EXECUTIVE SUMMARY (ENGLISH)
KIRTHAI – II HYDRO ELECTRIC POWER PROJECT (930 MW),
DISTRICT KISHTWAR, JAMMU & KASHMIR

Project Proponent:
JKSPDCL,
Head Office: Exhibition Ground, PDD Building,
Jahangir Chowk, Srinagar
Tel: 0194-2473740
Fax 0194-2473740
Email: jkspdcl@gmail.com

Environmental Consultant:
EQMS INDIA PVT. LTD. INDIA
304-305, 3rd Floor, Plot No. 16, Rishabh Corporate Tower,
Community Centre, Karkardooma, Delhi – 110092
Phone: 011-30003200, 30003219; Fax: 011-22374775
Website: www.eqmsindia.com ; E-mail – eqms@eqmsindia.org
EXECUTIVE SUMMARY

1.0 BACKGROUND

Considering the vast and untapped potential and availability, of the hydro resources in India, the development of hydropower projects is required to be explored fully. Power generation from such projects is also comparatively less damaging for the environment. Though power production from hydro resources does have its environmental concerns such as large inundations, disposal of muck and rehabilitation and resettlement (R&R) problems, they can be suitably handled with appropriate plans. e.g. the problem of muck disposal is always resolvable if the restoration of disposal areas is carried out in a scientific way. It would also be appropriate to state here that the problems related to large inundations and R&R issues may be tackled by going in for run-of-the-river schemes in place of large reservoir schemes as the quantum of inundation and displacement will be much less in run-of-the-river scheme projects.

The Kirthai HEP underwent evolutionary change for obviating a large-scale displacement of people of Paddar Valley and submergence of 643 ha and 1760 ha agricultural and forest land respectively. The finally emerged schemes now encompass:

(i) Kirthai HEP – I
   As a first development, 122 M high dam from river bed level, near village Gulabgarh, about 275 m upstream of existing Bailey bridge across the Chenab, with 160m long HRT leading to underground power house (380 MW) and an auxiliary surface powerhouse (10 MW) on right bank.

(ii) Kirthai HEP – II
   As a second stage development to utilize the full potential, another 121 m high dam (above riverbed level) about 16 km d/s of the dam axis of stage – I and 250 m u/s of Kidur Nallah with 4.289 km HRT leading to underground power house (840 MW) and dam-toe powerhouse (90 MW).

2.0 NEED FOR THE PROJECT

The need for the Kirthai HEP, Stage-II, installed capacity 930 MW, in the lower reach of the Chenab Basin, which stores 10360 MW power potential being 85.7% of the total hydropower potential of the state, has therefore been considered in context of power shortage in the Northern region in general and in the country as whole. The project has been conceptualized as a run-of-the-river under the ambitions cascading development programme of hydropower in the Chenab basin, is an upstream development of the proposed Kiru HEP (600MW) and is on the downstream of the proposed Kirthai HEP (3900MW). Thus, Kirthai HEP, Stage-II, installed capacity 9300 MW, shall have a maximum live storage of 17.0 MCM at FRL El 1764 masl and diurnal storage of 2.4 MCM for the peaking purpose. It presents itself as techno-viable and an attractive scheme for statutory clearance and development.

3.0 LOCATION AND APPROACH

The project is in Tehsil Paddar, with headquarter at Atholi, of newly created district of Kishwar of Jammu & Kashmir. The proposed diversion dam on the Chenab shall be located near Kidur about 13.5 km downstream of Gulabgarh at longitude 76° 04’ 37” E and latitude 33° 18’ 41” N. The underground powerhouse shall be located on left bank of the Chenab near Liddrari Nalla. The project site is accessible by NH-1A upto Batote and beyond it upto Kishwar by NH – 1B and then upto Gulabgarh by black topped road being manned by the BRO.

4.0 PROJECT FEATURES
Kirthai HEP, Stage-II, has been contemplated as a run of the river scheme on the Chenab. It envisages utilization of river water through average net head of 225.1 m for generation of annual energy of 3159.72 MU at 90% dependability, through an underground powerhouse (6X140MW) to be located on the left bank of the Chenab near Lidrara Nalla and a dam toe power house with average net head of 99.95m for generation of annual energy of 307.19 MU, thereby resulting into an annual generation of 3466.19 MU. The project comprises of 121 m high concrete gravity dam (from the river bed level), with overall length 219.80 m at top i.e. El 1766 masl and consisting of 93 m long over flow section. The sluice spillway, with 5 bays fitted with radial gates(9mx12.248m),with crest at El 1712.5 masl, has been designed to pass the PMF of 9660 cumec. A power intake with invert level at El 1731.80 masl shall convey the regulated discharge through 4 number, 6.4 m diameter, intake tunnels of varying length leading to four desilting chambers (440mx19mx24.87m)which in turn are joined to four flushing tunnels/ducts (3.6mx2.5m) to escape silt laden water into the river. Appropriate HRT manifold shall be provided from which 10.5 m diameter 4.289 km long HRT, with invert level at the start El 1725.00 masl, shall take off to convey 413.47 cumec discharge to 31.6 m diameter surge shaft connected at its lower end to concrete lined steel liner pressure shafts (3 No, 5.25m diameter, 827m long), each further bifurcating to unit penstocks to feed six number generating units of 140 MW capacity each under a net rated head of 225.1 m and housed in an underground power house of cavity size 187.5 m X 22 m X 49.7m on the left bank of the Chenab. The discharge through draft tubes shall be led to the river through 11.25 m diameter352.5m long circular tunnel with average outfall at El 1530 masl. For dam toe powerhouse, a Power intake shall be provided in the dam block-9 to exploit the environmental flow release of 99.71 cumec at a net head of 99.95 m at the dam toe power house. The water from the powerhouse shall be conveyed through 51m long TRC. The reservoir FRL has been fixed at El 1764 masl from the consideration of submergence alone. The Minimum Draw Down Level (MDDL) has been estimated at 1750.75 m, from consideration of the live storage of 17 MCM, available between the proposed FRL and MDDL, to be adequate for peaking operation of the station for about 44 hours in a week with flows corresponding to the minimum mean discharge (MMD) and releases within the daily volume restrictions of 50% to 130% of the corresponding daily inflows permissible within the scope of the Indus Water Treaty. The average load factor of the operation of the main powerhouse during lean period would be about 10.1% ensuring peak operation of the power house for about 2.4 hours daily. Annual Plant Load factor of the main station would be about 43.00%. The firm power from the project shall be118.8MW. The project, proposed to be completed in five years' time frame, shall require 2100 persons including professionals, technical, skilled and unskilled labours during the peak construction stage.
5.0 **ENVIRONMENT IMPACT ASSESSMENT**
The EQMS India Pvt. Ltd. has conducted the Environment Impact study, as per ToR issued by the MoEF&CC vide letter no. J-12011/6/2008-IA-1 5th June 2013.

6.0 **METHODOLOGY**
The methodology and techniques used for studying the various parameters of the environment viz. land, air, noise, water, flora, fauna and socio-economics in the study area are described as follows:

6.1 **Land Environment Study**
- Toposheets on 1:50,000 scale of the directly draining catchment area were used for the study.
- Detailed field survey was conducted for study of soil characteristics of erosion prone areas and landslides in the reservoir area.

6.2 **Air Quality Assessment**
To generate, a data base on the existing status of the pollutants, the study area was evaluated for setting up six locations to conduct air quality monitoring in respect of SPM, PM10, SO2 and NOx.

6.3 **Sound Pressure Level Measurement**
The sound level was measured at six locations by sound level meter.

6.4 **Soil Quality Assessment**
Physical and chemical characteristics of the soil were studied in respect of six samples taken from the study area.

6.5 **Water Environment Assessment**
For evaluating physical, chemical and biological characteristics of surface and ground water samples were taken from six locations.

6.6 **Aquatic Environment**
Evaluation of the parameters related to aquatic environment has been done in respect of biological characteristics of river water.

6.7 **Floral Study**
It is based on extensive field survey of the area. Three seasons study has been conducted. In this the phytosociology of plants and diversity of the forest vegetation was determined according to formula given by Curtis and McIntosh (1950) and by using Shannon Wiener information function (Shannon and Wiener, 1963) respectively.

6.8 **Faunal Study**
Various transects were identified along the villages to carry out faunal studies as the village trails were the best options to cover-up the complete area. Observer walked at a constant pace for their observation.

6.9 **Socioeconomic Study**
The data on socio economic and dependency on natural resources of people of study area were collected. The process involved assessment of the study area to obtain an overall perspective of the project affected villages that were located in the submergence zone / 10 km radius from the dam. In order to gather information on public perception of the proposed project the attitude/psychology survey was carried out which depicts the prevailing awareness and acceptance/no-acceptance about the project. Data collection from secondary sources has also been made to validate some of the information and to supplement the data on demographic aspects.
7.0 EXISTING STATUS OF ENVIRONMENT

7.1 Physical Environment
The catchment is having variable physiography, climate, geology, slope, soil types and land use/land cover.

7.1.1 Local Geology of Project Area
All the components of the project are located on the Pias Granite which is intruded within the Kishtwar Window.

7.1.2 Landuse/Land Cover
The dominating landuse classes are, dense forest (37.19%), open forest (40.09%), snow / glacier (16.53%) and agriculture land (3.09%)

7.1.3 Total Land Requirement for Construction of the Project
For execution of the project 225.50 ha land, falling in Tehsil Paddar of District Kishtwar, shall be required of which the apportionment between State, Private and Reserved forest land shall be 40.00 ha, 43.00 ha, 142.25 ha respectively.

8.0 ARCHAEOLOGICAL / HISTORICAL MONUMENTS/SENSITIVE AREA
No archaeological monument of national importance either lies in the project area or in its submergence area. No National Park, Sanctuary, Defense Establishments, Archeological Monuments, Notified Eco-sensitive areas or protected area under Wild Life (Protection) Act exists within the project area or within 10 km from it.

9.0 SOIL QUALITY
The results of the soil analysis show that the soil is slightly basic at all the locations having pH varying from 6.8 to 7.78. The texture of the soil varies from sandy loam to loamy sand having predominantly sand. Available nitrogen content in the surface soils ranges between 28 and 95-mg/kg (64.0 & 222-kg/ha) thereby indicating that soils are low in available nitrogen content. Available phosphorus content ranges between 3.8 & 9.6-mg/kg (8.7 & 20.3-kg/ha) thereby indicating that soils are having low to medium available phosphorus. Available potassium content in these soils ranges between 21.8 and 59.4-mg/kg (49.7 & 137.9-kg/ha) thereby is indicating that the soils are low to medium in potassium content. The organic matter varies from 0.80 % to 5.20%

10.0 AIR AND NOISE ENVIRONMENT
The pollutants concentration in the air is well below the permissible limit (PM10: 26.5 - 56.56 µg/m³; SO2: 3.4 - 7.5 µg/m³; NOx:9.5-14.2 µg/m³) as there are no industries in the area and the density of vehicular traffic is not alarming. The noise monitoring shows that day and night time noise levels are high near Gulabgarh as the monitoring location is near to local bus stand. At project site the noise levels are higher (Leq day and night 71dB (A)) due to high velocity of flow in the river.

11.0 WATER ENVIRONMENT
The analysis results have been compared with the Tolerance limits for inland surface waters, Class – C as set forth in IS:2296-1982. The results indicate that water is neutral in nature as pH recorded was 7.3 – 7.7 which is well within the range of 6.5 - 8.5 specified standard limits. The TDS recorded ranged between 51 - 92 mg/l which shows that at all four locations it is within the tolerance limit (1500 mg/l). The Chlorides and Sulphates were recorded ranged between 6 mg/l – 16 mg / l and 5.5-17 mg/l respectively and were well within the tolerance limits (Chlorides 600 mg/l and sulphates 400 mg/l). The nitrates ranged between 1.5 – 3.0 mg/l and is within the tolerance limit (50 mg/l) The fluoride content in water ranged between 0.06 – 0.83 mg/l i.e. within the tolerance limit (1.5 mg/l).
12.0 STATUS OF BIOLOGICAL ENVIRONMENT

12.1 FLORA OF THE PROJECT AREA

- In up-stream region
  In the upstream region 3 sampling locations were selected, these are submergence area, Gulabgarh and Kirthai village. The most dominant plant species found at Gulabgarh are conifers (Cedrus deodara/Pinus wallichiana), Quercus baloot, Poplus alba, and Pinus girardiana Shrub flora at this site was dominated with Adhatoda vasica, Artemisia brevifolia and Buddleja asiatica. Herbaceous flora was dominated with Amaranthus hybridus, Tridax procumbens and Cannabis sativa.

Vegetation of lower area of the right bank in Kirthai is dominated with Quercus baloot while upper stretch of right bank is dominated by Cedrus deodara. Left bank of the river is predominated with Quercus-devdar mixed forest. Artemisia brevifolia, Punica granatum, and Adhatoda vasica sp were found the leading species in shrub flora. Herbaceous flora was dominated with Tridax procumbens, Leucas cephalotes and Hedera nepalensis.

Submergence area has been sampled near Dam site, Laie bridge and Kirthai. Cedrus deodara, Quercus baloot and Alnus nitida were the tree species recorded from the area. Agave cantula, Xanthium sp, Rosa macrophylla and Punica granatum were the leading species in shrub flora. Herbaceous flora was dominated with Cannabis sativa, Tridax procumbens and Rumex sp.

- Dam Site
  Tree flora was dominated with Quercus baloot followed by Cedrus deodara and Alnus nitida. Xanthium sp Desmodium elegans and Artemisia brevifolia were the leading species in shrub’s flora whereas herb’s flora was predominated with Cannabis sativa, Tridax procumbens and Amaranthus hybridus.

- Downstream
  Quercus baloot, Berberis aristata and Cannabis sativa were the dominant plant species in tree, shrub and herb layers respectively.

- Threatened species
  Three RET species have been recorded/reported from study area; Viola sp, Juglans regia, Pinus gerardiana.

12.2 FAUNA

- The Faunal study for the proposed Kirthai Hydro-electric project stage II was carried out in both the submergence and influence zone of both upstream and downstream. The climate of the region is wet temperate type as per Champion & Seth (1968).

- 17 mammalian species of 5 order were recorded/reported during the survey.

- Markhor, Himalayan Black Bear, Chitin Bror, Lynx and Markhor are the species belonging to Schedule-I category as per the Wildlife Protection Act (1972).

- A total of 19 bird species belonging to 6 orders were observed during the survey. As many as 14 species of butterflies belonging to 4 families were recorded from the impact zone of the project.

- The phytoplanktonic community in the study area comprised of three (3) major classes namely Bacillariophyceae, Chlorophyceae and Cyanophyceae. The total number of 21 taxa were recorded at different sites during the study period of which, Bacillariophyceae comprised of eleven (11), Chlorophyceae of seven (7) and Cyanophyceae with only three (3) taxa.

- In the project area, no fish were observed or caught in Winter and Pre-Monsoon season. However, Schizothorax richardsonii (gray) having a size of 22 cm was recorded in monsoon season at downstream tributary (Honser Nallah) near Kirthai. As per consultation with concerned fisheries officials and researchers, EIA references available and public consultation conducted at Gulabgarh, Kishtwar, fish diversity and density is limited to few species like Snow Trout (Schizothorax richardsonii) only fish
recorded during Monsoon season, Loaches (*Nemachelus* sp. and *Botia* sp.)

*Glyptosternoids* (*Glyptothorax* sp.)

13.0 SOCIAL AND CULTURAL BACKGROUND OF THE AREA

13.1 DEMOGRAPHIC PROFILE AND LITERACY RATE OF THE STUDY AREA

There are altogether 12 Villages, including projected affected villages, in the study area. The total number of households are 1828 whereas population is 8893. The average household size is 4.86. Scheduled caste population comprise 14.1 % of the total population where as Scheduled Tribe population is 3%. Sex Ratio is 917 female per 1000 males. The literacy rate in the study area is 48.6%. The male and female literacy rates are 30.2% and 19.4% respectively. In the study area, the main and marginal workers are 28.1% and 1.2% respectively of the total population (8893) while the remaining 71.7% constitutes non-workers Thus, it implies that in study area the semi-skilled and non-skilled work-force required for the project is aplenty.

13.2 Demography of Project Affected Villages

As per the Census of India 2011, the total population of 7 six project affected villages (Layee, Mati, Kadail, Gulabgarh, Laddar, Atholi and Affani) comprising of 1034 households aggregates to 5174 of which male and female population is 2674 and 2500 respectively. The overall sex ratio is 935 females per thousand males, however the sex ratio for SC and ST population is 948 and 683 females per thousand males. The cast – wise composition of the total population of the project affected villages is made up of SC (18.0%) and ST (5.1%) while the General Category is (76.9%). The literate male and female are 1608 and 1058 which implies that the literacy rate is 51.5% with male and female percentage being 31.1% and 20.4% respectively. The illiterates are 48.8% of the total population of which male and female illiterates are 1895 (21.3%) and 2445 (27.5%) respectively. The main workers are 1387 (26.8%) and marginal workers are 8 (0.1%) respectively of the total population while the remaining 73.1% constitute non-workers.

13.3 Village-wise Project Affected Families

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Village</th>
<th>Private Land (ha)</th>
<th>No. of PAF</th>
<th>Houses</th>
<th>Kothas (N.R.)</th>
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<td>2</td>
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<td>446</td>
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<td>59</td>
</tr>
</tbody>
</table>

13.4 AGRICULTURE

Agriculture is the main source of income and employment as more 80% of the population directly or indirectly derive their livelihood from it.

14.0 IDENTIFICATION, PREDICTION AND EVALUATION OF IMPACTS

14.1 IMPACTS ON THE MICRO-CLIMATE OF THE AREA

Due to construction activities, there shall be temporary and nominal effect on the ambient temperature and humidity. The operation stage of a hydro electric project through an underground power house shall also not create any impact on the meteorology and climatology of the area.
14.2 CHANGE IN LANDUSE / LANDCOVER
Construction Phase
- For construction of the project about 225.25ha land will be acquired from private owners, govt. and forest department, out of which, 142.25 ha of forest land shall have its land use changed permanently in water body and built-up area (Project Components).
- Private land shall have its landuse permanently changed to built-up area covering colonies and project roads.
- About 1.29 MCM muck will be dumped in designated dumping areas, on slope on the bank of the river, after a safe distance of 30m, will bring no change into the landscape of the area.

Operational Phase
- During the operation phase no change in land use is expected. Many of the redundant areas having no further usage will be brought under plantation.

14.3 SOIL EROSION AND SILTATION
Construction Phase
- Soil erosion due to excavation of different components of the project, construction of roads and dumping of muck into disposal yards will accelerate soil erosion.

Operational Phase
- Soil erosion due to project activities will not exist in the operation phase as the construction would be completed and landscape restoration work would also be implemented.

14.4 IMPACT ON GEOLOGY
The intensity of anticipated environmental impact on geology of the area will be weak and extent of anticipated impact will be local. No impact is anticipated on the geology of the area during the operation phase.

14.5 IMPACT ON HYDROLOGY
Impact on the Surface and Ground Water Hydrology: - The small water requirement, during construction of the project, which shall be met from the Chenab river and the local sources, would not bring about appreciable change in hydrology. Further the existing drainage system in the area will not be modified or affected during the construction phase. Since the water usage will be mainly from the main river and local khad water for construction purposes, no adverse impact on groundwater availability is expected.

Since, the water from the river is neither used by the villages along the river, nor is there any significant aquatic flora / faunal population; the reduced flow is not likely to have any adverse impact. Thus, no negative impact due to water withdrawal shall be experienced. However, the creation of reservoir shall result in the raised ground water table on the upstream of the dam.

14.6 ENVIRONMENTAL DEGRADATION DUE TO LABOUR IMMIGRATION
During the construction phase congregation of approximately 2100 workers is likely to take place in the project area, which will increase pressure on land and water resource. Conflict between the migrants and the local population may occur for employment. Labour engaged in construction activity will also move away once the project work is completed; therefore, no additional impact is expected.

14.7 IMPACTS ON AIR ENVIRONMENT
Temporary changes in air quality during construction phase are expected due to emission of hydrocarbons from vehicles and gases from blasting operations. The predicted ground level concentration in air for PM10 due to fugitive dust emissions from construction
activities (excavation and crushing) at the Dam complex has been found to be 15.07 µg/m³, while the resultant concentration shall be 68.57 µg/m³ which is within the limits. Due to increased transportation during construction phase at 25 m predicted concentration for PM₁₀ is 9.9 µg/m³ which reduces to 6.2 µg/m³, 3.7 µg/m³ and 1.1 µg/m³ at 50m, 150m and 500m respectively. Thus, the impact on the pollutant level (PM₁₀) due to increased traffic due to transportation of mineral shall be minimal. The increased GLC in respect of NOx were insignificant being 0.14 µg/m³ upto 25m and 0.12 µg/m³ upto 50m and 0.10 µg/m³ upto 1km.

14.8 IMPACTS ON NOISE ENVIRONMENT
Temporary increase in noise levels are expected during construction phase only. The noise level of 91 dB(A) at the construction site gets highly attenuated to 40 dB(A), 35 dB(A) and 30 dB(A) about 1200m, 2400m and 3600 m respectively from the point source (dam site).

At the auxiliary powerhouse site (90MW) the existing leq day and night noise level is 70 dB(A) which is mainly due to the noise generated due to the flow of the river. During operation phase the noise levels shall increase to 88.8 dB(A) at generator floor level.

At the underground powerhouse site during operation phase the noise levels shall increase. At generator floor level the predicted noise level shall be 92.2 dB(A) and 100.5 dB(A) with one and six turbines running respectively.

14.9 IMPACTS DUE TO GROUND VIBRATION AND AIR OVER PRESSURE DUE TO BLASTING
Due to blasting (surface excavation), the resulting PPV shall be 0.09 mm/sec at Layee which shall be considerably lower than the limiting values 5.0 mm/sec for excitation frequency less than 8 Hz, in case of temporary structures. Predicted air over pressure due to blasting at Gulabgarh shall be 87 dB(A). Due to blasting for tunneling, the resulting PPV shall be 0.19 mm/sec at Layee which shall be considerably lower than the limiting values 5.0 mm/sec for excitation frequency less than 8 Hz, in case of temporary structures.

14.10 IMPACTS ON WATER ENVIRONMENT
During the construction phase, the water environment of the Chenab due to proposed project shall be impaired due to increase in silt rate from the discharge coming out open air works, batching and crushing plants and from the foundation works of power house. Due to this minor impact on the water quality and aquatic fauna of temporary nature shall be experienced in the river water. The sewage generated at the labour camps and other residential areas may also bring considerable pollutants to river sections, if disposed off in the river section without treatment.

In the operation phase of the proposed project the water environment in general will not deteriorate owing to its being a run of the river scheme whereby the water will be continuously used for power generation and released simultaneously.

14.11 IMPACT DUE TO CHANGE IN HYDROLOGICAL CYCLE
The quantity of the water abstracted from the river for non-consumptive use of power generation is again returned to the system without any consumption, thus, there shall not be any change in hydrological cycle in context to the project absolutely.

14.12 IMPACT DUE TO ACIDIFICATION OF RESERVOIR
There will be no acidification of lake due to the alkaline nature of the Chenab water at dam site and other Nala having pH vary between as 7.3 to 7.7 and the soil of the fluvial valley and the side / reposed slopes in the project area are calcareous.

14.13 IMPACTS ON FLORA
It is evident from this study that from the submergence and influence zone of the proposed project none of tree species, shrub, herb or any climber or grass species are either vulnerable or endangered. Interestingly the vegetation composition of the submergence
zone is also widely distributed in the influence zone in abundance and there will be no significant loss to the habitat. However, any loss of riverine vegetation during the project activity period will be restored in the reservoir periphery in due course of time.

The floral abundance of the project area in post construction phase will increase by many folds as the plantation under catchment area treatment, reservoir rim treatment, green belt, restoration and landscaping will be completed.

14.14 IMPACTS ON FAUNA

As the project activity is not going to submerge all the major habitats, there is little concern for these niche birds. There will be no alteration to the existing habitat of endangered and threatened species. There is also no wildlife sanctuary, national park and biosphere reserve near the project area. As the project is having its submergence mostly along the gorge, the project is not likely to be a threat to any of the recorded butterfly species. Increase in temporary stress levels of wildlife during construction phase due to noise, human interference and reduction in present habitat. Threat due to poaching might increase. Due to reservoir creation, there will be improvement in the habitat for mainly water birds, reptiles, mammals, amphibians and plankton and Improvement in food chain of some reptiles, birds and carnivorous mammals due to creation of reservoir and increase in humidity level. The butterfly diversity in the area would be enhanced as scrub habitat around the submergence will receive substantial amount of moisture, which will help in natural regeneration of forest canopy. Due to construction of dam, there shall be fragmentation in river and the spawning movement of fishes shall be inhibited.

14.15 SUMMARY OF POSITIVE AND NEGATIVE IMPACTS

The positive impacts are enlisted below:

- Employment opportunities
- Benefits to economy and commerce
- Increased infrastructure
- Recreation and tourism potential
- Improvement in environment through implementation of CAT, Compensatory Afforestation, Green belt Development and different other plans

The negative impacts are:

- Seven villages shall be partially affected due to acquisition of land for project purpose
- The loss of agriculture land (43 ha) and agriculture produce.
- The change of river status from riverine to lacustrine regime
- The loss of forest due to construction of dam, reservoir and appurtenant works
- Likely decrease in agriculture and horticulture production due to air pollution
- Disturbance to the fauna of the study area during construction
- Pressure on the existing provincial / state road will increase.

15.0 IMPACT MANAGEMENT

To ameliorate the negative affects of the project construction and overall improvement of the environment following management plans are formulated for implementation concurrent to the project construction. The cost of the management plans is shown in Table.
**Executive Summary of EIA/EMP for 930MW Kirthai-Il Hydro Electric Power Project, District Kishtwar, Jammu & Kashmir**

<table>
<thead>
<tr>
<th></th>
<th>Plan Description</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>4.</td>
<td>Fisheries Management Plan</td>
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<tr>
<td>5.</td>
<td>Resettlement &amp; Rehabilitation Plan (for community development works alone)</td>
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<td>6.</td>
<td>Green Belt Development Plan</td>
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<td>Restoration Plan for Quarry Sites Landscape and Restoration Plan</td>
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<td>Water, Air and Noise Management Plan</td>
<td>95.00</td>
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<td>12.</td>
<td>Public Health Delivery Plan</td>
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<td>13.</td>
<td>Labour Management Plan</td>
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<td>14.</td>
<td>Sanitation and Solid Waste Management Plan</td>
<td>500.00</td>
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<td>15.</td>
<td>Local Area Management Plan</td>
<td>1135.00</td>
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<td>16.</td>
<td>Environmental Safeguards During Construction Activities Including Road Construction</td>
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<td>17.</td>
<td>Energy Conservation Measures</td>
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<td>18.</td>
<td>Environmental Monitoring Plan</td>
<td>82.00</td>
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**Grand Total** 15354.00