**Monitoring Plan**

**Construction period**

| Environmental item | Item to be monitored | Monitoring site | Frequency | Method | Party in charge | Evidence |
| --- | --- | --- | --- | --- | --- | --- |
|  | H2S | Rincón de la Vieja Hotel and 4 sites (north, south, east and west) on the well base boundary | During production testing period (weeks-one month): every three month (quarterly) | Field measurement | ICE | C:\Users\jovaler\Downloads\Dashboard (1).png |
| Noise | Noise level | Ricón de la Vieja 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 production testing period (weeks-one month): once/week  During power plant construction: monthly (with peak time for each construction job taken into account) | Field measurement | ICE | C:\Users\jovaler\Downloads\Dashboard (2).png |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| water quality | 1. pH, Electric conductivity (EC), Turbidity (TURB), Suspended solids (SS), Oils and grease, BOD, and COD 2. Arsenic (As), Hexavalent chrome (Cr+6), and Mercury (Hg) | Upper and lower streams of the Colorado and Negro Rivers, and upper and lower streams of the creek running near GPG2 | 1. During production testing period: twice/testing period (weeks-one month) 2. During power plant construction: monthly /construction period | Field measurement and laboratory analysis of collected samples | ICE and construction contractor (effluents from temporary settling basin) | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Site** | **Disolved oxygen (mg/L)** | **BOD (mg/L)** | **COD (mg/L)** | **S.S (mg/L)** | **Oils and Grease (mg/L)** | **Cr +6 (mg/L)** | **Hg (mg/L)** | | R. Negro | 7.73 | <2 | <1 | <15 | nd | nd | nd | | R. Colorado | 8.7 | 7 | 10 | <15 | nd | nd | nd | | Q. Yugo | 8.81 | 7 | 11 | <15 | nd | nd | nd |   nd: Not detectable  Construction period  The BMWP-CR is an index obtained from summing punctuation assign to different macroinvertabrates`s families base on the sensitivity to pollution.  The punctuation is assigned just once for every single family, independently of the amount of individuals or genus encountered. The sum of punctuation of all families in the study area offers a final value of index.  **Table 1. Water quality level according to BMWP-CR`s value.**   |  |  |  | | --- | --- | --- | | **Level** | **BMWP-CR** | **COLOR** | | Excellent water quality | >120 |  | | Good water quality, not polluted nor altered in other sensitive way | 101-120 |  | | Regular water quality, eutrophy, moderate polluted | 61-100 |  | | Bad water quality, polluted. | 36-60 |  | | Bad water quality, very polluted. | 16-35 |  | | Very bad water quality, extremely polluted. | <15 |  | |
| pH, EC, TURB, SS, Oils and grease, BOD and COD | Upper and lower streams of the Colorado and Negro Rivers, upper and lower streams of the creek running near GPG2, and outlet of the settling basin (construction work effluents) | Monthly | **Values ​​obtained and level of ambient water quality according to the BMWP-CR. July 2019 – september 2021.**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Year** | **Month** | **Site** | **BMWP-CR Value** | **Water quality** | | 2019 | ago-19 | Qda. Yugo arriba | 80 | Regular water quality, eutrophy, moderate pollution. | | 2019 | ago-19 | Qda. Yugo abajo (calle) | 101 | Good water quality, not polluted nor altered in other sensitive way | | 2019 | ago-19 | Río Colorado arriba | 47 | Bad water quality, polluted. | | 2019 | ago-19 | Río Colorado LT | 62 | Regular water quality, eutrophy, moderate pollution. | | 2019 | ago-19 | Río Negro arriba | 83 | Regular water quality, eutrophy, moderate pollution. | | 2019 | ago-19 | Río Negro abajo | 72 | Regular water quality, eutrophy, moderate pollution. | | 2019 | ago-19 | Río Blanco arriba | 52 | Bad water quality, polluted. | | 2019 | ago-19 | Río Blanco abajo | 54 | Bad water quality, polluted. | | 2019 | nov-19 | Qda. Yugo arriba | 99 | Regular water quality, eutrophy, moderate pollution. | | 2019 | nov-19 | Qda. Yugo abajo (calle) | 122 | Excellent water quality. | | 2019 | nov-19 | Río Colorado arriba | 73 | Regular water quality, eutrophy, moderate pollution. | | 2019 | nov-19 | Río Colorado LT | 73 | Regular water quality, eutrophy, moderate pollution. | | 2019 | nov-19 | Río Negro arriba | 125 | Excellent water quality. | | 2019 | nov-19 | Río Negro abajo | 111 | Good water quality, not polluted nor altered in other sensitive way | | 2019 | nov-19 | Río Blanco arriba | 46 | Bad water quality, polluted. | | 2019 | nov-19 | Río Blanco abajo | 54 | Bad water quality, polluted. | | 2020 | feb-20 | Qda. Yugo arriba | 74 | Regular water quality, eutrophy, moderate pollution. | | 2020 | feb-20 | Qda. Yugo abajo (calle) | 103 | Good water quality, not polluted nor altered in other sensitive way | | 2020 | feb-20 | Río Colorado arriba | 61 | Regular water quality, eutrophy, moderate pollution. | | 2020 | feb-20 | Río Colorado LT | 62 | Regular water quality, eutrophy, moderate pollution. | | 2020 | feb-20 | Río Negro arriba | 106 | Good water quality, not polluted nor altered in other sensitive way | | 2020 | feb-20 | Río Negro abajo | 101 | Good water quality, not polluted nor altered in other sensitive way | | 2020 | feb-20 | Río Blanco arriba | 47 | Bad water quality, polluted. | | 2020 | feb-20 | Río Blanco abajo | 67 | Regular water quality, eutrophy, moderate pollution. | | 2020 | may-20 | Qda. Yugo arriba | 95 | Regular water quality, eutrophy, moderate pollution. | | 2020 | may-20 | Qda. Yugo abajo (calle) | 77 | Regular water quality, eutrophy, moderate pollution. | | 2020 | may-20 | Río Colorado arriba | 90 | Regular water quality, eutrophy, moderate pollution. | | 2020 | may-20 | Río Colorado LT | 86 | Regular water quality, eutrophy, moderate pollution. | | 2020 | may-20 | Río Negro arriba | 89 | Regular water quality, eutrophy, moderate pollution. | | 2020 | may-20 | Río Negro abajo | 77 | Regular water quality, eutrophy, moderate pollution. | | 2020 | may-20 | Río Blanco arriba | 30 | Bad water quality, very polluted. | | 2020 | may-20 | Río Blanco abajo | 37 | Bad water quality, polluted. | | 2020 | ago-20 | Qda. Yugo arriba | 82 | Regular water quality, eutrophy, moderate pollution. | | 2020 | ago-20 | Qda. Yugo abajo (calle) | 93 | Regular water quality, eutrophy, moderate pollution. | | 2020 | ago-20 | Río Colorado arriba | 32 | Bad water quality, very polluted. | | 2020 | ago-20 | Río Colorado LT | 85 | Regular water quality, eutrophy, moderate pollution. | | 2020 | ago-20 | Río Negro arriba | 67 | Regular water quality, eutrophy, moderate pollution. | | 2020 | ago-20 | Río Negro abajo | 76 | Regular water quality, eutrophy, moderate pollution. | | 2020 | ago-20 | Río Blanco arriba | 56 | Bad water quality, polluted. | | 2020 | ago-20 | Río Blanco abajo | 51 | Bad water quality, polluted. | | 2020 | dic-20 | Qda. Yugo arriba | 59 | Bad water quality, polluted. | | 2020 | dic-20 | Qda. Yugo abajo (calle) | 78 | Regular water quality, eutrophy, moderate pollution. | | 2020 | dic-20 | Río Colorado arriba | 80 | Regular water quality, eutrophy, moderate pollution. | | 2020 | dic-20 | Río Colorado LT | 49 | Bad water quality, polluted. | | 2020 | dic-20 | Río Negro arriba | 80 | Regular water quality, eutrophy, moderate pollution. | | 2020 | dic-20 | Río Negro abajo | 91 | Regular water quality, eutrophy, moderate pollution. | | 2020 | dic-20 | Río Blanco arriba | 34 | Bad water quality, very polluted. | | 2020 | dic-20 | Río Blanco abajo | 30 | Bad water quality, very polluted. | | 2021 | feb-21 | Qda. Yugo arriba | 102 | Good water quality, not polluted nor altered in other sensitive way | | 2021 | feb-21 | Qda. Yugo abajo (calle) | 101 | Good water quality, not polluted nor altered in other sensitive way | | 2021 | feb-21 | Río Colorado arriba | 112 | Good water quality, not polluted nor altered in other sensitive way | | 2021 | feb-21 | Río Colorado LT | 115 | Good water quality, not polluted nor altered in other sensitive way | | 2021 | feb-21 | Río Negro arriba | 99 | Regular water quality, eutrophy, moderate pollution. | | 2021 | feb-21 | Río Negro abajo | 139 | Excellent water quality. | | 2021 | feb-21 | Río Blanco arriba | suspended |  | | 2021 | feb-21 | Río Blanco abajo | suspended |  | | 2021 | may-21 | Qda. Yugo arriba | 36 | Bad water quality, polluted. | | 2021 | may-21 | Qda. Yugo abajo (calle) | 68 | Regular water quality, eutrophy, moderate pollution. | | 2021 | may-21 | Río Colorado arriba | 98 | Regular water quality, eutrophy, moderate pollution. | | 2021 | may-21 | Río Colorado abajo | 72 | Regular water quality, eutrophy, moderate pollution. | | 2021 | may-21 | Río Negro arriba | 74 | Regular water quality, eutrophy, moderate pollution. | | 2021 | may-21 | Río Negro abajo | 72 | Regular water quality, eutrophy, moderate pollution. | | 2021 | may-21 | Río Blanco arriba | suspended |  | | 2021 | may-21 | Río Blanco abajo | suspended |  | | 2021 | ago-21 | Qda. Yugo arriba | 72 | Regular water quality, eutrophy, moderate pollution. | | 2021 | ago-21 | Qda. Yugo abajo (calle) | 129 | Excellent water quality. | | 2021 | ago-21 | Río Colorado arriba | 86 | Regular water quality, eutrophy, moderate pollution. | | 2021 | ago-21 | Río Colorado abajo | 62 | Regular water quality, eutrophy, moderate pollution. | | 2021 | ago-21 | Río Negro arriba | 69 | Regular water quality, eutrophy, moderate pollution. | | 2021 | ago-21 | Río Negro abajo | 111 | Good water quality, not polluted nor altered in other sensitive way | | 2021 | ago-21 | Río Blanco arriba | suspended |  | | 2021 | ago-21 | Río Blanco abajo | suspended |  |   **Table 2. Punctuation assigned base on netherland system for valoration of physico-chemical analyses of water quality for body receptors.**   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Points** | **PSO (%)** | **DBO (mg/L)** | **N-NH (mg/L)** | **Sum** | **Water quality** | **Color** | | 1 | 110 - 100 y 90 - 100 | ≤ 3 | < 0.50 | 3 | No Pollution |  | | 2 | 111 - 120 y 71 - 90 | 3.1 - 6.0 | 0.50 - 1.0 | 4.0 - 6.0 | Incipient Pollution |  | | 3 | 121 - 130 y 51 - 70 | 6.1 - 9.0 | 1.1 - 2.0 | 7.0 - 9.0 | Moderate Pollution |  | | 4 | 31 - 50 | 9.1 - 15 | 2.1 - 5.0 | 10.0 - 12 .0 | Severe Pollution |  | | 5 | ≤ 30 y > 130 | > 15 | > 5 | 13.0 - 15 | Very severe Pollution |  |   **Values ​​obtained and level of water quality according to physico-chemical analysis. July 2019 – september 2021.**   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Year** | **Site** | **Temperature (°C)** | **pH** | **Dissolved oxygen (ppm)** | **DBO (mg/L O₂)** | **Ammoniacal nitrogen (mg/L NH₄)** | **%SatO2** | **Points** | **Water quality** | | ago-19 | Qda. Yugo arriba | 23.1 | 6.7 | 8.10 | <2 | <0,02 | 104 | 3 | No Pollution | | ago-19 | Qda. Yugo abajo (calle) | 22.7 | 6.65 | 9.40 | <2 | <0,02 | 119 | 4 | Incipient Pollution | | ago-19 | Río Colorado arriba | 23.4 | 6.66 | 12.8 | <2 | <0,02 | 163 | 7 | Moderate Pollution | | ago-19 | Río Colorado abajo | 23.8 | 6.64 | 9.7 | <2 | <0,02 | 125 | 5 | Incipient Pollution | | ago-19 | Río Negro Arriba | 25.5 | 6.63 | 10.9 | <2 | <0,02 | 142 | 7 | Moderate Pollution | | ago-19 | Río Negro Abajo | 24.9 | 6.64 | 8.66 | <2 | <0,02 | 112 | 4 | Incipient Pollution | | ago-19 | Río Blanco arriba | 23 | 4.86 | 10.1 | <2 | <0,02 | 125 | 5 | Incipient Pollution | | ago-19 | Río Blanco abajo | 21.7 | 4.67 | 8.7 | <2 | <0,02 | 107 | 3 | No Pollution | | nov-19 | Qda. Yugo arriba | 23.9 | 6.69 | 8.43 | 13 | <0,02 | 109 | 6 | Incipient Pollution | | nov-19 | Qda. Yugo abajo (calle) | 23.4 | 6.75 | 8.26 | 2 | <0,02 | 106 | 3 | No Pollution | | nov-19 | Río Colorado arriba | 23.2 | 7.42 | 7.18 | 2 | <0,02 | 91 | 3 | No Pollution | | nov-19 | Río Colorado abajo | 22.2 | 7.1 | 7.68 | 2 | <0,02 | 96 | 3 | No Pollution | | nov-19 | Río Negro Arriba | 22.2 | 7.49 | 6.95 | <2 | <0,02 | 85 | 4 | Incipient Pollution | | nov-19 | Río Negro Abajo | 22.2 | 7.35 | 6.63 | 4 | <0,02 | 81 | 5 | Incipient Pollution | | nov-19 | Río Blanco arriba | 23 | 4.34 | 8.80 | 2 | <0,02 | 111 | 4 | Incipient Pollution | | nov-19 | Río Blanco abajo | 21.8 | 4.38 | 8.24 | <2 | <0,02 | 102 | 3 | No Pollution | | feb-20 | Qda. Yugo arriba | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-20 | Qda. Yugo abajo (calle) | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-20 | Río Colorado arriba | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-20 | Río Colorado abajo | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-20 | Río Negro Arriba | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-20 | Río Negro Abajo | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-20 | Río Blanco arriba | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-20 | Río Blanco abajo | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | may-20 | Qda. Yugo arriba | 22.6 | 7.0 | 3.58 | <2 | 0.08 | 45 | 6 | Incipient Pollution | | may-20 | Qda. Yugo abajo (calle) | 22.6 | 7.7 | 3.88 | <2 | <0,02 | 49 | 6 | Incipient Pollution | | may-20 | Río Colorado arriba | 25 | 7.4 | 3.64 | <2 | 0.07 | 48 | 6 | Incipient Pollution | | may-20 | Río Colorado abajo | 23.2 | 7.4 | 3.28 | <2 | 0.03 | 42 | 6 | Incipient Pollution | | may-20 | Río Negro Arriba | 25 | 7.5 | 3.64 | <2 | 0.07 | 47 | 6 | Incipient Pollution | | may-20 | Río Negro Abajo | 25 | 7.7 | 3.53 | <2 | 0.06 | 46 | 6 | Incipient Pollution | | may-20 | Río Blanco arriba | 21.5 | 4.1 | 3.58 | <2 | <0,02 | 44 | 6 | Incipient Pollution | | may-20 | Río Blanco abajo | 21.5 | 3.9 | 3.51 | <2 | 0.07 | 43 | 6 | Incipient Pollution | | ago-20 | Qda. Yugo arriba | 22.4 | 7.66 | 11.7 | <2 | 0.05 | 148 | 7 | Moderate Pollution | | ago-20 | Qda. Yugo abajo (calle) | 22.5 | 7.84 | 12.2 | 8 | 0.05 | 154 | 9 | Moderate Pollution | | ago-20 | Río Colorado arriba | 22.6 | 6.67 | 12.0 | <2 | 0.05 | 150 | 7 | Moderate Pollution | | ago-20 | Río Colorado abajo | 23.9 | 7.51 | 11.8 | <2 | 0.05 | 152 | 7 | Moderate Pollution | | ago-20 | Río Negro Arriba | 25.5 | 7.16 | 11.8 | <2 | 0.05 | 154 | 7 | Moderate Pollution | | ago-20 | Río Negro Abajo | 25.5 | 7.44 | 9.9 | 6 | 0.06 | 129 | 6 | Incipient Pollution | | ago-20 | Río Blanco arriba | 21.8 | 3.71 | 10.5 | 8 | 0.05 | 130 | 7 | Moderate Pollution | | ago-20 | Río Blanco abajo | 21.8 | 3.73 | 11.3 | <2 | 0.05 | 140 | 7 | Moderate Pollution | | dic-20 | Qda. Yugo arriba | 22.8 | 7.07 | 10.6 | <2 | 0,05 | 135 | 7 | Moderate Pollution | | dic-20 | Qda. Yugo abajo (calle) | 22.9 | 7.33 | 12.3 | <2 | 0,06 | 156 | 7 | Moderate Pollution | | dic-20 | Río Colorado arriba | 23.0 | 7.34 | 11.3 | <2 | 0,03 | 143 | 7 | Moderate Pollution | | dic-20 | Río Colorado abajo | 22.4 | 7.48 | 12.0 | <2 | 0,06 | 150 | 7 | Moderate Pollution | | dic-20 | Río Negro Arriba | 21.8 | 7.03 | 10.6 | <2 | 0,02 | 129 | 5 | Incipient Pollution | | dic-20 | Río Negro Abajo | 21.7 | 7.33 | 10 | <2 | 0,03 | 122 | 5 | Incipient Pollution | | dic-20 | Río Blanco arriba | 21.3 | 5.02 | 12.7 | <2 | 0.04 | 155 | 7 | Moderate Pollution | | dic-20 | Río Blanco abajo | 21.8 | 5.02 | 12.3 | <2 | 0,07 | 152 | 7 | Moderate Pollution | | feb-21 | Qda. Yugo arriba | 22.2 | 7.83 | 16.0 | <2 | 0,02 | 201 | 7 | Moderate Pollution | | feb-21 | Qda. Yugo abajo (calle) | 22.2 | 7.9 | 14.5 | <2 | 0,02 | 182 | 7 | Moderate Pollution | | feb-21 | Río Colorado arriba | 22.0 | 7.92 | 16.0 | <2 | 0,02 | 198 | 7 | Moderate Pollution | | feb-21 | Río Colorado abajo | 21.9 | 8.02 | 16.0 | <2 | 0,02 | 199 | 7 | Moderate Pollution | | feb-21 | Río Negro Arriba | 24.8 | 7.82 | 10.7 | <2 | 0,02 | 138 | 7 | Moderate Pollution | | feb-21 | Río Negro Abajo | 23.2 | 8.02 | 10.7 | <2 | 0,02 | 133 | 7 | Moderate Pollution | | feb-21 | Río Blanco arriba | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | feb-21 | Río Blanco abajo | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | may-21 | Qda. Yugo arriba | 23.8 | 6.3 | 7 | <2 | <0,02 | 93 | 3 | No Pollution | | may-21 | Qda. Yugo abajo (calle) | 24.6 | 6.32 | 7 | <2 | <0,02 | 98 | 3 | No Pollution | | may-21 | Río Colorado arriba | 23.9 | 6.9 | 8 | 6 | <0,02 | 100 | 4 | Incipient Pollution | | may-21 | Río Colorado abajo | 24.8 | 5.5 | 8 | 7 | <0,02 | 100 | 5 | Incipient Pollution | | may-21 | Río Negro Arriba | 24.9 | 7.22 | 8 | <2 | <0,02 | 99 | 3 | No Pollution | | may-21 | Río Negro Abajo | 24.5 | 6.2 | 8 | <2 | <0,02 | 99 | 3 | No Pollution | | may-21 | Río Blanco arriba | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | | may-21 | Río Blanco abajo | suspended | suspended | suspended | suspended | suspended | suspended | suspended | suspended | |
| Soil | Cadmium (Cd), Lead (Pb), As, Cr+6, Hg, etc. | One site in the vicinity of a representative well | 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 |  |
| 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 Colorado River | Monthly (with rainy and dry seasons, breeding seasons, etc. taken into account) | Visual observation records and photographs | ICE | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  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I Trimester, 2021.**  \\10.149.70.64\Data_RGE\GE\Gest-Soc-Ambiental\FOTOS-GMA\Gest_Biologia\BD_Biologia\CG_PAILAS\Monitoreos_fauna\Diurno_aves\T_Monos\20210409\IMG_1244.JPG  **Distribution of flora species by habits registered in the Las Pailas. March 2014 – October 2021.**    **Results of monitoring, July 2019 – september 2021.**   |  |  | | --- | --- | | **Group** | **EsIA** | | **Amphibian** | | *Agalychnis callidryas* | √ | | *Cochranella granulosa* |  | | *Craugastor fitzingeri* |  | | *Dendropsophus microcephalus* |  | | *Duellmanohyla rufioculis* |  | | *Engystomops pustulosus* |  | | *Gymnopis multiplicata* |  | | *Hypopachus variolosus* |  | | *Incilius coccifer* |  | | *Incilius valliceps* |  | | *Leptodactylus savagei* | √ | | *Lithobates forreri* |  | | *Lithobates taylori* |  | | *Lithobates warszewitschii* |  | | *Pristimantis ridens* |  | | *Rhinella horribilis* | √ | | *Sachatamia albomaculata* |  | | *Smilisca baudinii* |  | | *Smilisca phaeota* |  | | *Teratohyla spinosa* |  | | *Trachycephalus typhonius* |  | | **Birds** |  | | *Amazilia rutila* | √ | | *Amazilia saucerrottei* | √ | | *Amazilia tzacatl* | √ | | *Amazona albifrons* | √ | | *Antrostomus carolinensis* | √ | | *Aramides albiventris* | √ | | *Archilochus colubris* | √ | | *Arremonops rufivirgatus* | √ | | *Attila spadiceus* | √ | | *Aulacorhynchus prasinus* | √ | | *Basileuterus rufifrons* | √ | | *Brotogeris jugularis* | √ | | *Buteo plagiatus* | √ | | *Buteo platypterus* | √ | | *Calocitta formosa* | √ | | *Campephilus guatemalensis* | √ | | *Campylopterus hemileucurus* |  | | *Campylorhynchus rufinucha* | √ | | *Cantorchilus modestus* | √ | | *Cathartes aura* | √ | | *Catharus ustulatus* | √ | | *Chiroxiphia linearis* | √ | | *Chloroceryle americana* | √ | | *Chlorostilbon canivetii* | √ | | *Ciccaba virgata* | √ | | *Colinus cristatus* | √ | | *Coragyps atratus* | √ | | *Crax rubra* | √ | | *Crotophaga sulcirostris* | √ | | *Crypturellus cinnamomeus* | √ | | *Dendrocincla homochroa* |  | | *Dendrocolaptes sanctithomae* | √ | | *Empidonax flaviventris* | √ | | *Empidonax minimus* |  | | *Eucometis penicillata* | √ | | *Eumomota superciliosa* | √ | | *Euphonia affinis* | √ | | *Euphonia hirundinacea* | √ | | *Euphonia luteicapilla* |  | | *Eupsittula canicularis* | √ | | *Eurypyga helias* | √ | | *Geothlypis formosa* |  | | *Geothlypis poliocephala* | √ | | *Geotrygon montana* |  | | *Habia fuscicauda* |  | | *Harpagus bidentatus* |  | | *Henicorhina leucophrys* | √ | | *Henicorhina leucosticta* |  | | *Hylocharis eliciae* | √ | | *Hylocichla mustelina* | √ | | *Hylomanes momotula* |  | | *Hylophylax naevioides* |  | | *Icterus galbula* | √ | | *Icterus pustulatus* | √ | | *Leiothlypis peregrina* |  | | *Leptotila verreauxi* | √ | | *Megarynchus pitangua* | √ | | *Megascops cooperi* | √ | | *Melanerpes hoffmannii* | √ | | *Micrastur semitorquatus* |  | | *Microcerculus philomela* |  | | *Mionectes oleagineus* |  | | *Mniotilta varia* | √ | | *Momotus lessonii* | √ | | *Morococcyx erythropygus* | √ | | *Myiarchus nuttingi* |  | | *Myiarchus tuberculifer* | √ | | *Myiarchus tyrannulus* | √ | | *Myiodynastes maculatus* |  | | *Myiothlypis fulvicauda* |  | | *Myiozetetes similis* | √ | | *Nyctibius jamaicensis* |  | | *Nyctidromus albicollis* | √ | | *Onychorhynchus coronatus* |  | | *Pachysylvia decurtatus* | √ | | *Passerina caerulea* | √ | | *Patagioenas flavirostris* |  | | *Penelope purpurascens* | √ | | *Peucaea ruficauda* | √ | | *Phaethornis striigularis* |  | | *Piaya cayana* | √ | | *Pionus senilis* |  | | *Piranga olivacea* | √ | | *Piranga rubra* | √ | | *Pitangus sulphuratus* | √ | | *Polioptila albiloris* | √ | | *Polioptila plumbea* | √ | | *Psarocolius montezuma* | √ | | *Psilorhinus morio* | √ | | *Pteroglossus torquatus* | √ | | *Pulsatrix perspicillata* | √ | | *Quiscalus mexicanus* | √ | | *Ramphastos sulfuratus* | √ | | *Ramphocaenus melanurus* |  | | *Rupornis magnirostris* | √ | | *Selenidera spectabilis* | √ | | *Setophaga petechia* |  | | *Streptoprocne zonaris* | √ | | *Thryophilus pleurostictus* | √ | | *Thryophilus rufalbus* |  | | *Tinamus major* |  | | *Tityra semifasciata* |  | | *Tolmomyias sulphurescens* |  | | *Trogon elegans* | √ | | *Trogon massena* | √ | | *Trogon melanocephalus* | √ | | *Turdus assimilis* |  | | *Tyrannus forficatus* | √ | | *Tyrannus melancholicus* | √ | | *Vermivora chrysoptera* | √ | | *Vireo flavifrons* | √ | | *Vireo flavoviridis* | √ | | *Vireo olivaceus* | √ | | *Vireo philadelphicus* | √ | | *Xiphorhynchus lachrymosus* |  | | *Zenaida asiatica* | √ | | **Mammals (Visual, Mist nets and Camera trap)** |  | | *Alouatta palliata* | √ | | *Artibeus jamaicensis* | √ | | *Artibeus lituratus* | √ | | *Artibeus tolteca* |  | | *Ateles geoffroyi* | √ | | *Caluromys derbianus* |  | | *Canis latrans* | √ | | *Carollia castanea* |  | | *Carollia perspicillata* | √ | | *Carollia sowelli* |  | | *Carollia subrufa* |  | | *Cebus imitator* | √ | | *Centurio senex* |  | | *Cuniculus paca* | √ | | *Dasyprocta punctata* | √ | | *Dasypus novemcinctus* | √ | | *Didelphis marsupialis* |  | | *Didelphis virginiana* |  | | *Eira barbara* | √ | | *Glossophaga commissarisi* |  | | *Glossophaga soricina* |  | | *Heteromys salvini* | √ | | *Leopardus pardalis* | √ | | *Marmosa mexicana* |  | | *Micronycteris hirsuta* |  | | *Micronycteris microtis* |  | | *Myotis keaysi* |  | | *Nasua narica* | √ | | *Nyctomys sumichrasti* |  | | *Odocoileus virginianus* | √ | | *Ototylomys phyllotis* |  | | *Pecari tajacu* |  | | *Philander opossum* |  | | *Platyrrhinus helleri* |  | | *Potos flavus* |  | | *Pteronotus mesoamericanus* |  | | *Sciurus deppei* | √ | | *Sciurus variegatoides* | √ | | *Sphiggurus mexicanus* | √ | | *Sturnira parvidens* |  | | *Sylvilagus floridanus* | √ | | *Tamandua mexicana* | √ | | *Tapirus bairdii* | √ | | *Tayassu pecari* | √ | | *Conepatus semistriatus* | √ | | *Leopardus wiedii* |  | | *Panthera onca* | √ | | *Puma concolor* | √ | | **Reptiles** |  | | *Boa imperator* | √ | | *Bothrops asper* | √ | | *Coleonyx mitratus* | √ | | *Corytophanes cristatus* |  | | *Ctenosaura similis* | √ | | *Holcosus festivus* | √ | | *Holcosus quadrilineatus* |  | | *Holcosus undulatus* |  | | *Iguana iguana* | √ | | *Imantodes cenchoa* | √ | | *Imantodes gemmistratus* |  | | *Leptodeira rhombifera* | √ | | *Leptophis ahaetulla* |  | | *Leptophis mexicanus* | √ | | *Marisora unimarginata* | √ | | *Mastigodryas melanolomus* |  | | *Norops biporcatus* | √ | | *Norops capito* | √ | | *Norops cupreus* | √ | | *Norops oxylophus* | √ | | *Oxybelis aeneus* | √ | | *Phyllodactylus tuberculosus* |  | | *Scolecophis atrocinctus* |  | | *Sibon anthracops* | √ | | *Sibon nebulatus* |  | | *Sphenomorphus cherriei* | √ | | *Spilotes pullatus* |  | | *Tantilla vermiformis* |  | | *Trimorphodon quadruplex* |  |   **State of conservation of species:**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Group | Specie | State of conservation | | | | CITES | IUCN | MINAE 32633- Regulations | | Amphibian | *Agalychnis callidryas* | II |  | RP | | *Dendropsophus microcephalus* |  |  | RP | | *Engystomops pustulosus* |  |  | RP | | Teratohyla spinosa |  |  | RP | | Birds | *Amazilia rutila* | II |  | RP | | *Amazilia saucerrottei* | II |  | RP | | *Amazilia tzacatl* | II |  | RP | | *Amazona albifrons* | II |  | RP | | *Archilochus colubris* | II |  | RP | | *Brotogeris jugularis* | II |  | RP | | *Buteo plagiatus* | II |  | RP | | *Buteo platypterus* | II |  | RP | | *Brotogeris jugularis* | II |  | RP | | *Buteo plagiatus* | II |  | RP | | *Buteo platypterus* | II |  | RP | | *Campylopterus hemileucurus* | II |  | RP | | *Chlorostilbon canivetii* | II |  | RP | | *Ciccaba virgata* | II |  | RP | | *Crax rubra* | III | VU | RP | | *Eupsittula canicularis* | II |  | RP | | *Eurypyga helias* |  |  | RP | | *Harpagus bidentatus* | II |  | RP | | *Hylocharis eliciae* | II |  | RP | | *Hylocichla mustelina* |  | NT |  | | *Hylomanes momotula* |  |  | RP | | *Megascops cooperi* | II |  | RP | | *Micrastur semitorquatus* | II |  | RP | | *Penelope purpurascens* | III |  | RP | | *Phaethornis striigularis* | II |  | RP | | *Pionus senilis* | II |  | RP | | *Pulsatrix perspicillata* | II |  | RP | | *Ramphastos sulfuratus* | II |  | RP | | *Rupornis magnirostris* | II |  | RP | | *Tinamus major* |  | NT | RP | | *Vermivora chrysoptera* |  | NT |  | | Mammals | *Alouatta palliata* | I |  | EN | | *Artibeus jamaicensis* |  |  | RP | | *Ateles geoffroyi* | I | EN | EN | | *Cebus imitator* | II |  | RP | | *Cuniculus paca* | III |  |  | | *Dasyprocta punctata* | III |  |  | | *Eira barbara* | III |  |  | | *Leopardus pardalis* | I |  | EN | | *Nasua narica* | III |  |  | | *Odocoileus virginianus* | III |  |  | | *Pecari tajacu* | II |  | RP | | *Potos flavus* | III |  |  | | *Sciurus deppei* |  |  | RP | | *Sphiggurus mexicanus* | III |  |  | | *Tamandua mexicana* | III |  |  | | *Tapirus bairdii* | I | EN | EN | | *Tayassu pecari* | II | VU | EN | | *Leopardus wiedii* | I | NT | EN | | *Panthera onca* | I | NT | EN | | *Puma concolor* | I |  | EN | | Reptiles | *Boa imperator* | II |  | RP | | *Coleonyx mitratus* |  |  | RP | | *Iguana iguana* | II |  | RP | | VU: Vulnerable, EN: Endangered, RP: Reduced populations, NT: Near Threatened, I=Appendix I CITES, II=Appendix II CITES, III=Appendix III CITES. | | | | | | | |
| Waste\* | Generated amount | Power plant construction site | Monthly | Total of generated amount (weight or volume) | Construction contractor | **Generated in 2019 to 2021** |
|  |  |  |  |  |  |  |
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\*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).

**Operation period**

| Environmental item | Item to be monitored | Monitoring site | Frequency | Method | Party in charge |
| --- | --- | --- | --- | --- | --- |
| Air quality | H2S. | Rincón de la Vieja Hotel, Guachielin Hotel, national park entrances, and 4 sites (north, south, east and west) around the power plant. | 4 times/year. | Field measurement. | ICE. |
| Noise | Noise level. | Rincón de la Vieja Hotel, national park entrances, and 4 sites (north, south, east and west) on the power plant site boundary. | 4 times/year including the following scenarios:  *Scenario 1*: plant operation, constant noise level is expected.  *Scenario 2*: Plant events (pipe clean up) and unexpected contingency events. | Field measurement. | ICE. |
| Water quality | 1. pH, EC, TURB, SS, Oils and grease, BOD and COD. 2. As, Cr+6 and Hg. | Upper and lower streams of the Colorado and Negro Rivers, and upper and lower streams of the creek running near GPG2.  Items in 1) only at outlets of the septic tanks and oil separator tanks. | 4 times/year. | Field measurement and laboratory analysis of collected samples. | ICE. |
| Fauna and flora | Plants and animals (birds, amphibians, reptiles, and mammals) | Baseline survey sites, the vicinity of wells, and the project site side of the national park | For vegetation and plantation, once a year for a period of 10 years.  For fauna and flora,  once/year (with consideration given to breeding seasons, etc.  After 3 years, the continuation of monitoring will be reconsidered based on opinions of biological experts.) | Visual observation records and photographs | ICE |
| Waste\* | Generated amount | Power plant | Monthly | Total of generated amount (weight or volume). | ICE. |

\*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).