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EXECUTIVE SUMMARY

1. Introduction

This draft Environmental Impact Assessment (EIA) Report for the proposed Shiggaon Lift Irrigation Scheme (SLIS) has been prepared according to the structure of EIA Report presented in the EIA Notification, 2006 by Ministry of Environment and Forests, Government of India. The EIA is based on the TOR's issued by MoEF, field inspection in command area, inventories, baseline environmental studies and available secondary information.

Shiggaon Lift Irrigation Scheme is proposed to irrigate 9900 ha dry lands in 30 villages of Shiggaon, Savanur and Hanagal Taluks in Haveri district. The villages coming under this scheme are poverty offended drought area. Agriculture is the economic activity of the Haveri district. Low annual rainfall of the order of 532 mm coupled with large variance in annual rainfall and uncertainty within a year causes the agriculture a risky venture. Hence the proposed scheme envisages diversion of 42.45 M. Cum (1.5 TMC) of water by constructing a diversion weir across Varada River near Halasur village of Savanur taluk, Haveri district, lifting of water to higher lands and providing Sprinkler Irrigation facility. Thus providing irrigation and stabilizing the agricultural production and improving per capita income and standard of living of the people.

2. Project Description

Shiggaon LIS is proposed to irrigate dry lands in villages of Shiggaon, Savanur and Hanagal taluks of Haveri district. The Jackwell is located at Longitude 75°17'00"E and Latitude 14° 51'00"N near Halasur village of Savanur Taluka. The project site (Head works) is approachable by Road and is at a distance of 21km along NH 4 from Shiggaon, the Taluk head quarters. The total water allocated for the proposed project is 42.45 M.Cum (1.5 TMC) but the current utilization of water for the proposed project is 31.696 M.Cum (1.12 TMC) by adopting Sprinkler Irrigation with piped conveyance system as suggested by EAC, MoEF and thereby saving 10.77 M.Cum (0.38 TMC) of water. Further, the quantum of saved water will be utilized for irrigating balance area through sprinkler irrigation at later stages. The scheme also envisages construction of 6 Bandaras and to provide drinking water facility and sub soil replenishment by filling of existing MI tanks with in the command area. The proposed project doesn't envisage displacement of the families/houses for the project activities. The total land required for the project is 45 ha which is dry in nature and will be acquired as per Land Acquisition Act, 1894. Land resources conservation achieved is 94%.

The total cost of the project is ₹ 238 Crores and the Benefit –cost ratio is 1.28. Table E.1 shows the salient features of the propose project.

Table E.1 Salient Features of the Scheme

Salient Features of the Scheme	
1	Name of the Project Shiggaon LIS
2	Purpose Irrigation
3	Name of the River Varada River/ Tungabhadra Sub-basin (k-8)/ Krishna Basin
4	Location Near Halasur Village, Savanur Taluk, Haveri District
5 (i)	Diversion Weir
	a. Latitude 14°52'00"N
	b. Longitude 75°22'00"E
(ii)	Jack well cum pump house
	a. Latitude 14°51'00"N
	b. Longitude 75°17'00"E
6	Climate Moderately Warm
A) Lifting of Water From Varada River	
1	Lift point location (Diversion Weir) Near Halasur Village, Savanur Taluk, Haveri Dist (on L/s of Varada River)
2	Quantity of water to be lifted 1.50 TMC
3	Lift Details
a)	Length of Intake Channel 180 m
b)	RL from which water is to be Lifted 520.00 m
c)	RL of Delivery point 611.000 m
d)	Static head 91.00 m
e)	Length of rising Main 11.80 Km
f)	Discharge required 6.134 Cumecs up to chainage 3+630, 5.564 Cumecs up to chainage 5+730, 4.74 Cumecs up to chainage 8+990, and 2.417 Cumecs up to chainage 11+800.
g)	Diameter of rising main 2.00 m dia up to chainage 5+730, 1.60 m dia up to chainage 8+990, and 1.2 m dia up to chainage 11+800

h)	Type of Material	M.S Raising Main										
i)	No of rows	1 No.										
j)	HP required	10,616 HP										
k)	No of Pumps	4										
B)	Intake Channel Details											
a)	Length of the Canal	180 m										
b)	Bed width of canal	3.50 m										
c)	FSD	4.00 m										
d)	Free board	0.60 m										
e)	Bed fall	1:500										
f)	Side Slope	0.5:1										
g)	Velocity	1.438 m/sec										
h)	Capacity at head	9.201 Cumecs										
C)	Branch Canals											
Sl.No	Hydraulic Particulars	Allapur	Haravi	Maranbida	Kundur	Bankapur	Shiggaon					
		DC 1	DC 2	DC 3	DC 4	DC 5	DC 6					
1	Offtake chainage from Raising Main	3.63	3.63	5.73	5.73	8.99	11.80					
2	Required Discharge (Qr)	0.413	0.157	1.085	0.239	1.823	2.417					
3	Irrigable Command Area ICA (Ha)	677	257	1619	392	2990	3965					
4	Irrigation											
a)	Gross Command Area	14371 Ha										
b)	Culturable Command Area	9900 Ha										
c)	Irrigable Command Area	9900 Ha										
d)	Intensity of Irrigation	100 %										
5	Districts Benefited	1 - Haveri										
6	Villages Benefited											
a)	Shiggaon Taluka, Haveri District	14										
b)	Hanagal Taluka, Haveri District	8										
c)	Savanur Taluka, Haveri District	8										
	Total	30										

D) Stabilization of MI Tanks in the Command Area of SLIS		
1	No of MI tanks proposed to be filled	5
a)	Shiggaon Taluka	3 Tanks
b)	Hanagal Taluka	1 Tank
c)	Savanur Taluka	1 Tank
2	Utilisation for filling MI Tanks	3.962 M.Cum (0.14 TMC)
E) Construction of Bandaras		
a)	Shiggaon Taluka	2
b)	Savanur Taluka	4
	Total	6
F) Utilization		
a)	For Irrigation	27.764 M.Cum (0.98 TMC)
b)	Filling M.I Tanks	3.962 M.Cum (0.14 TMC)
c)	Total Utilisation under project	31.96 M.Cum (1.12 TMC)

- Water savings achieved in the project based on the EAC suggestions, MoEF = 10.77 Mcum (0.38 TMC)
- Further, the quantum of saved water will be utilized for irrigating balance area through sprinkler irrigation at later stages.

3. Baseline Environmental Scenario

Collecting the baseline environmental status of the project command area helps to predict the magnitude of impacts that are likely to be caused due to the proposed project on different environmental components during the construction and operation phases of the project. It also helps to identify critical environmental attributes required to be monitored during and after the proposed development of the project. In order to assess the baseline environmental status of the project command area, monitoring of various environmental attributes were conducted during Post Monsoon Season (October 2009 to November 2009), Winter Season (December 2009 to February 2010), Pre-Monsoon Season (March 2010 to May 2010) and Monsoon season (June 2010 to September 2010). In addition to the baseline environmental monitoring, field inspection/studies in the command area, collection of secondary information for all the environmental components and discussions with the officials and local public were conducted by the consultants to establish realistic information on the area w.r.t the project.

3.1. Physical Environment

3.1.1. Geography and Topography

The project area is situated between Longitude 75°11'E and 75°20'E and Latitude 14°51'N and 14°56'N and spread over 3 Taluks namely Shiggaon, Savanur and Hanagal Taluks of Haveri district. The topography of the project area is partly plain and partly sloping and continuous sloping area without much of undulations. The elevation of command area ranges from EL 625.00 m to EL 530.00 m.

3.1.2. Climate & Meteorology

The Haveri district experiences the minimum temperature of 16°C in November and 42°C during May and annual rainfall in the hilly zone ranges from 900 mm to 3700 mm. The catchment area of the project spreads in two agro climatic zones. The western and eastern part of the catchment fall under Hilly zone and northern Transition zone respectively.

The climate of the western part in general is characterized as humid and dry. The relative humidity during the southwest monsoon months is in the order of 85 to 90%. The driest part of the year is the period from January to March when the relative humidity in the afternoon is about 30%.

During the southwest monsoon sky is mostly overcast or heavily clouded over the entire catchment and from the month of October cloudiness decreases. During the period from December to February the sky is clear. The eastern part of the catchment is influenced by winds of both east to southeast and west to northwest directions with annual mean wind speed of 11.4 km/hr. In the western part of the catchment, winds blow from directions between southwest and northwest during southwest monsoon season with mean wind speed of 5.4 km/hr.

3.1.3. Seismicity

The proposed project area is located in the Zone-II of Seismic Zoning Map of India. Hence, the area is not prone to Earthquakes.

3.1.4. Geology and Minerals

Haveri district is endowed with slates, schists and phyllites. The crystalline schist is formed by lava, dust and other particles of volcanic origin and is made up of sedimentary rocks. This sedimentary system was believed to have been formed after granitoid gneiss rocks broke upon due to tectonic changes resulting in disturbance of sedimentation and formation of metamorphic rocks. Apart from sand and building stones no other mineral ores are found in the district.

3.1.5. Soil characteristics

The major part of the Haveri district is red sandy soil followed by the medium black soil and deep black soil. All these soils are generally suitable for irrigating the Khariff crops.

From the overall results of the physico-chemical analysis conducted for 25 soil samples in the study area, it is noticed that, the pH values of the soil ranges between 6.5 and 8.5 and most of the values belong to soil reaction index II, which shows that the soils of the study area are under the neutral range. The electrical conductivity of the soil samples were observed to be in the range between 73 and 428 $\mu\text{mhos/cm}$ indicates Salinity of the soils are in Low and Medium range. Based on the rating chart of soil tests, all the soil samples belong to Normal i.e., Salt Index I, where-as Organic Carbon content of soil samples were observed to range from 0.08 to 4.8 percent. As per the nutrient index, the Organic Carbon, Available Phosphorus (P) and Available Potassium (K) in soil samples are at high Level. Overall, results of the soil quality analysis revealed that, it holds good for cultivation as indicated below.

Table E.2 Characteristics of Nutrient Index

Nutrient Index	Characteristics			Remarks
	Organic Carbon (OC)	Available Phosphorus (P)	Available Potash (K)	
Post Monsoon Season	1.68	1.08	0	High
Winter Season	1.72	0	0	High
Pre Monsoon Season	1.72	0	0	High
Monsoon Season	1.68	1.04	0	High

3.1.6. Hydrology

Varada, Kumudwati, Tungabhadra and Dharma are the four rivers flowing through the Haveri District.

The baseline status of water quality in the command area was established to evaluate the anticipated impact of the proposed project on water quality and to suggest appropriate mitigation measures for implementation. Water samples were collected from 27 locations in the command area for Post Monsoon Season (October 2009 to November 2009), Winter Season (December 2009 to February 2010), Pre-

Monsoon Season (March 2010 to May 2010) and Monsoon season (June 2010 to September 2010)

The results show that the surface and ground water collected are within the standards (IS 10500 and BIS 10500:1991) and suitable for drinking after conventional treatment followed by disinfection. Further, the results show that slight variation in Turbidity, Potassium, Total Hardness and phosphates were more than the standards (Nil - 56.4, 184-696, 0.1 to 0.622 respectively) for the ground water samples collected which defines the alkaline nature of the water in Haveri districts. Most of the water samples were bacteriologically contaminated (10 - 32 for Total coliform and nil - 20 for faecal coliform). pH of the water above 8.5 can be noticed in very few water samples. Water quality analyzed for Irrigation parameters such as Sodium Absorption Ratio (SAR), Residual Sodium Carbonate (RSC) and Percent Sodium have revealed most of the water samples suitable for Irrigation purposes and w.r.t Salinity of water, majority of water samples revealed medium salinity (Class II) which is suitable for Irrigation. The following Table E.3 presents the number of samples exceeding the limits in each season.

Table E.3 Comparative Assessment with Standards Prescribed by BIS for Drinking Water

Parameters	Maximum Permissible limits (BIS-10500: 1991)	No. of samples above maximum permissible limit prescribed by (BIS-10500:1991)			
		Number			
		Post Monsoon	Winter	Pre - monsoon	Monsoon
pH	6.5-8.5	0	0	0	0
EC (µmhos/cm)	3000	0	0	0	0
Turbidity (NTU)	10	4	4	2	5
TDS	2000	0	0	0	0
TH as CaCO ₃	600	2	1	1	3
Ca as CaCO ₃	200	0	0	0	0
Chlorides	1000	0	0	0	0
Sodium	200	0	0	0	0
Potassium	10	8	7	4	9
Fluoride	1.5	0	0	0	0
Sulphates	400	0	0	0	0
Nitrates	45	0	0	0	0
Phosphates	0.3	2	2	2	3
Colour (Hazen unit)	25	0	0	0	0
Total Coliform (MPN)	01/100 ml	27	27	27	27
Faecal Coliform(MPN)	Nil/100 ml	10	10	9	12

3.1.7. Ambient air quality

The ambient air quality status within the project influence area forms the basis for prediction of the impacts due to the proposed project. Ambient air quality in the command area was measured by setting up Ambient Air Quality Monitoring (AAQM) stations at 20 locations for Post Monsoon Season (October 2009 to November

2009), Winter Season (December 2009 to February 2010), Pre-Monsoon Season (March 2010 to May 2010) and Monsoon season (June 2010 to September 2010). The results show that all the ambient air quality parameters (namely SPM, RSPM (PM₁₀, PM_{2.5}) SO₂, NO₂) are well within the NAAQ Standards. There are no major air polluting sources in the project area and generally the air quality of the area is found to be good.

3.1.8. Ambient Noise levels

Ambient Noise Level Monitoring was conducted at 25 locations in the command area. The ambient noise level results viz., Leq Day dB (A) were in the range between 44.8 dB (A) and 57.2 dB (A) and Leq Night dB (A) were in the range between 30.8 dB (A) and 42.8 dB (A) and to conclude, all the results were observed to be well within the CPCB standards for Residential area.

3.2. Biological Environment

From the studies it is evident that most of the species are common to the region except *Chloroxylon swietenia* and *Santalum album* which are Vulnerable. Whereas the animal species found in the study area are most common to the region. Since the proposed project activity doesn't involve cutting of trees and the absence of forest areas in the study area, project has positive impact on the flora of the region. Once the project is implemented on ground, the farmers are suggested/advised to abide with horticulture crops thereby improving the agro biodiversity of the region.

Bankapur Peacock Conservation Reserve is situated on 56.3 Ha of land in Bankapura village of Shiggon Taluk, which is close to NH-4 (2.5 Kms) in the command area. As per the Forest Dept. and Animal Husbandry Dept. citation, there are about 75-100 Peacocks in the Reserve. Out of 56.3 ha, 63% of the area is under cultivation for growing fodder crops and remaining 31 % of the area is Barren land/waste land including a water hole and the remaining 6% of the land comprising of office buildings and roads. The conservation reserve is created for protecting the Peacock, the national bird, which is found naturally breeding in the moats of the Bankapura fort. Peafowls get protection from the villagers and moats provide excellent breeding places for them here.

The construction activities of project are restricted to the construction of Jackwell cum pump house and the water shall be carried to the fields through HDPE pipes by adopting sprinkler irrigation facility as per the suggestions of EAC, MoEF. Hence there will not be any impacts envisaged on the fauna of the region. But, even then proper mitigation measures are suggested in the EMP during the construction phase for without even causing secondary impacts on Bankapura Conservation Reserve.

3.3. Aquatic Ecology

The plankton community inclusive of both the phytoplankton and the zooplankton was 'low' – both by numerical density and diversity too. The benthic/littoral life too was composed of nymphs and adult stages of Insects, adult stages of Molluscs, Fish, Crustaceans and Amphibia. Fishing with suitable gears was conducted in the Varada river at Devagiri, Mannangi and Domburmatta (Savanur

taluk), bridge (NH-4) and in the vicinity of the Shiggaon Lift Irrigation Project (Haveri district) and near about Koodla and in the Dharma river (Hangal taluk), just above its confluence point with the river Varada. A total of 41 fish species in the Varada River and 31 fish species in the Dharma River comprised of large, medium, minor carps, minnows/weed fishes and the catfishes – large, medium and minor ones were observed.

As reported, Gangetic carps – Catla catla, Labeo rohita and Cirrhinus mrigala, as also the exotic Cyprinus carpio communis are the ones frequently observed in the fish catches, especially, during the monsoon months. The inadvertently entered exotic Oreochromis mossambica is also recorded quite frequently during the monsoon months and lean period also and is contributing towards the fishery of the rivers studies. Other indigenous fish species such as Puntius sarana sarana, Labeo calbasu, L. fimbriatus, Cirrihinus reha, Gonoproktopterus kolus and catfish like Wallago attu, Ompok bimaculatus, Mystus cavasius, Channa marulius, C. striatus, Clarias batrachus, Mastacembelus armatus. Rita pavementata as also Notopterus notopterus also contributes substantially to the fishery of the rivers Varada and the Dharma.

4. Anticipated Environmental Impacts & Mitigation Measures

4.1. Positive Impacts of the Project

The potential positive environmental impacts due to the proposed project include the following.

- As per the MoEF recommendation, with the adoption of Sprinkler Irrigation system, 10.77 Mcum (0.38 TMC) of water will be saved.
- The project requires only 45 ha dry land for the implementation of the project, i.e. 0.0045% of the total command area of the project, there by achieving land resources conservation of about 94%.
- The project doesn't require any diversion of forest land and cutting of trees for its implementation.
- There is no displacement of families in the proposed project.
- The proposed project is benefiting drought affected areas comprising of 30 villages in Shiggaon, Savanur and Hanagal Taluks.
- The proposed project boosts total farm output and hence, with unchanged prices, raises farm income.
- Project improves yields through reduced crop loss due to erratic, unreliable or insufficient rainwater supply.
- It allows for the possibility of multiple-cropping, and so an increase in annual output.
- It allows a greater area of land to be used for crops in areas where rain fed production is impossible or marginal.
- The proposed project enables the use of complimentary inputs, such as high yielding varieties (HYVs).
- The proposed project requires labour for construction and on-going maintenance of Raising Main, wells and pumps etc. This is likely to be an important sector of employment for the poor, especially the landless rural

poor or rural households.

- It aims to increase the farm output as a result of irrigation will stimulate demand for farm labour both within the main cropping season and across new cropping seasons, increasing both numbers of workers required and length of employment period. Rural poverty levels may therefore be reduced by increased employment opportunities.
- It reduces migration to urban areas, and so reduces the pool of job-seekers and relieves the downward pressure on urban areas.
- The project envisages providing opportunity to switch farm use away from staples to higher value, market-oriented products.
- By making employment and incomes more reliable (as well as higher) the project aims to protect farmers from loss of assets and also prevents peasants from getting into debt-traps.
- Access to irrigation in the project area may have very positive impacts on nutritional outcomes, through the availability of increased and more stable food supplies and, sometimes, cleaner water. In addition, increased income levels will allow rural producers, assuming transport costs are not prohibitive, to purchase a wider variety of foods. This should help to ensure that not only calorie intake is sufficient but that also diets are better balanced, with adequate intake of micro-nutrients.
- Filling of existing MI tanks in the command area of the scheme will be subjected to stabilization which in turn helps in sub soil replenishment and also providing drinking water facility through recharge of under ground water table.

4.2. Negative Impacts of the Project

The potential Negative environmental impacts due to the proposed project include the following.

- Increased air pollution due to the movement of vehicles and laying pipes during the construction phase.
- Use of Pesticides/Fertilizers leads to surface as well as ground water pollution.
- Irrigation-induced land degradation - Soil salinity and water logging—on-farm and off-farm impacts, Loss of soil fertility due to irrigation induced crop intensification, Increase in biological imbalances due to irrigation (weeds, pests)
- Surface water pollution—nutrients/chemicals
- Groundwater pollution—nutrients/chemicals
- Toxic concentration of substances in surface and groundwater.
- Saline return flows
- Health impacts in terms of increased water borne diseases (schistosomiasis, malaria)

Matrix method is adopted for qualitative and quantitative assessment of impacts on various environmental components from the proposed Project. The Activity - impact identification matrix is presented below in Table E.4.

Table E.4 Activity-Impact Identification Matrix

Sl. No	Environmental Attributes	Project Activities	Nature of Impacts											
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative			
A. Construction Phase														
1.Impacts on Land Environment														
1	Landslide	Construction of Jack Well cum Pump house, minor head works, Bandaras etc. Excavation Heavy earth moving vehicles	M	✓				✓	✓					✓
2	Change in Topography	Construction of Jack Well cum Pump house, minor head works, Bandaras, MI tanks etc. Excavation Construction of labor camps	M	✓		✓		✓			✓			✓
3	Change in Geology	Excavation Quarrying Operation	H	✓				✓	✓					✓
4	Loss of Productive Soil	Construction site, temporary offices, workers camps, stockyards, borrow areas Construction of Haul roads and traffic detours Site Clearance	L	✓				✓			✓			✓
5	Compaction of Soil	Movement of heavy machinery and vehicles	H	✓				✓						✓
6	Contamination of Soil	Machinery and operation of the Diesel Generator Sets Construction labor camps	L		✓				✓			✓		✓
7	Soil Borrow areas and quarry Sites.	Muck Disposal	M	✓					✓		✓			✓

Sl. No	Environmental Attributes	Project Activities	Nature of Impacts									
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative	
8	Soil erosion and change in land forms	Construction of Jack Well cum Pump house, minor head works, Bandararas, etc Site clearance	M H	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓
2. Impacts on Water Environment												
1	Eutrophication	Sewage from labor camp	L	✓				✓				✓
		Muck disposal	M	✓				✓				✓
2	Siltation and sedimentation	Washing off from crusher	L	✓				✓				✓
		Muck disposal	M	✓				✓				✓
		Construction of Jack Well cum Pump house, minor head works, Bandararas, etc.	L	✓					✓			✓
		Diversion of river water	L		✓						✓	✓
3	Change in River Water Quality	Decomposition of sediments and deposition of organic matter	H	✓				✓				✓
		Washing of crusher	M	✓				✓				✓
		Muck disposal	M	✓				✓				✓
		Sewage from labor camp	L	✓					✓			✓
4	Change in surface and ground water quality	Creation of Impoundments in the Construction yard	L	✓		✓				✓		✓
		Construction of Jack Well, Bandararas etc.	L		✓						✓	✓
3. Impacts on Air Environment												
1	Increase in dust concentration	Construction activity, operation of crusher, structural and erection works	H		✓			✓				✓
		Excavation	H		✓			✓				✓
2	Fugitive Emissions from various sources	Vehicular movement	H		✓			✓				✓
		Loading and dislodging Use of sand, fine	H		✓			✓				✓

Sl. No	Environmental Attributes	Project Activities	Nature of Impacts											
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative			
3	Increase in SO ₂ , SPM, NO _x	aggregates												
		Crushing	H		✓	✓	✓	✓						✓
		Vehicular movement	H		✓	✓	✓	✓						✓
		Operation of DG sets	M		✓	✓	✓							✓
		Fuel Combustion in equipments and Vehicles	M		✓	✓	✓	✓						
		Burning of fuels from construction workers	M	✓		✓	✓							✓
4.	Impacts on Noise Environment													
1	Increase Noise Level	During Construction from movement of heavy earth moving vehicles.	M		✓			✓						✓
		Operation of D.G sets	L		✓			✓						✓
		Movement of vehicles carrying raw materials	M		✓			✓						✓
5.	Impacts on Biological Environment													
1	Pressure on existing natural resources	Immigration of labor population & technical staff	L	✓				✓						✓
		Transportation of construction materials	L	✓				✓				✓		✓
2.	Reduced Photosynthetic activity, Wilting of plants, loss of floral diversity	Site Clearance	M		✓		✓							✓
		Construction activities	L	✓				✓						✓
3.	Impact on Bankapura Peacock Conservation	Immigration of labour population	L	✓				✓						✓
		Vehicular movement	M	✓				✓						✓
4.	Impacts on Fishes and Aquatic Ecosystem	Construction of Jack Well	L	✓				✓						✓
		Increase in turbidity of water due to Washing of crushers		✓				✓						✓
		Construction of weir across river	H		✓		✓							✓

Sl. No	Environmental Attributes	Project Activities	Nature of Impacts											
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative			
		Sewage from labor camp	L	✓				✓						✓
6. Impacts on Socio economic Environment														
1	Increase in job opportunity	During Construction	H	✓				✓					✓	
2	Increase in income level	During Construction	M		✓			✓					✓	
	Pressure on existing infrastructure facility	Urbanization and developments	M		✓			✓					✓	
3	Pressure on existing infrastructure facility	Immigration of labor and technical staff	M	✓				✓						✓
4	Impact on Human Health	Due to water/air borne diseases	L	✓				✓					✓	
		Increased Traffic	L	✓				✓					✓	
B. Operation Phase														
1	Change in climate and meteorology	Improvement in Agro-Bio diversity	H		✓			✓						✓
		Replenishment of underground water table	H		✓					✓				
2	Impacts on Land Environment	Due to good yield of crops	H		✓			✓						✓
		Soil Salinity, Soil Erosion, Soil Properties, etc	M	✓					✓					✓
		Application of natural fertilizers	H	✓					✓					
	Impacts on Water Environment	Addition of Gypsum for Irrigation Water	H	✓				✓						✓
		Changes in surface and ground water quality due to soil erosion	L	✓					✓					✓
		Application of fertilizers and pesticides	M		✓				✓					✓
		Impounding of water	L		✓				✓					✓
4	Impacts on Air Environment	DG sets Operation	L		✓			✓						✓
5	Impacts on Noise Environment	Spraying of pesticides	M		✓			✓						✓
		Operation of Jack well	L		✓			✓						✓
		Repair of Equipments	L	✓					✓					✓
6	Impacts on Biological	Increase of Agro-biodiversity	H	✓				✓						✓

Sl. No	Environmental Attributes	Project Activities	Nature of Impacts											
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative			
	Environment	Change in cropping pattern	H	✓		✓			✓				✓	
		Bankapura Peacock Conservation	M	✓			✓				✓			✓
7	Impacts on Socio economic Environment	Employment opportunity	H	✓		✓			✓					✓
		Yield of the crops	H	✓		✓			✓					✓
		Economic status of the region	H	✓		✓			✓					✓
		Health Status	H	✓		✓			✓					✓

4.3. Public consultation

Successful implementation of the project requires coordinated efforts of various stakeholders at different levels. The public consultation process helps in reducing the public resistance to change and enable the participation of the local people in the decision making process. Local Level Focus Group Discussions were conducted in 5 villages to assess the perception of the people about the proposed project. The stakeholders selected included shop keepers, local residents, owners/ workers of local commercial establishments, farmers, labors, etc. Personal discussions were also conducted for horizontal Government Departments such as Forest Department, Wildlife Department, Agriculture Department, Fisheries Department, Animal Husbandry and Veterinary Department, Social Welfare Department, etc to assess the perception of the officials about the proposed project.

Our field investigation involving discussions with the farmers, knowledgeable elders in the villages, officials concerned with the project and other stakeholders has brought the fact that the project is a promising activity. The benefits of the project are multifaceted and they can be realized now as well as in the future.

4.4. Mitigation of Impacts & Environmental Management Plan

In order to address the impacts predicted for various project activities, mitigation measures, environmental enhancement measures, monitoring actions and a reporting schedule are suggested in the form of an Environmental Management Plan (EMP). The EMP includes a list of all project related activities and impacts and their mitigation measures at different stages of project i.e. construction phase and operation Phase, Environmental monitoring plan and a clear reporting schedule. The EMP sets a time frame to all proposed mitigation and monitoring actions with specific responsibility assigned to the proponents, the contractors and the regulatory agencies.

All project-related activities, their impacts on environment and mitigation measures for the impacts at different stages of project are presented in the Table E.5.

Table E.5 Proposed Environmental Management Plan

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
I. CONSTRUCTION PHASE			
1. Land Environment			
Site clearance, excavation, muck disposal, vehicular movement, Loading & unloading of sand, & aggregates	Soil Erosion, dust generation	<ul style="list-style-type: none"> ▪ Vegetative cover will be reprojected / rehabilitated at the earliest practicable time to minimize duration & extent of soil erosion. ▪ Providing good vegetative cover will disperse the energy of rain drops and contour drainage will slow down surface runoff. ▪ The cleared site will be periodically watered to reduce the emission of dust particles. ▪ The workers will be provided with PPE such as nose masks and goggles to reduce impact on health. ▪ Vehicular speed will be regulated. ▪ Proper checks for ensuring erosion control structures shall be in place before earthworks are started. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL
Excavation, heavy earth moving vehicles, muck disposal, operation of D.G sets	Soil compaction	<ul style="list-style-type: none"> ▪ Separate paved roads will be created within the project premises for the movement of vehicles to avoid soil compaction and care shall be taken to not to disturb the fertile land. ▪ The excavated soil will be utilized for the formation of service roads. ▪ Some of the waste will be reused for the development of access roads to the construction plant sites, labour camps, internal roads, access roads to the site. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL
Use of D.G sets construction of labour camps, solid waste	Deterioration of soil quality	<ul style="list-style-type: none"> ▪ The labour camps will be provided within the project premises such that the place does not have any impact on the productivity. ▪ The domestic solid waste will be disposed to nearby 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
generation from labour camps		<ul style="list-style-type: none"> ▪ municipal landfills. ▪ Oil spillages from D.G sets will be collected and handed over to KSPCB authorized recyclers. ▪ Impervious concrete base and a sump will be constructed at all the fuel, waste oil emission and chemical storage yards. A berm shall also be constructed along the periphery of the concrete platforms in the construction area. An oil interceptor will be constructed for providing for treating the oil wastes collected in the sumps ▪ Land fills of contaminated soils with the oil and chemicals shall be avoided as far as possible, these materials shall be buried in the construction of slopes or shoulders. ▪ Procedures and Plans shall be in place for cleaning up of any accidental spills. ▪ Washing bay with oil interceptor shall be constructed for the effective collection of oil spills generated during washing. 	
2. Water Environment			
Construction of Jack well, pump house, raising mains etc.	Pollution of River water	<ul style="list-style-type: none"> ▪ The project envisages only diversion of River water for irrigation purpose and the flow of the water body is not obstructed by any other means. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL
Construction of Labour camps	Deterioration of surface ground water quality	<ul style="list-style-type: none"> ▪ The Sewage generated from labour camps will be treated in Septic Tank and Soak Pits that will be designed and constructed as per IS 2470 Part-I & Part-II guidelines. Project assures there will not be any direct discharge of sewage into the water. ▪ Frequent check (say quarterly) of septic tank and soak pits will be done to repair and replacement of leaking and 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
		<p>malfunctioning. And it will be designed in such a way that no adverse change in groundwater quality as a result of the discharge.</p> <ul style="list-style-type: none"> ▪ BOD and COD limits of the water shall be checked regularly to avoid eutrophication and also the decomposition of sediments to avoid eutrophication. 	
3. Air Environment			
Excavation, loading and unloading of sand, aggregates etc, movement of vehicles.	Fugitive dust emission, wilting of plants	<ul style="list-style-type: none"> ▪ The transport vehicles using petrol or diesel will be properly maintained to minimize smoke in the exhaust. ▪ Any vehicle not meeting the vehicular pollution standards will not be allowed within the construction activity & vehicular speed will be regulated at 20 kmph. ▪ Water shall be sprayed by high-pressure water hoses during dust generating construction activities e.g. excavation, crushing/demolishing, concrete mixing, material handling etc. to suppress dust; and ▪ Vehicles delivering loose and fine materials like sand and fine aggregates shall be covered by tarpaulin to reduce spills on roads. ▪ The height from which excavated materials are dropped will be controlled to a minimum practical height to limit fugitive dust generation from unloading. ▪ All roads (internal and external) to be used by the project authorities should be made 'pucca' (Sprinkled with water) to mitigate the dust generation along the roads. ▪ The workers will be provided with PPE such as nose masks and goggles to reduce impact on health. ▪ A greenbelt will also be developed in and around the boundary of the project site for protecting ambient air quality status. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
Operation of D.G sets, burning of fuel for cooking from labour camps.	Emission of SO ₂ , NO ₂ , SPM	<ul style="list-style-type: none"> ▪ Exhausts of other equipment used for construction (e.g. generators), if any shall be positioned at a sufficient height to ensure dispersal of exhaust emissions and meet the standards set by CPCB. ▪ Idle running of vehicles will be minimized during transport and handling activities. ▪ Low ash content diesel will be used to run the equipments. ▪ Domestic fuel will be provided for the construction workers to prevent cutting of trees in the vicinity ▪ Combustible wastes shall be burnt in a controlled manner and other category of wastes should be disposed off at identified dump site or as per the guidelines recommended by KSPCB/CPCB. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL
4. Noise Environment			
Construction activity like excavation and vehicular traffic	Disturbance to construction workers, technical staff and locality. And also on Bankapura Peacock Reserve.	<ul style="list-style-type: none"> ▪ The noise pollution will be checked and maintained by installing sound barricades around crushing plants and by taking up regular maintenance of heavy earth moving vehicles. Selection of equipment with less noise generation will be used. ▪ On site workers near the noise generating equipment shall be provided with noise protection devices like earmuffs/earplugs. ▪ Noise absorbing plant species will be planted along the periphery. ▪ The construction of Jack well is carried out at a distance away from the Bankapur Peacock Conservation Reserve (i.e., > 10 Km). Hence there will not be any impact of noise on the Reserve. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL
Operation of	To the workers	Acoustic enclosures for D.G sets will be provided.	<ul style="list-style-type: none"> ▪ Project Contractor

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
D.G. Sets	and technical staff.	<ul style="list-style-type: none"> Use of DG sets should be enclosed type and should conform to the EP rules prescribed for air and noise emission. On site workers near the noise generating equipment shall be provided with noise protection devices like earmuffs/earplugs. 	
5. Biological Environment			
Site clearance	Loss of greenery, Bankapur Peacock Reserve.	<ul style="list-style-type: none"> Providing LPG etc for the labour force will be to reduce the overall fuel requirements and tree felling in the project vicinity. The proposed land is a dry land with small plantations here and there. So there will not be much change in the flora. And this does not have any impact on the Bankapur Peacock Reserve. Fast growing trees will be planted along the periphery of the project area. 	<ul style="list-style-type: none"> Project Contractor KNNL KFD
Excavation, loading and unloading of materials, vehicular movement.	Wilting of local plants and trees, Bankapur Peacock Reserve.	<ul style="list-style-type: none"> Proper watering of mud roads will be undertaken to avoid the wilting of plants. Vehicle speed will be regulated to 20 Km/hr within the premises. Vehicles carrying sand and aggregates will be covered with tarpaulin to avoid fugitive dust emissions. The excavated surface will be watered to suppress the dust emission. The movement of construction workers in and around the Bankapur Peacock Reserve will be avoided in due consultation of the forest department in charge. 	<ul style="list-style-type: none"> Project Contractor KNNL KFD
Installation of HDPE pipes	Bankapura Peacock Conservation	<ul style="list-style-type: none"> Installation of HDPE pipes around the Bankapura Peacock Conservation Reserve will be avoided during the breeding season of peacocks and these works shall be 	<ul style="list-style-type: none"> Project Contractor KNNL KFD

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
	Reserve.	<p>undertaken in due consultation with the Wildlife Division, Forest Department and Animal Husbandry Department, Haveri District.</p> <ul style="list-style-type: none"> ▪ Plantation of dust absorbing trees and shrubs near the dust generating areas such as <i>Azadirachta indica</i>, <i>Anthocephalus cadamba</i>, <i>Polyalthia longifolia</i>, etc, 	
Accumulation of excavated rock/ stones/ boulders etc. to prevent their sliding back into the river	Aquatic Ecology	<ul style="list-style-type: none"> ▪ These should be shifted to safe locations quite away from the river course, to avoid siltation and obstruction. To avoid dumping of waste paints, thinners, contaminated rags, brushes etc. into the river course to maintain hygiene of the medium. High intensity explosives should be avoided during the construction phase. During the monsoon, there will be large scale fishing activity and during the lean season, partial fishing activity will be there in the vicinity of Project site. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL ▪ Dept. of Fisheries, Haveri
6. Socio Economic Environment			
Excavation, Pondage of Water, Land Acquisition	Health of workers, resettlement & rehabilitation	<ul style="list-style-type: none"> ▪ The health checkups (diagnostic) for all regular employees at scheduled intervals (half yearly) to be maintained along with the corresponding health records. ▪ Safety training will be provided to all construction workers on operation of equipments. Security shall also be extended during non-working hours to ensure there is no uncontrolled access to the machinery and equipment. ▪ The project site is a vacant area with dry land; hence it does not involve any resettlement and rehabilitation activity. 	<ul style="list-style-type: none"> ▪ Project Contractor ▪ KNNL
II. Operational Phase			
1. Climate and Meteorology			
Planting of Trees	Increase in Agro - Biodiversity	<ul style="list-style-type: none"> ▪ Improvement in the agro - biodiversity, replenishment of underground water table, etc of the region. 	<ul style="list-style-type: none"> ▪ KNNL, or ▪ Sub consultants

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
		<ul style="list-style-type: none"> The conversion of dry land to agricultural land improves the surrounding atmosphere by clearing the air, which intern helps in increase in the local avi-fauna in the locality. 	appointed by KNNL
2. Soil Environment			
Agricultural Activities	Soil erosion	<ul style="list-style-type: none"> Soil erosion shall be avoided through reformed agricultural methods. Plantation of soil binding plants e.g. grass will be carried out to avoid soil erosion. 	<ul style="list-style-type: none"> KNNL, Agriculture Dept. or Sub consultants appointed by KNNL
Application of pesticides, herbicides, fertilizers. Watering etc.	Soil quality	<ul style="list-style-type: none"> The accumulation of salts in the soil will be monitored regularly to avoid the addition of excess salts in the soil. Gypsum will be added to the irrigation water or mixed into the soil before irrigation to reduce the sodium content of soils. There will not be water logging, since sprinkler irrigation method is adopted for irrigation at a regular interval of time, which does not alter the soil quality. 	<ul style="list-style-type: none"> KNNL, Agriculture Dept. or Sub consultants appointed by KNNL
3. Water Environment			
Operation of Jack well, pump house, raising mains, diversion of river water.	Change in the hydraulic regime, down stream flow, water logging.	<ul style="list-style-type: none"> The down stream users will not be affected due to the shortage of water. Proper checks and monitoring will be envisaged to maintain the welfare of ecology and down stream users. Only diversion of river water will be done, which does not have any impact on the people depending on the down stream flow. 	<ul style="list-style-type: none"> KNNL, or Sub consultants appointed by KNNL
Application of pesticides, herbicides,	Surface & ground water quality, aquatic flora and	<ul style="list-style-type: none"> Care will be taken that the pesticides applied for the crops will not leach into the ground water that adversely affects the ground water. 	<ul style="list-style-type: none"> KNNL, Agriculture Dept. or

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
fertilizers & watering etc.	fauna.	<ul style="list-style-type: none"> ▪ Restrictions on the time, method and rate of application of fertilizers and pesticides will be imposed to avoid surface run-off and leaching into the ground water. ▪ Farmers will be advised to use nutrient management plans to reduce excess application of nutrients. ▪ To minimize pesticide impacts, farmers shall be advised to practice Integrated Pest Management (IPM) techniques (which can include biological pest control) to maintain control over pests, reduce reliance on chemical pesticides, and protect water quality. ▪ It does not involve construction of any barrages, hence no much impact on the aquatic life. 	<ul style="list-style-type: none"> ▪ Sub consultants appointed by KNNL
4. Air Environment			
Vehicular movements. Application of pesticides and herbicides.	Emission of, SO ₂ , NO ₂ , SPM.	<ul style="list-style-type: none"> ▪ The KPTCL will provide power required to run the pumps for Jack well. Hence there will not be any emission of SO₂, NO₂ etc, ▪ The farmers will be advised to use pesticides & herbicides during the calm period when the wind speed is low, mornings and evenings are usually good times. ▪ Before applying the pesticides, to check for the nozzles of the spray equipments. Spraying should be done continuously at a regular time and uniformly with low pressure. 	<ul style="list-style-type: none"> ▪ KNNL, ▪ Agriculture Dept. or ▪ Sub consultants appointed by KNNL
5. Noise Environment			
Operation of Pumps & Jack well, Vehicular movement	To the farmers working in the site, Bankapura Peacock Conservation Reserve.	<ul style="list-style-type: none"> ▪ Acoustic enclosures will be provided for the pumps operating the Jack well. ▪ Regular check-up and maintenance of the operating equipments and machines will be done and maintained in a good condition. ▪ Plantation of noise attenuating species to reduce noise 	<ul style="list-style-type: none"> ▪ KNNL, or ▪ Sub consultants appointed by KNNL

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
		<ul style="list-style-type: none"> pollution will be carried out. The development of green belt will also help in controlling the noise arising from the pumps. 	
6. Biological Environment			
Growth of Agricultural Crops during lean season	Poaching & Killing of Birds	<ul style="list-style-type: none"> Proper care and awareness shall be envisaged that the birds visiting the adjacent agricultural lands for feeding shall not be killed or poached at any circumstances. 	<ul style="list-style-type: none"> KNNL, Agriculture Dept. or Sub consultants appointed by KNNL
Fishing Activities near the weir during the monsoon season	Aquatic Ecology	<ul style="list-style-type: none"> Local/migrant fishermen, in their own interest, should be suitably advised not to fish during the 'monsoon' season to allow the fish to breed and for the recruitment to take place in the river which amounts to auto-stocking. Fish culture in the riverine sector is to be ensured with active support/participation of the Department of Fisheries and fishermen community too. 	<ul style="list-style-type: none"> KNNL Dept. of Fisheries, Haveri Sub consultants appointed by KNNL
7. Socio Economic Environment			
Implementation of Irrigation Scheme	Health status of the people	<ul style="list-style-type: none"> KNNL will have a dialogue with PHCs in the command area, such that the communicable diseases and other water borne diseases shall be avoided. Personal protective facilities like helmets, safety (gas) mask/safety dress, shoes, goggles, earplugs etc., are ensured for all workers, engaged in operation depending upon their nature of work. 	<ul style="list-style-type: none"> KNNL, Agriculture Dept. or Sub consultants appointed by KNNL
	Economic Status of the people of the region	<ul style="list-style-type: none"> The conversion of dry land to irrigational land will provide the employment opportunity to the people of the district, thereby improving the economic status of the people and also region. Increases crop yield, communication between the other 	<ul style="list-style-type: none"> KNNL, Agriculture Dept. or Sub consultants appointed by

Project Activities	Environmental Impact	Mitigation Measures	Responsible Agency for Implementation
		states etc.	KNNL

4.5. Command Area Development Plan

The Proposed Command Area is well connected by Village roads and can be accessed even during monsoon season. The Infrastructural facilities in the proposed Command Areas comprises of good transportation facilities, agricultural marketing facilities, Banks and access roads.

The proposed project is lifting of water from Jackwell to Raising main upto Delivery chamber through pipeline, then from Raising main and Delivery chamber water will be conveyed through distribution lines of different diameters upto the Water Storage tanks which are to be constructed in the farmers land. The area provided for the irrigation is 80 Hectares. 160 number of sprinkler sets will be provided. After completing the sprinkler irrigation network, the entire sprinkler irrigation system shall be handed over to the water user's co-operative societies. Water user's co-operative society may collect water tax from all the beneficiaries. The functional utility of OFD works depends on levels of accuracies and quality of construction. The B.C. Ratio is 1.28, hence the project is techno - economically viable. The efficiency of gross irrigation water requirement through sprinkler irrigation system of the overall the project is 71.25%. As a part of the project, it is proposed to stabilize existing 5 tanks in the command area of the project and construction of 6 bandaras will help in recharging the ground water which in turn serve the propose of drinking water demand in the command area. The stage of ground water development for the whole district was computed as 72%. But the taluk wise ground water estimation data indicates the stage of ground water development varies between 31.76 and 38.92 % for Hangal, Savanur and Shiggaon taluks where 100% area belongs to safe category.

Problems that are expected from the proposed Command Area are salinity, alkalinity, water logging, and inadequate distribution of irrigation water to tail enders, inefficient agricultural produce marketing system, etc.

According to, NBSS&LUP Land Capability Class of Soils of the proposed Command Area are classified as II_s and III_w classes. The main objective of the CADA is to reduce the gap between potential area created and actual area utilised and objective to ensure rapid and optimum utilisation of Irrigation potential and to increase the agriculture production. Water Users' Association (WUA) aims at high efficiency of water conveyance and appropriate methods of water application, through participatory irrigation management at each stage of irrigation development.

The active participation of farmers and other water users with the irrigation bureaucrats can minimize the future problems and increase productivity with smooth functioning and management of the project. This will also help in building up of an atmosphere of common purpose and thereby in the unification of the beneficiaries into a homogenous group.

5. Environmental Monitoring Programme.

An Environmental Monitoring Programme as presented in Table E.6. is proposed as part of the EMP to evaluate the efficiency of implementation of mitigation measures recommended in the EMP and facilitate management decisions for the project.

Table E.6 Environmental Monitoring Plan

Environmental Parameters	Project Stage	Parameters to be Monitored	Frequency of Monitoring	Duration	Locations	Implementation & Supervision
Water Quality	Construction	Physico-Chemical and Bacteriological analysis for Surface water and Groundwater, Groundwater Table assessment (Pre-and Post Monsoon)	Twice a Year for 3 Years	Composite Sampling	As mentioned in the baseline Studies (Chapter 4)	Contractor or Sub-Consultants appointed by Contractor KNNL or Sub-Consultants appointed by KNNL
	Operation		Twice an Year			
Soil Quality	Construction	Physico-Chemical, Bacteriological and Irrigation Properties	Twice a Year for 3 Years	Composite Sampling	As mentioned in the baseline Studies (Chapter 4)	Contractor or Sub-Consultants appointed by Contractor KNNL or Sub-Consultants appointed by KNNL
	Operation		Twice an Year			
Air Quality	Construction	PM ₁₀ , PM _{2.5} , NO ₂ and SO ₂	Twice a Year for 3 Years	8 Hours Sampling	As mentioned in the baseline Studies (Chapter 4)	Contractor or Sub-Consultants appointed by Contractor
	Operation	Not Required	Not Required	Not Required	Not Required	Not Required
Noise Levels	Construction	Leq Day, Leq Night in dB(A)	Twice a Year for 3 Years	Leq in dB (A) in day	Any 10 locations as mentioned in	Contractor or Sub-Consultants

Environmental Parameters	Project Stage	Parameters to be Monitored	Frequency of Monitoring	Duration	Locations	Implementation & Supervision
	Operation	Not Required	Not Required	Not Required	Not Required	Not Required
Health Impacts	Construction	Identification of water related diseases, sites, adequacy of local vector control and curative measures etc.,	Thrice a Year for 3 Years	As specified by the near PHC	Villages in the command area and also in labor camp	Contractor or Sub-Consultants appointed by Contractor
	Operation					KNNL or Sub-Consultants appointed by KNNL

5.1. Block Cost Estimates for Implementation of EMP

The cost of implementing mitigation measures as estimated in Table E.7, works out to ₹ 68.82 Lakhs. The operational cost of the same is estimated at 21.8 Lakhs during the first three years and ₹ 50 Thousand per annum from 4th year onwards.

Table E.7 Cost Estimates for Environmental Management Plan

Item	Particulars	Cost in ₹
A. Total Cost During Construction Phase (Non - Recurring Cost)		
Provision of Sewage treatment and sanitation facilities for the construction camps, including maintenance for 2 years	Lump Sum	200,000.00
Provision of Water Supply Facilities for the construction camps	Lump Sum	200,000.00
Solid Waste Management for Labor Camps	Lump Sum	200,000.00
Health & Medical Facilities for labor camp	Lump Sum	300,000.00
Power Supply for Labor Camps	Lump Sum	150,000.00
LPG for Labor Camps	30 Cylinder/Month x ₹400 x 2 years	2,88,000.00
Temporary Education Facility for Labor Children	Lump Sum	100,000.00
Environmental Monitoring		
Air Quality Monitoring	₹4800/location x 20 locations x 2 seasons x 2 years	384,000.00
Water Quality Monitoring	₹4300/location x 25 locations x 2 seasons x 2 years	430,000.00
Noise Level Monitoring	₹400/location x 25 locations x 2 seasons x 2 years	40,000.00
Soil Quality Monitoring	₹4900/location x 25 locations x 2 seasons x 2 years	490,000.00
Mobilization Charges	₹50000/season x 2 seasons x 2 years	200,000.00
Dust Suppression at Site	Lump Sum	100,000.00
Others (including training, workshops, awareness campaigning etc.)	Lump sum	100,000.00
Aquatic Life Management	Lump Sum	200,000.00
Plantation on the left and right banks of Varada & Dharma River, in and around construction site and	2000 Saplings x ₹900/Sapling including their Maintenance for 3 years	1,800,000.00

Item	Particulars	Cost in ₹
their maintenance for 3 years as a part of Green Belt Development including watch and ward		
Command Area Development Plan	Lump Sum	1,500,000.00
Construction of sedimentation tanks, oil interceptors at construction yards	Lump sum	200,000.00
Total cost during construction phase		6,882,000.00
B. Annual Cost During Operational Phase during First Three Years (Recurring Cost)		
Environmental Monitoring		
Water Quality Monitoring	₹4300/location x 25 locations x 2 seasons x 3 years	645,000.00
Soil Quality Monitoring	₹4900/location x 25 locations x 2 seasons x 3 years	735000
Management of Public Health & Eradication of Water Borne Diseases	Lump Sum	200000
Mobilization Charges	₹50000/season x 2 seasons x 3 years	300000
Maintenance of Green Belt Development including watch and ward	₹50000/Season x 2 Season x 3 Years	300000
Total cost during operation phase		2,180,000.00
C. Annual Cost during Operational Phase from 4th Year Onwards		
Maintenance of Green Belt	₹50000	50,000.00
Total Annual Cost during Operational Phase from 4 th Year Onwards		50,000.00

6. Summary and Conclusion

- The proposed scheme envisages diversion of 42.45 M.Cum (1.5 TMC) of water by constructing a diversion weir across Varada river near Halasur village of Savanur Taluka, lifting of water to higher lands and providing Sprinkler Irrigation facility and also providing drinking water facility by filling existing MI Tanks in 9,900 Ha of dry lands (Command Area) of Shiggaon, Savanur and Hangal Taluks of Haveri district.
- The total water allocated for the proposed project was 42.45 M. Cum (1.5 TMC). But the current utilization of water for the proposed project is 31.696 M.Cum (1.12 TMC) by adopting Sprinkler Irrigation with piped conveyance system *as suggested by EAC, MoEF and thereby saving 10.77 M. Cum (0.38 TMC) of water, thus water resources are conserved.*
- The scheme also envisages to provide drinking water facility and sub soil replenishment by filling of existing MI tanks within the command area and bandaras of the same.
- The land use in the proposed project area is dry land agriculture, subject to

vagaries of monsoon rain with low cropping intensity and low productivity and which, this project will be definitely boon to the local farmers of the region and inturn will improve the GDP of the state.

- The proposed irrigation is only in Khariff and the intensity of irrigation is 100%.
- Filling of existing MI tanks in the command area helps in stabilization and replenishment of the underground water table in the region.
- The project doesn't require diversion of forest land and it doesn't envisage cutting of trees for construction activities. Hence, the project doesn't require Forest clearance under Forest (Conservation Act) 1980.
- Land resources are conserved since the land requirement for the project is minimal i.e., 45 Ha.
- There is no displacement of families in the scheme.
- The proposed project brings substantial socio-economic development in the region by providing scientific irrigation facility for farmers in the region.
- Secondary impacts are anticipated during the construction phase of the project like water pollution, air pollution, noise pollution, solid waste disposal and other health problems. But, proper mitigation measures are proposed as a part of EMP along with the responsible agency for implementation of the project.
- Bankapura Peacock Conservation Reserve is situated in the command area of the project. Since, the project envisages sprinkler irrigation system by carrying water to the agricultural lands through HDPE pipes, there is no impacts on the reserve by any means. In turn indirectly, the project helps to provide the irrigation facility to the adjacent lands of the Reserve, so that the birds can get sufficient food all the time which exhibits mutualism.
- There are no impacts on the aquatic life/ecology from the proposed project, in turn it will boost the fishing activities due to the diversion weir construction which provides habitats for the same to breed.
- The total cost for implementation of mitigation measures as stated in EMP is ₹68.82 Lakhs during the construction phase, ₹21.82 Lakhs during the first three years of operation phase and ₹50,000 for fourth year onwards for maintenance of green belt.
- Overall, the proposed project doesn't envisage serious impact neither on the physical, biological nor on the social environment. Hence the project requires early Environmental Clearance from MoEF for its implementation, which in turn provides relief to the proposed beneficiaries of the command area region.

7. Environmental Policies and Regulations

The environmental policies and regulations required by the Shiggaon Lift Irrigation Scheme are given in the Table E. 8.

Table E.8 Summary of Requirements of Applicable Environmental Regulations

Regulation	Requirement
1. EIA Notification, 2006	The proposed project envisages the culturable command area of 9,900 ha and whereas the Bankapura Peacock Conservation Reserve is located in the command area of the project. Hence, the project falls under Category "A" as per the EIA Notification 2006 and requires prior environmental clearance from MoEF, Govt. of India. Public Hearing is required for the project as per the notification and as per the awarded TOR.
2. Water (Prevention and Control of Pollution) Act, 1974	CFE from Karnataka State Pollution Control Board (KSPCB) is required for discharging wastewater from labor/construction camps.
3. Air (Prevention and Control of Pollution) Act, 1981	CFE from KSPCB is required for setting up of diesel generators and their emissions during the construction stage.