Users\jovaler\AppData\Local\Temp\Dashboard-1.png |
| **Environmental item** | **Item to be monitored** | **Monitoring site** | **Frequency** | **Method** | **Party in charge** |
| **Noise** | Noise level | Borinquen Hotel, one site on the well base boundary (in the hotel direction), and 4 sites (north, south, east and west) in the vicinity of the power plant site.  | During testing period (weeks-one month): once/weekDuring power plant construction: monthly (with peak time for each construction job taken into account) | Field measurement | ICE |
| C:\Users\jovaler\AppData\Local\Temp\Dashboard-2.png |
|  |
| **Environmental item** | **Item to be monitored** | **Monitoring site** | **Frequency** | **Method** | **Party in charge** |
| Water quality | 1. pH, Electric conductivity (EC), Chlorides (Cl-)
 | Upper and lower streams of the Salitral rivers, upper and lower streams within the project area (AP) of the creek running.  | 1. During testing period: twice/testing period (weeks-one month)
 | Laboratory analysis of collected samples | ICE and External laboratory to hire by ICE |
|  |
| **Water quality** | 1. Oils and grease,
 | Outlet of the settling basin (construction work effluents). Only in the presence of machinery in the project area (AP) | 1. Oils and grease, every six months (semester) After 2 years, the continuation of monitoring will be reconsidered based on opinions of professional experts.)
 | Laboratory analysis of collected samples | ICE and External laboratory to hire by ICE |
|  |
| **Water quality** | 1. Hexavalent chrome (Cr+6), and Mercury (Hg) and COD
 | NOT APPLICABLE (NA) | NOT APPLICABLE (NA) | -------- |  |
|  |
| **Water quality** | 1. Arsenic (As)
 | Only in drinking water intakes | every six months (semester)After 2 years, the continuation of monitoring will be reconsidered based on opinions of professional experts.) | Laboratory analysis of collected samples | ICE and External laboratory to hire by ICE |
|  |
| **Environmental item** | **Item to be monitored** | **Monitoring site** | **Frequency** | **Method** | **Party in charge** |
| **Soil** | Complete analysis - Cadmium (Cd), Lead (Pb), As, Cr+6, Hg, etc. | Four points in the vicinity of a representative geothermal field | One year before construction starts, and once five years after operation starts | Laboratory analysis of collected samples | ICE |
| Four points in the vicinity of the power plant site  | One year before construction starts, and once five years after operation starts |
| Not applicable for this period. Monitoring in 2020. |
| **Environmental item** | **Item to be monitored** | **Monitoring site** | **Frequency** | **Method** | **Party in charge** |
| **Fauna and flora** | Plants and animals (birds, amphibians, reptiles, and mammals) | Area in the vicinity of wells and power plant site, the project site side of the national park, and gallery forest along the Salitral river | Monthly (with rainy and dry seasons, breeding seasons, etc. taken into account) | Visual observation records and photographs | ICE |
| **Results of monitoring and state of conservation of species, april, may, June 2020.**

|  |  |
| --- | --- |
| **Group** | **State of Conservation** |
| **Amphibian** | **CITES** | **IUCN** | **MINAE N° 40548- Regulations**  |
| *Craugastor fitzingeri* |   |   |   |
| *Lithobates warszewitschii* |   |   |   |
| **Birds** |
| *Amazona albifrons* | II |   | RP |
| *Aramides albiventris* |   |   |   |
| *Attila spadiceus* |   |   |   |
| *Aulacorhynchus prasinus* |   |   |   |
| *Basileuterus culicivorus* |   |   |   |
| *Basileuterus rufifrons* |   |   |   |
| *Brotogeris jugularis* | II |   | RP |
| *Buteo plagiatus* | II |   | RP |
| *Calocitta formosa* |   |   | RP |
| *Campylopterus hemileucurus* | II |   | RP |
| *Cantorchilus modestus* |   |   |   |
| *Chiroxiphia linearis* |   |   |   |
| *Ciccaba virgata* | II |   | RP |
| *Coragyps atratus* |   |   |   |
| *Crax rubra* | III | VU | RP |
| *Crypturellus cinnamomeus* |   |   |   |
| *Crypturellus boucardi* |   |   | RP |
| *Dendrocincla homochroa* |   |   |   |
| *Eucometis penicillata* |   |   |   |
| *Eumomota superciliosa* |   |   |   |
| *Euphonia hirundinacea* |   |   |   |
| *Eupsittula canicularis* | II |   | RP |
| *Geothlypis poliocephala* |   |   |   |
| *Hylocharis eliciae* | II |   | RP |
| *Leptotila verreauxi* |   |   |   |
| *Melanerpes hoffmannii* |   |   |   |
| *Microcerculus philomela* |   |   |   |
| *Mionectes oleagineus* |   |   |   |
| *Momotus lessonii* |   |   |   |
| *Morococcyx erythropygus* |   |   |   |
| *Myiarchus tuberculifer* |   |   |   |
| *Nyctidromus albicollis* |   |   |   |
| *Pachysylvia decurtatus* |   |   |   |
| *Passerina caerulea* |   |   |   |
| *Patagioenas flavirostris* |   |   |   |
| *Penelope purpurascens* | III |   | RP |
| *Peucaea ruficauda* |   |   |   |
| *Piaya cayana* |   |   |   |
| *Pitangus sulphuratus* |   |   |   |
| *Pseudastur albicollis* | II |   | RP |
| *Psilorhinus morio* |   |   |   |
| *Ramphastos sulfuratus* | II |   | RP |
| *Thryophilus pleurostictus* |   |   |   |
| *Thryophilus rufalbus* |   |   |   |
| *Tityra semifasciata* |   |   |   |
| *Trogon melanocephalus* |   |   |   |
| *Volatinia jacarina* |   |   |   |
| *Zenaida asiatica* |   |   |   |
| *Zenaida macroura* |   |   |   |
| *Henicorhina leucosticta* |   |   |   |
| **Mammals (Visual, Sherman, Mist nets and Camera trap)** |
| *Alouatta palliata* | I |   | EN |
| *Ateles geoffroyi* | I | EN | EN |
| *Cebus imitator* | II |   | RP |
| *Conepatus semistriatus* |   |   |   |
| *Dasypus novemcinctus* |   |   |   |
| *Puma concolor* | I |   | EN |
| *Sciurus deppei* |   |   | RP |
| *Sciurus variegatoides* |   |   |   |
| *Tamandua mexicana* | III |   |   |
| *Tapirus bairdii* | I | EN | EN |
| *Tayassu pecari* | II | VU | EN |
| *Canis latrans* |   |   |   |
| *Dasyprocta punctata* | III |   |   |
| *Didelphis marsupialis* |   |   |   |
| *Leopardus pardalis* | I |   | EN |
| *Nasua narica* | III |   |   |
| *Odocoileus virginianus* |   |   |   |
| *Panthera onca* | I | NT | PE |
| **Reptiles** |
| *Norops cupreus* |   |   |   |
| *Norops oxylophus* |   |   |   |
| *Phyllodactylus tuberculosus* |   |   |   |
| *Senticolis triaspis* |   |   |   |

I=Appendix I CITES, II=Appendix II CITES, III=Appendix III CITES, IUCN= The International Union for Conservation of Nature, CITES=The Convention on International Trade in Endangered Species of Wild Fauna and Flora, NT= Near Threatened, EN= endangered species, RP= species with reduced or threatened populations, VU= Vulnerable. **Wild animals monitoring. May 2020.****Night monitoring.**\\10.149.70.64\Data_RGE\GE\Gest-Soc-Ambiental\FOTOS-GMA\Gest_Biologia\BD_Biologia\CG_Borinquen\Monitoreos_fauna\Nocturnos\T22\20200506\IMG_0136.JPG **Distribution of flora species by habits registered in the Borinquen Geothermal Field. March 2014 – March 2020.** |
| **Environmental item** | **Item to be monitored** | **Monitoring site** | **Frequency** | **Method** | **Party in charge** |
| **Waste\*** | Generated amount | Power plant construction site | Monthly | Total of generated amount (weight or volume) | Construction contractor |
| Not applicable for this period. In 2021 starts the construction of plant. |

\*Appropriate waste management including disposal of sludge will be implemented in accordance with Law for the Integrated Management of Residues (Law 8839), and in reference to Resolution No. 1948-2008-SETENA17 (page26).