EXECUTIVE SUMMARY OF

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

ಕರಡು ಪರಿಸರ ಆಘಾತ ಅಂದಾಜೀಕರಣ ವರದಿಯ ಕಾರ್ಯಕಾರಿ ಸಾರಾಂಶ

VENKATESHWARA LIFT IRRIGATION PROJECT

ವೆಂಕಟೇಶ್ವರ ಏತ ನೀರಾವರಿ ಯೋಜನೆ

BAGALKOT DISTRICT, KARNATAKA

ಬಾಗಲಕೋಟೆ ಜಿಲ್ಲೆ, ಕರ್ನಾಟಕ

KARNATAKA NEERAVARI NIGAM LTD

ಕರ್ನಾಟಕ ನೀರಾವರಿ ನಿಗಮ ನಿಯಮಿತ

IRRIGATION NORTH ZONE, CLUB ROAD, BELAGAVI - 590 001 KARNATAKA

ನೀರಾವರಿ ಕೇಂದ್ರ ವಲಯ, ಕ್ಲಬ್ ರಸ್ತೆ, ಬೆಳಗಾವಿ–590 001, ಕರ್ನಾಟಕ

CONSULTANTS

ವರದಿ ಸಿದ್ದಪಡಿಸಿದವರು

ENVIRONMENTAL HEALTH & SAFETY CONSULTANTS PVT LTD

ಮೆ. ಎನ್ವಿರಾನ್‌ಮೆಂಟಲ್ ಹೆಲ್ತ್ ಅಂಡ್ ಸೇಫ್ಟಿ ಕನ್ಸಲ್ಟೆಂಟ್ ಪ್ರೈ.ಲಿ.

13/2, 1ST MAIN ROAD, NEAR FIRE STATION, INDUSTRIAL TOWN,
RAJAJINAGAR,BANGALORE-560 010,

ನಂ. 13/2, ಮೊದಲನೇ ಮುಖ್ಯ ರಸ್ತೆ, ಅಗ್ನಿ ಶಾಮಕ ಠಾಣೆಯ ಹತ್ತಿರ,
ಕೈಗಾರಿಕಾ ನಗರ, ರಾಜಾಜಿನಗರ, ಬೆಂಗಳೂರು – 10

SEPTEMBER 2016

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FOR

VENKATESHWARA LIFT IRRIGATION SCHEME

AT

BAGALKOT DISTRICT, KARNATAKA.

PROJECT BY

THE CHIEF ENGINEER
KARNATAKA NEERAVARI NIGAM LTD
IRRIGATION NORTH ZONE
CLUB ROAD, BELAGAVI - 590 001
KARNATAKA

CONSULTANTS

ENVIRONMENTAL HEALTH & SAFETY CONSULTANTS PVT LTD
 # 13/2, 1ST MAIN ROAD, NEAR FIRE STATION, INDUSTRIAL TOWN,
RAJAJINAGAR,BANGALORE-560 010,
QCI NO. 56 AS PER PROVISIONAL ACCREDITATION REV. 38 FEBRUARY 08, 2016

DOCUMENT NO. EHSC/KNNL/VLIS

SEPTEMBER, 2016

REVISION RECORD

Rev. No	Date	Purpose
EHSC/01	24.09.2016	Issued as Draft EIA Report for Comments and Suggestions
EHSC/02	28.09.2016	Issued as Draft EIA Report for submission to KSPCB for conducting Environmental Public consultation

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1. Introduction

The proposed scheme envisages utilization of 0.75 TMC of water from the Krishna River near Kulahalli Village, Jamakhandi Taluk and lifting the water to South – Western side villages of Jamakhandi taluk and Southern side villages of Mudhol taluk lands and providing irrigation facility to 7,200 ha of land during Khariff season only. SEAC has issued ToR for the project vide its letter No. SEIAA 25 IND 2015 dated 13.10.2015. The project has been accorded administrative approval from Govt., of Karnataka vide order no. WRD 17 EAO 2013 dated 12.02.2015 and the total cost of the project is 174.42 Crores. The said EIA report includes the data on various field studies undertaken by the accredited experts including baseline environmental data collection from the study area during the study period November 2015 to July 2016, in line with the ToRs, anticipated impacts (identified, predicted & evaluated) on different components of the environment, delineating specific Environmental Management Plan (EMP) including Environmental Program along with the budgetary provisions to be undertaken by KNNL stating responsibility of various parallel departments for effective implantation of the same.

2. Project Description

The annual average rainfall in Jamakhandi taluk is 664.70mm and Mudhol taluk is 562mm and they lie in rain – shadow area. The project is benefiting 10 villages of which Jamakhandi (6villages) and Mudhol taluk (4villages) – Kalahalli, Navalagi, Bandaging, Jagadal, Chimmad, Siddapur of Jamakhandi taluk and Mudhol taluk – Mugalkoda, Shirol, Kulahalli and Belagali. The dominant soils in this region are black cotton with low water holding capacity, moderately deep fine texture and heavy black soil with high water holding capacity but poor internal drainage.

Table 1 Salient Features of the project

1	Name of the Scheme	Venkateshwara Lift Irrigation Scheme
2	Name of the river	Krishna
3	Geographical Location of Lift point	Latitude – $16^0$38'10"N Longitude –$78^0$12'50"E
4	Location of the Lift point	Kulahalli village, Jamakhandi taluk, Bagalkot district.
5	Type of project	Irrigation
6	Mode Of Irrigation	Flow Irrigation
6	Estimated cost of the project	Rs. 174.42 Cr
7	Command Area	7,200 Ha
8	No. of villages benefitting	10
9	Allocated water	0.75 TMC
10	Cropping pattern	Kharif (June - October)
11	Irrigation intensity	100%
12	Submergence area	Nil
13	Rehabilitation and Resettlement	Nil
14	Total Land required	28Ha
16	Total forest land required	Nil
16	Power Requirement	4.89 Source – Hubli Electricity Supply Company Limited (HESCOM).

2.1 Need for the project

Proposed command areas Taluks are severely prone to erratic droughts due to lack of south-west monsoons. The drought details from 2001 to 2015 are given below.

Table 2 Drought details project command area Taluks

Taluk	Year 2001 to 2015														
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Jamakhandi															
Mudhol															

Drought causes agriculture a risky venture. Due to which people are constantly translocating to adjoining towns and cities. The people of the region have no other employment opportunities except agriculture and there is potential land bank to grow suitable crops in the region. Hence providing irrigation and stabilizing the agricultural production, provides a much needed relief to the people. It improves the per capita income and standard of living of the people. Further it utilizes the water and land resources and substantially improves GDP contribution from agriculture.

The proposed command area of the project was surrounded by Jamakhandi Branch Canal on the west and Ghataprabha Left Bank Canal on the south. However, due to higher elevation and topographical features, it was impossible to provide irrigation with the existing projects. Hence, proposed project is of utmost important and necessary for the region.

2.2 Water availability

Consequent upon the issue of award of Krishna Water Disputes Tribunal-II (KWDT-II), to utilize the allocated quantum of water in full with proper and efficient utilization, the Govt. of Karnataka has constituted the committee to review the present Master Plan of Krishna basin and prepare the Revised Master Plan to utilize the allocated water to Karnataka by Krishna Water Disputes Tribunal-I and Krishna Water Disputes Tribunal-II.

Accordingly the committee for preparation of Revised Master Plan of Krishna basin has been constituted. This small requirement of 0.75 TMC could be made available to this scheme to mitigate the problem of the farmers in the proposed region. Water utilization for the proposed scheme is within the state allocation of KWDT-1 award for the state of Karnataka.

VLIS is proposed on the upstream of Hipparagi barrage located at a distance of 2.7 Km. he inflow and discharge at Almatti Reservoir from 1983-2008 is given below. The details of the water yield calculations are given below;

Table 3 Water yield calculations for the period from 1983-84 to 2008-09

Sl.No	Year	Inflow at Almatti Reservoir (TMC)
1.	1983-84	611.22
2.	1984-85	362.12
3.	1985-86	301.66
4.	1986-87	273.65
5.	1987-88	109.70
6.	1988-89	583.93
7.	1989-90	297.69
8.	1990-91	569.85
9.	1991-92	767.43
10.	1992-93	404.57
11.	1993-94	682.88
12.	1994-95	1036.16
13.	1995-96	243.23

Sl.No	Year	Inflow at Almatti Reservoir (TMC)
14.	1996-97	411.87
15.	1997-98	723.09
16.	1998-99	457.24
17.	1999-00	585.90
18.	2000-01	209.64
19.	2001-02	212.22
20.	2002-03	204.87
21.	2003-04	149.34
22.	2004-05	515.96
23.	2005-06	1180.10
24.	2006-07	55.93
25.	2007-08	342.19
26.	2008-09	753.16
Average		463.29

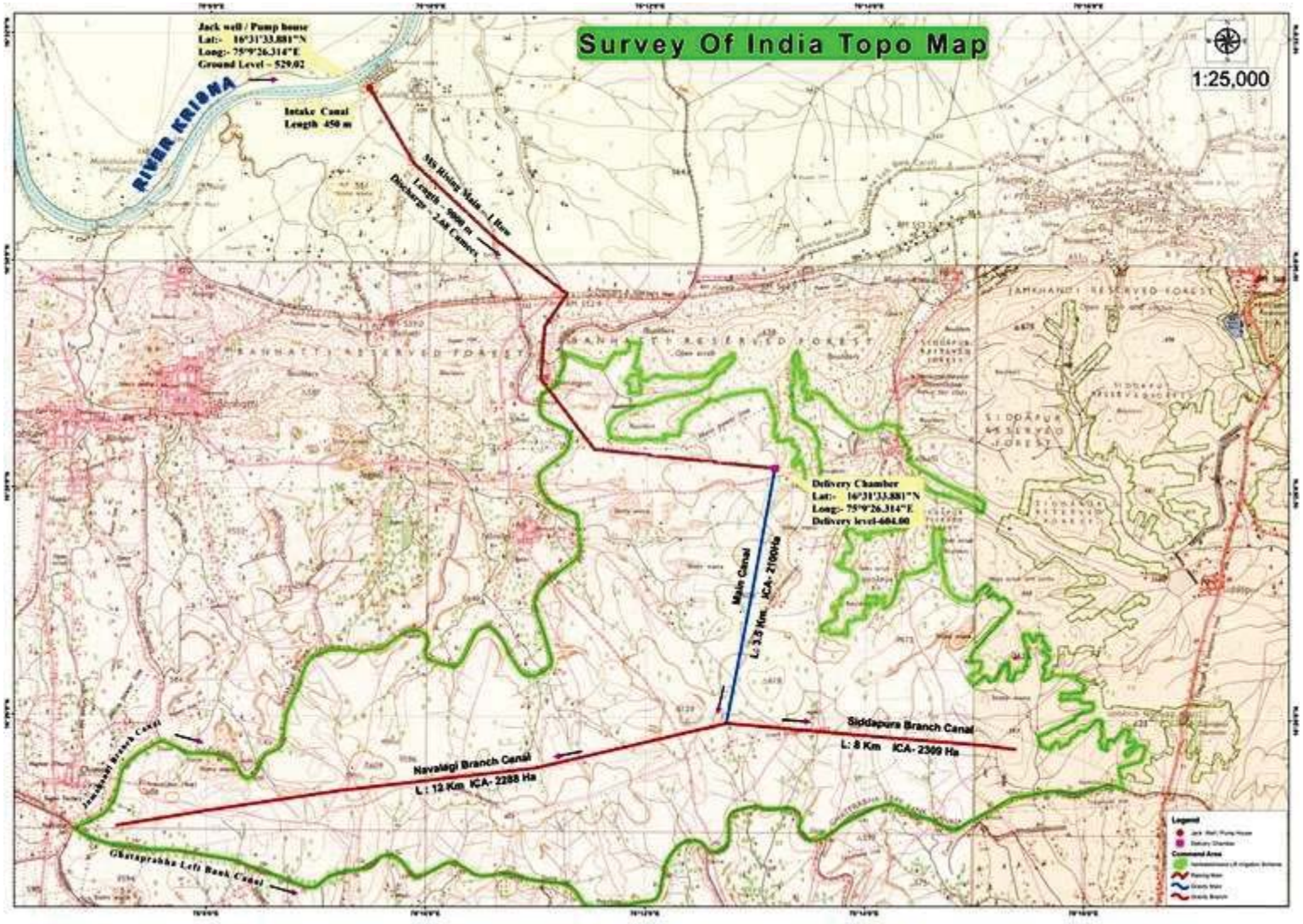

Fig - 1 Location map of the project

2.3 Command area of the project

The command area of 7200 ha is spread across Jamakhandi and Mudhol Taluk of Bagalkot District. 10 villages will be benefitted under this scheme and they are as follows.

Table 4 List of benefitting villages

Sl no.	Benefitting villages	Name of the Taluk	No. of households	Population as per census 2011
1	Kalahalli	Jamakhandi	626	3,441
2	Navalagi		1,498	7,875
3	Bandigani		362	2,140
4	Jagadal		1,389	7,815
5	Chimmad		1,902	10,839
6	Siddapur		1,030	5,058
Total (A)			6,807	37,168
7	Mugalkhod	Mudhol	1,475	8,642
8	Shirol		2,309	12,171
9	Kulali		1,559	8,353
10	Belagali		369	2,048
Total (B)			**5,712**	**31,214**
Grand total (A + B)			**12,519**	**68,382**

Table 5 Irrigation system and distribution network details

Sl.No	Name of the canal	Length of the canal (Km)	Irrigable command area (ha)	Peack discharge required in cumecs
1	Main canal	3.5	2100	0.783
2	Navalagi Canal	12.10	2300	0.857
3	Siddapura canal	8.0	2800	1.044
Total		**23.6**	**7200**	**2.684**

2.4 Irrigation Planning and structural components of the project

An intake channel (450 m) is proposed to lift the water from Krishna River. A jack well cum pump house will be constructed to pump the water to the Delivery chambers through a MS rising main of 9Km length (1.3 m dia). The RL of delivery chamber is kept at RL 604m. The distribution network comprises Main Canal taking off from Delivery Chamber at RL. 602.00m. the technical details of the project are given below;

Table 6 Details of zones in command area

A. Lift Location	
Name of the river	Krishna
Lift Point	Near Kulahalli Village, Jamakhandi Taluk, Bagalkot District
Ground Level	RL 518.00 m
CBL	514.50 m
Delivery Level	604.00 m
B. Intake Canal	
Length	450 m
Bed width	1.5 m
Side slope	1:01
Free board	0.6 m
C. Jackwell cum pump house	
No. of Pumps	3 + 1 standby

Total Power Requirement	4.89 MW (6560 HP)
Source	HESCOM
D. Rising Main	
Length	9.0 Km
Diameter	1.3 m
Material	Mild Steel (MS)
E. Delivery Chambers	
RL of DC-1	604.00 m
Length	11.0m
F. Canals	
1.Main canal	
Ground level	606.00
Length	3500m
Irrigating area	2100 ha
2.Navalagi Canal	
Ground Level	605.00
Length	12000m
Irrigating area	2300m
3.Siddapur Canal	
Ground level	605.00
Length	8000m
Irrigating area	2800ha

2.5 Land Requirement

The proposed project requires 28 Ha for implementation of the project. The land required is only for construction of Jack well cum pump house, Intake canal and Delivery chambers. No forest land is required for the project. The required land will be acquired as per the Right to Fair Compensation and Transparency in Land Acquisition Act, 2015.

2.6 Existing cropping pattern details

The present agricultural practices including the crops grown are tuned to the rainfall regime. The crops grown are Khariff crops only which are as under. The estimated percentage area of these crops and their corresponding yields are given below;

Table 7 Existing cropping pattern in the command area

Sl. No.	Crops	Intensity	Crop Area (Ha)
1	Local Jowar	1.00%	50.40
2	Hy. Maize	21.00%	1058.40
3	Bajra	1.00%	50.40
4	Ground nut	23.00%	1159.20
5	Jowar	21.00%	1058.40
6	Vegetables	13.00%	655.20
7	Sunflower	20.00%	1008.0
	Total	100.00%	5040.00

2.7 Proposed cropping pattern details

In view of introducing flow Irrigation system in the entire command area of 7200 ha, the following cropping pattern (for Khariff Season) is proposed.

Table 8 Proposed cropping pattern

Sl. No.	Crops	Intensity	Crop area (ha)
1	Local Jowar	1.00%	72.0
2	Hybrid Maize	21.00%	1512.0
3	Bajra	1.00%	72.0
4	Groundnut	23.00%	1656.0
5	Hybrid Jowar	21.00%	1512.0
6	Vegetables	13.00%	936.0
7	Sunflower	20.00%	1440.0
Total		**100.00%**	**7200.00**

3. Description of baseline environment

Collecting the baseline environmental status of the project area helps to ascertain the magnitude of impacts that are likely to be caused due to the proposed project on different environmental components. It also helps to identify critical environmental attributes required to be monitored during and after the proposed development. To assess the baseline environmental status, command area, 10 Km radius from the main project components were considered and the data was collected during the period Post Monsoon (November 2015 – January 2016), Pre – Monsoon (February 2016 – April -2016) and Monsoon (May 2016 – July 2016). In addition to the baseline environmental monitoring, field inspection in the study area, collection of secondary information for all the environmental components and discussions with the officials and local public were conducted by the experts to establish realistic information on the area w.r.t the project.

3.1 Physical Environment

3.1.1 Climate & Meteorology

Air borne pollutants is dispersed by atmospheric motion. Knowledge of these motions, which range in scale from turbulent diffusion to long-range transport by weather systems, is essential to simulate such dispersion and quality of impacts of air pollution on the environment. The purpose of EIA is to determine whether concentrations are likely to encounter at fixed locations (Know as the receptor), due to the given sources (locations and rates of emission known) under idealized atmospheric conditions.

Secondary meteorological data is obtained from IMD for Bagalkot, from where the meteorological data (Temperature, Relative Humidity, Rainfall, Wind speed and Wind direction etc.) were collected.

3.1.2 Ambient air quality

Ambient air quality was monitored at 2 stations for PM_{10}, $PM_{2.5}$, SO_2 and NO_2 parameters in the study area viz., during the Post Monsoon (November 2015 – January 2016), Pre – Monsoon (February 2016 – April -2016) and Monsoon (May 2016 – July 2016). AAQM was carried out on 24hrly basis on weekly twice mode continuously for one single month in each season viz., Post Monsoon, Pre Monsoon and Monsoon. The results of ambient air quality reveal that, PM_{10} was in the range between 60 – 69 $\mu g/m^3$ and whereas $PM_{2.5}$ was in the range between 21 – 28 $\mu g/m^3$. SO_2 and NO_2 are in the range between 2.51 – 9.7 $\mu g/m^3$ and 8.2 – 13.89 $\mu g/m^3$ respectively, which are well within the NAAQ standards and found to be good and satisfactory.

3.1.3 Ambient Noise levels

The results of ambient noise levels were compared with Residential standards and results reveal that, the noise levels in the study area ranging from 48.05 – 51.6dB(A) for day time and 36.06 – 41.77dB(A) for night time during Post - monsoon season. The

noise levels during Pre-Monsoon season is ranging between 47.5 – 48.2d(B)A for day time, 36.2 – 37.4 d(B)A for night time and 49.57 – 50.36 dB(A) for day and 36.7 – 37.4 d(B)A for night time during Monsoon season. Overall, the noise levels in all the seasons were observed to be well within the CPCB standards.

3.1.4 Geology and Minerals

The main rock formations in the study area and the geological succession are

- Quaternary - Recent Alluvial deposits - Unconformity
- Algonkian - Dolerite dykes, pegmatite and quartz veins- Unconformity
- Precambrian - Clospet granites, limestone, phyllites, Mica Hornblende, quartzite and basic igneous rocks of Dharwar system
- Archaean - Peninsular gneiss, amphibolites etc.

3.1.5 Soil characteristics

Major occupation of Mudhol and Jamakhandi taluk of Bagalkot district in Karnataka is agriculture. Farming in these areas are basically rain fed and farming is a dependent on the management of soils, crops, animals; use of package of practices, farm techniques, farm machinery and agricultural implements, marketing, human resources in a systematic way. To meet the burgeoning population's food security, it is planned to increase food production with an estimated average of 4 tons per hectare from the present 1.5 tons per hectare. Due to the great dependence and pressure on land and water resources, obviously, there will be an effect on soil quality and crop productivity. As per some estimates, the soils have been degrading at the rate of one million a hectare per year and. 57% of geographical area is affected by various forms of degradation viz., water and wind erosion, physical and chemical deterioration (NBSS & LUP 2014). The state department of Agriculture has estimated that about 10% of irrigated (1.27 lakh ha) command area are affected by problems such as water logging, salinity and alkalinity (Dep. of Agriculture, 1985). Similarly a depletion of ground water levels has also been noticed at an alarming rate in recent times through the rapid depletion of the ground water resources. In this context, it is a great challenge to the scientific community, to evolve and develop appropriate strategies, to increase food production on a sustainable basis.

Table 9 Nutrient index in command area

Sl No	Parameter	Nutrient index	Remarks
1	Organic carbon (OC)	3.0	High
2	Available phosphorus (P)	1.077	Low
3	Available potassium (K)	0.88	Low

3.1.6 Hydrology

Bagalkot district is drained by the river Krishna and its tributaries Ghatprabha and Malaprabha. All these rivers enter district on the western side and flow in an easterly direction to join the Bay of Bengal. Krishna River enters the district at Terdal village in Jamakhandi taluk and flows in south-easterly direction and forms the northern boundary of the district separating it from Bijapur district. The Ghataprabha River flows in the middle part of the district and joins the Krishna in Chikkasangama village in Bilgi taluk. The Malaprabha flowing in the southern part joins the Krishna at Kudal Sangama in Hungund Taluk. The Ghataprabha and Malaprabha canal systems serve the western parts of the district. The Dam across the Krishna River at Almatti and the canal systems serve the eastern parts. Rainfalls being as low as 560 mm annually, these canals are the lifelines, providing much needed irrigation and drinking water to the district.

3.1.7 Surface Water

The baseline status of water quality in the study area was established. Water samples were collected from 4 locations (1 No. of surface water & 3 No. of ground water) in the study area during Post – Monsoon season (Nov 2015 – Jan 2016), Pre – Monsoon (Feb 2016 – April 2016) and Monsoon (May 2016 – July 2016).

During Post Monsoon season, the Physico-chemical parameters for Krishna River (lift point) were within the standards. Total Hardness was observed to be 200 mg/L. Dissolved oxygen was observed to be 8.1mg/L. Suspended solids was 18mg/L, Total Coliform was found to be 1CFU/100mL, Fluoride was found to be 0.08 mg/L and E. coli was nil in the study area.

In Pre – Monsoon season, Suspended solids at the locations was found to be 30 mg/L. Dissolved oxygen was observed to be 6.4 mg/L, total hardness was observed to be 440mg/L, Total Coliform was found to be 1CFU/100 mL and E. coli were nil in the study area.

Suspended solids was found to be 31mg/L, Dissolved oxygen near lift point was observed to be 7.5 mg/L. Fluoride was found to be 0.49mg/L, Total Coliform was found to be 2 CFU/100 mL and E. coli was nil in Monsoon season.

3.1.8 Ground Water

During Post – Monsoon season, Total Hardness in ground water was ranging from 108 - 504 mg/L, whereas Fluoride ranged between 0.23 – 0.42mg/L, total Coliform was 1CFU/100mL and E.coli was absent in all three sampling locations.

The ground water quality analysis results reveal that, the Total Hardness was found in the range of 240 - 430 mg/L. Fluoride levels are ranging between 0.38 – 0.64 mg/L and E.coli was absent in all three sampling locations during Pre – Monsoon.

During Monsoon, the Total Hardness ranged between 120 – 450 mg/L, fluoride ranged between 0.23 – 0.71mg/L. Overall the values were found to be within standards.

3.2 Biological Environment

3.2.1 Flora

A total of 57 species of trees, 23 species of shrubs, 46 species of herbs and 35 species of grasses found in the study area. All the species observed / recorded are common and no rare, endangered and threatened species found in the region.

Among 12 species recorded, *Azadirachta indica* found abundant compared to other species due to its close contact with black cotton soil and can withstand maximum temperatures. *Acacia nilotica* restricted to bunds of agricultural lands and river banks. The other species recorded in the quadrates are *Eucalyptus hybrid, Cocos nucifera, Tectona grandis, Tamarindus indica, Albizzia lebbeck and Pongamia pinnata*. Overall, the Shannon wiener diversity indices indicating lesser diversity of species in the study area.

Table 10 List of commonly found tree species in the study area

Sl.No	Common Name	Botanical Name	Status as per Red data book	IUCN Status 2015-4
1	Karijali	*Acacia nilotica#*	Common	Common
2	Kaggali	*Acacia catechu#*	Common	Common
3	Banni	*Acacia ferruginea#*	Common	Common
4	Anagobli	*Acacia latronum#*	Common	Common
5	Bilijali	*Acacia leucophloea**	Common	Common

Sl.No	Common Name	Botanical Name	Status as per Red data book	IUCN Status 2015-4
6	Heddi	*Adina cordifolia**	Common	Common
7	Bilpatre	*Aegle marmelos#*	Common	Common
8	Hebbevu	*Ailanthus excelsa#*	Common	Common
9	Sujjulu	*Albizia amara**	Common	Common
10	Bage	*Albizia lebbeck#*	Common	Common
11	Dindaga	*Anogeissus latifolia**	Common	Common
12	Halasu	*Artocarpus integrifolia#*	Common	Common
13	Bevu	*Azadirachta indica#*	Common	Common
14	Kaduhippe	*Madhuca indica#*	Common	Common
15	Basavanapada	*Bauhinia racemosa#*	Common	Common
16	Burga	*Bombax ceiba#*	Common	Common
17	Mulgojjalu	*Bridelia retusa#*	Common	Common
18	Murkalu	*Buchanania lanzan**	Common	Common
19	Muthaga	*Butea monosperma#*	Common	Common
20	Kakke	*Cassia fistula#*	Common	Common
21	Huruglu	*Chloroxylon swietenia*	Common	Vulnerable
22	Sissoo	*Dalbergia sissoo#*	Common	Common
23	Bettakanagalu	*Dillenia indica#*	Common	Common
24	Thupra	*Diospyros melanoxylon**	Common	Common
25	Neelagiri	*Eucolyptus tereticornis#*	Common	Common
26	Bela	*Feronia elephantum#*	Common	Common
27	Ala	*Ficus bengalensis#*	Common	Common
28	Basari	*Ficus glomerara#*	Common	Common
29	Arali	*Ficus religiosa#*	Common	Common
30	Shivane	*Gmelina arborea**	Common	Common
31	Thapsi	*Holoptelea integrifolia#*	Common	Common
32	Mavu	*Mangifera indica#*	Common	Common
33	Sampige	*Michelia champaca#*	Common	Common
34	Akash Mallige	*Millingtonia hortensis#*	Common	Common
35	Karibevu	*Murraya koenigii#*	Common	Common
36	Honge	*Pongamia pinnata#*	Common	Common
37	Kare	*Randia deumetorum#*	Common	Common
38	Geru	*Semecarpus anacardium#*	Common	Common
39	Nerale	*Syzygium cumini#*	Common	Common
40	Hunase	*Tamarindus indica#*	Common	Common
41	Saguvani	*Tectona grandis#*	Common	Common
42	Alale	*Terminalia chebula#*	Common	Common
43	Hale	*Wrightia tinctoria#*	Common	Common
44	Gojjaga	*Caesalpinia bonducella#*	Common	Common
45	Srigandha	*Santalum album#*	Common	Vulnerable
46	Gobbarada gida	*Gliricidia sepium#*	Common	Common
47	Subabul	*Leucaena leucocephala#*	Common	Common
48	Thengu	*Cocos nucifera#*	Common	Common
49	Adake	*Areca catechu#*	Common	Common
50	Nelli kai	*Emblica officinalis#*	Common	Common
51	Copper pod	*Peltophorum pterocarpum#*	Common	Common
52	Sihihunase	*Pithecellobium dulce#*	Common	Common
53	Echalu	*Phoenix sylvestris#*	Common	Common
54	Gulmohar	*Delonox regia#*	Common	Common

Sl.No	Common Name	Botanical Name	Status as per Red data book	IUCN Status 2015-4
55	Gasagase	*Muntingia calabura#*	Common	Common
56	Bugari mara	*Thespesia populnea#*	Common	Common
57	Nimbe	*Citrus indica#*	Common	Common
58	Shivalinga pushpa	*Couorupita guianensis#*	Common	Common
59	Rain tree	*Samanea saman#*	Common	Common
60	Jacaranda	*Jacaranda mimosifolia#*	Common	Common
61	Papaya	*Carica papaya#*	Common	Common
62	Sapota	*Manilkara zapota#*	Common	Common
63	Hebbevu	*Melia dubia#*	Common	Common

Source: IUCN/Red data books: Karnataka Forest Department and Botanical Survey of India.

3.2.2 Fauna

The study area has poor diversity of wild animals. 10 species of mammals found in the region and are common to the region. The avian diversity is fairly good and 34 species of birds recorded in the region. Of which, Indian peafowl (Pavo cristatus), Black kite (*Milvus migrans)* belongs to Schedule-I category and remaining species belongs to Schedule -IV of the Wildlife (Protection) Act, 1972. 16. Species of butterflies found in the study area and all are common to the region. No rare, endangered and threatened species found in the region.

3.3 Aquatic Ecology

The plankton population in lotic water bodies such as rivers and hill streams depends on prevailing conditions, seasons and incidence of discharge of water when precipitation occurs in the catchment area. The plankton of the Krishna River, inherently, is 'poor' in representation and is subjected to constant changes (Poor- rich - Poor). As the species and values indicate, Zooplankton dominated over phytoplankton by both numbers and percentage (Annexure-8).

The plankton biomass is in moderate concentration with standing crop varying between 0.4 and 0.2 ml/ 100 lts. Total plankton count accounted was at 822 and 441 u/l. Numerically, Zooplankton dominated over Phytoplankton

The Phytoplankton representative, on the basis of taxonomic criteria, represented by Blue-green Algae- Myxophyceae (Anacystis cyanes and Oscillatoria princeps): Algae-Chlorophyceae (Volvox aureus, Cosmarium granatum, Ulothrix zonata) and Bacillariophycear (Navicula radiosa).

The zooplankton is represented by Protozoa (Arcella mitrata), Rotifers (Brachionus calcyflorus, Keratella tropics, Filinia longiseta), Cladocera Daphnia magna, Bosmina longirostris and Cypris subglobosa) and Copepoda (Cyclope and nauplius). The Miscellaneous group was represented by vegetative parts only.

4. Anticipated Environmental Impacts & Mitigation Measures

Due to the activities of the project, there will be potential impacts on the environment of varying magnitude. Most of the impacts are likely to occur during the construction phase of the project. The following sections reveal the impacts due to the project on the physical, biological and social environment. Impacts have been assessed based on the information collected from the screening and feasibility study reports, field surveys and additional secondary data collected as part of the study. The majority of the impacts are confined only during the construction stage.

4.1 Ambient Air Quality

The construction of the project is expected to last approximately in 24 months. The initial site clearing will be followed by site preparation activities

Sources of air pollution

- Pollution due to fuel combustion in equipments: The operation of construction equipments requires combustion fuel. Normally, diesel is used for such equipments. The major pollutant which gets emitted as a result of combustion of diesel is SO2.
- Dust pollution: The operation of the trucks carrying construction materials to the site, batching plants during the construction phase is likely to generate fugitive emissions, which can move even up to 100 m in predominant wind direction.
- Emissions due to usage of firewood for cooking at labor camps.
- Due to operation of DG sets and excavation, laborers are prone to health problems.

The following mitigation measures will be followed to control potential emissions of fugitive dust during construction of the project:

- Unpaved roads and disturbed areas in the project construction site are watered as frequently as necessary to prevent fugitive dust plumes. The frequency of watering are reduced or eliminated during periods of precipitation.
- Construction equipment vehicle tires inspected and washed as necessary to be cleaned free of dirt prior to entering paved roadways.
- Vehicles used to transport solid bulk material on public roadways and having the potential to cause visible emissions provided with a cover, or the materials sufficiently wetted and loaded onto the trucks in a manner to provide at least one foot of freeboard.
- Vehicles delivering loose and fine materials like sand and fine aggregates covered by tarpaulin sheets to reduce spills on roads and to reduce fugitive emissions.

4.2 Ambient Noise Level

During construction phase, various sources of noise pollution arise due to operation of machineries like concrete plant, cranes, batch plants, material lifting operations, communication noise, including DG sets etc., Other source of noise pollution includes movement of vehicles for unloading of construction materials, fabrication, handling of equipments. Construction activities are expected to produce noise levels in the range of 80 – 95 dB (A).

- PPEs such as, ear plugs and ear muffs will be provided to the workers.

- Periodic maintenance and servicing of construction equipments/ vehicles.
- Acoustic enclosures will be provided for DG sets
- Construction activities shall be restricted only to day time and there should not be any construction during evening and night hours to avoid the psychological effects on surrounding population and biota.

4.3 Water Environment

The quality of water resources both surface and ground water may also deteriorate if solid waste management practices are not adopted in the labour camps of the project during peak construction phase.

Improper treatment of sewage from labor camps leads to infiltration into the subsurface soil and finally affects the ground water of the region. This will create unaesthetic conditions in the site, attracts mosquitoes/flies, thereby chances of deteriorating the health of the workers in unhygienic conditions. Improper disposal of construction debris, used oil, diesel for DG sets, etc will result in ground water contamination and in turn affecting drainage of the area.

The mitigation measures include;

- The sewage generated from the labour camps shall be treated in the Septic Tank and Soak Pits designed and constructed as per IS 2470 Part-I & Part-II.
- There will be no open discharge of sewage from labour camps and the labour camps will be provided with sufficient bathrooms and toilets. Periodical health check-ups for labors will be done.
- Construction debris will be reused at site, used oil generated from the DG sets will be stored separately and handed over to KSPCB authorized recyclers.
- During construction of intake canal, the river course and the point of contact of intake canal will be provided with sand bags

4.4 Biological Environment

- During construction, due to the fugitive dust, photosynthetic activity would be reduced and leads of wilting of plants.
- Use of river water for domestic needs by labors will bear riverine water pollution and affects aquatic biota.
- Use of fire wood for labor camps results in cutting of trees.
- Construction equipment / vehicles washing leads to oil spillages into river and leads to reduction in dissolved oxygen levels.
- Improper disposal of construction materials and domestic wastes leads eutrophication.
- Mitigation measures:
- Periodical water sprinkling in and around the construction areas including access roads to avoid fugitive dust generation.
- Labor camps shall be located 1 Km away from the river course and imposing restrictions for not using the river water for domestic purpose.
- Labors camps shall be provided with LPG facilities.
- Construction equipment / vehicles washing shall be undertaken at authorized service stations.

- Security personnel near river course and sign boards will be erected to educate the labors.

4.6 Evaluation Impacts

Matrix method was used to identify interactions between various project activities and environmental parameters and components. Later, a weightage of 1-10 shall be given to the impacts based on the significance of the impacts. The impacts are quantified 'with' and 'without' EMP. The criteria adopted for weightage are given below;

Table 11 Criteria for evaluation of impacts

Sl.No	Criteria	Score
1	Minor impact	1-2
2	Medium impact	3-4
3	Significant impact	5-8
4	Major impact	9-10

Table 12 Evaluation of Impacts

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative	Without EMP	With EMP
A. Construction Phase													
1.Impacts on Land Environment													
1	Land	Construction of canal network, jack well cum pump house, raising main, canal, etc.	M	✓			✓	✓			✓		
		Vehicular movement	M	✓			✓	✓			✓		
2	Change in Topography	Construction of canal network, jack well cum pump house, raising main, canal, etc.	M	-	✓	✓	-	✓			✓		
3	Loss of Productive Soil	Construction site, temporary offices, workers camps, stockyards	M	✓			✓		✓		✓		
		Construction of Haul roads	L	✓			✓	✓			✓		
4	Compaction of Soil	Site Clearance	L	✓			✓	✓			✓		
		Movement of vehicles	L	✓			✓	✓			✓		
5	Contamination of Soil	Machinery and operation of the Diesel Generator Sets	M		✓		✓		✓		✓		
		labor camps	H	✓			✓		✓		✓		
2. Impacts on Water Environment													
1	Eutrophication	Sewage from labor camp	H	✓			✓	✓			✓		
		Muck disposal	H	✓			✓	✓			✓		
2	Change in River Water	Construction of canal network, jack well cum	M	✓			✓		✓		✓		

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative	Without EMP	With EMP
	Quality	pump house, raising main, canal, etc.											
		Diversion of river water	H		✓	✓		✓		✓			
		Decomposition of sediments and deposition of organic matter	M	✓			✓	✓			✓		
		Washing of equipments	L	✓			✓	✓			✓		
		Muck disposal	M	✓			✓	✓			✓		
3	Change in surface and ground water quality	Sewage from labor camp	H	✓			✓		✓		✓		
3. Impacts on Air Environment													
1	Increase in dust concentration	Construction equipments, operation of DG sets,	M	✓			✓	✓			✓		
		Excavation	H	✓			✓	✓			✓		
2	Fugitive Emissions from various sources	Vehicular movement	H	✓			✓	✓			✓		
		Loading and dislodging Use of sand, fine aggregates	M	✓			✓	✓			✓		
		Batching plant	M	✓			✓	✓			✓		
3	Increase in SO_2, PM, NO_x	Vehicular movement	M	✓			✓	✓			✓		
		Operation of DG sets	M	✓			✓	✓			✓		
		Fuel Combustion in equipments and Vehicles	M	✓			✓	✓			✓		
		Burning of fuels from construction workers	M	✓			✓	✓			✓		
4	Impact on Human Health	Emission of Dust particles	M	✓			✓	✓			✓		

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative	Without EMP	With EMP
4. Impact on Noise Environment													
1	Increase Noise Level	movement of vehicles	M	✓			✓	✓			✓		
		Operation of D.G sets	L	✓			✓	✓			✓		
		Movement of vehicles carrying raw materials	M	✓			✓	✓			✓		
5. Impact on Biological Environment													
1	Pressure on existing natural resources	Immigration of labor population	L		✓	✓		✓			✓		
2	Reduced Photosynthetic activity, Wilting of plants	Transportation of construction materials	M		✓		✓		✓		✓		
		Site Clearance	M		✓	✓		✓			✓		
3.	Impacts on Fishes and Aquatic Ecosystem	Increase in turbidity of water due to Washing of machineries	M	✓			✓	✓			✓		
		Sewage from labor camp	H	✓			✓	✓			✓		
6. Impact on Socio-economic Environment													
1	Land acquisition	Affecting livelihood	H		✓	✓		✓			✓		
2	Impact on Human Health	Due to water/air borne diseases, traffic movement	H	✓			✓		✓		✓		
B. Operation Phase													
1	Impacts on Land Environment	Application of natural fertilizers and pesticides	H		✓	✓		✓		✓			
2	Impact on water	Application of fertilizers and pesticides	M		✓	✓			✓	✓			

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative	Without EMP	With EMP
	environment												

5. Analysis of Alternatives

The Proposed Command area villages are deprived of irrigation facilities from existing Ghataprabha Left Bank Canal (GLBC) and also by Jamakhandi Branch Canal, hence it is proposed to irrigate this area by a new LIS which is the only alternative. Thus, Venkateshwara Lift Irrigation Scheme is conceived to irrigate the left out areas of Jamakhandi and Mudhol taluk of Bagalkot district.

6. Environmental Monitoring Program

The purpose of the monitoring programme is to ensure that the objectives of the project is achieved through the mitigation measures and result in desired benefits to environment and local population of the region.

Table 13 Environmental Monitoring Plan (2 years)

Environmental Parameters	Parameters to be Monitored	Frequency of Monitoring	Locations	Responsibility	Estimated Cost in Rs.
Surface water quality of Krishna river	pH, Temperature, EC, TDS Alkalinity, TH, DO, BOD, COD, NO_3, PO_4, Cl, SO_4, Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Fortnightly once until completion of Intake canal	Near lift point (1 No.)	Contractors or agencies appointed by KNNL	24,000/-
Ground water quality	pH, Temperature, EC, TDS Alkalinity, TH,NO_3, PO_4, Cl, SO_4, Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Once in a month	Bandigani Jagadal (2 Nos.)	Contractors or agencies appointed by KNNL	1,20,000/-
Soil Quality	pH, EC, Mg, Ca, Alkalinity, Cl, Na, K, Organic Carbon, K, PO_4, SAR, N and Salinity	Once in a month	Kulali Navalagi Siddapur (3 No.)	Contractors or agencies appointed by KNNL	2,16,000/-
Air Quality	PM_{10}, $PM_{2.5}$, NO2 and SO_2	Monthly	Bandigani Shirol (2 Nos.)	Contractors or agencies appointed by KNNL	2,88,000/-
Noise Levels	Leq Day, Leq Night in dB(A)	Monthly once until completion of construction works	Bandigani Shirol (2 Nos.)	Contractors or agencies appointed by KNNL	48,000/-
Aquatic life	Limnological and biological studies	Six monthly once until completion	Near intake canal (1 No.)	Contractors or agencies appointed by KNNL	1,50,000/-
Health check ups	Spirometry, Pulse Oxymetry, Blood Test, Lung Function Test, Eye test, Physical fitness tests	Six monthly once until completion	Labor camp (1 No.)	Contractors or Doctors / PHC appointed by KNNL	4,00,000/-
				Total	**12,46,000/-**

Table 14 Environmental Monitoring Program for Operation phase (3 years)

Environmental Parameters	Parameters to be Monitored	Frequency of Monitoring	Locations	Responsibility	Estimated Cost in Rs.
Surface water quality of Krishna river	pH, Temperature, EC, TDS Alkalinity, TH, DO, BOD, COD, NO_3, PO_4, Cl, SO_4, Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Quarterly once for 3 years	Near lift point (1 No.)	Agencies appointed by KNNL	90,000/-
Ground water quality	pH, Temperature, EC, TDS Alkalinity, TH,NO_3, PO_4, Cl, SO_4, Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Quarterly once for 3 years	Bandigani Jagadal (2 Nos.)	Agencies appointed by KNNL	60,000/-
Soil Quality	pH, EC, Mg, Ca, Alkalinity, Cl, Na, K, Organic Carbon, K, PO_4, SAR, N and Salinity	Quarterly once for 3 years	Kulali Navalagi Siddapur (3 No.)	Agencies appointed by KNNL	1,08,000/-
Aquatic life	Limnological and biological studies	Yearly once for 3 years	Near intake canal (1 No.)	Agencies appointed by KNNL	3,00,000
				Total	**5,58,000**

7. Social Impact Assessment

Venkateshwara Lift Irrigation Scheme is proposed to irrigate an area of 7,200Ha by lifting 0.75 T.M.C of water from Krishna River during Khariff season. The project aims at providing irrigation facility to 10 villages of Jamakhandi and Mudhol Taluk. Benefiting villages include Kalahalli, Navalagi, Bandigani, Jagadal, Chimmad, Siddapur of Jamakhandi taluk and Mugalkhod, Shirol, Kulahalli and Belagali of Mudhol taluk.

7.1 Demographic profile of the villages

The total population of the six impacted villages is 35986 out of which 18105 is male and 17881 is female.

Table 15 Population and sex ratio of the project impacted villages

Impacted villages	District	Taluk	Population	Male	Female
Bandigani	Bagalkot	Jamakhandi	2140	1104	1036
Kulhalli	Bagalkot	Jamakhandi	8353	4269	4084
Navalgi	Bagalkot	Jamakhandi	7875	3924	3951
Kalhalli	Bagalkot	Jamakhandi	3441	1720	1721
Chimmad	Bagalkot	Jamakhandi	10839	5426	5413
Yallatti	Bagalkot	Jamakhandi	3338	1662	1676
		Total	**35986**	**18105**	**17881**

The Project Influence area covers ten villages viz., Kalahalli, Navalagi, Bandigani, Jagadal, Chimmad, Siddapur of Jamakhandi taluk and Mugalkodh, Shirol, Kulahlli and Belagali of Mudhol taluk in Karnataka State.

7.2 Impact of the project

During the project construction phase and operation-management phase additional employment will be generated.

The only negative impact is that 28 Ha of agricultural land spreading across 10 villages will be lost for the project construction purposes and they will be sufficiently compensated as per rules. Since no residential or commercial properties affected, there is no need for any displacement and hence resettlement /rehabilitation is not involved.

Villagers have some additional demands for construction of linking roads, sanitation facilities etc which will also be duly attended by the Govt., especially since this backward villages are in the hit list for the developmental interventions.

So overall impact of the project is positive which will bring long term development/ growth in the development map of these villages.

8. Project Benefits

- The VLIS is proposed to provide economically viable and socially acceptable irrigation practices for the command area. Irrigation is important to the health of the agricultural industry. Improving the viability of individual farming and increasing the efficiency and economic stability of the command area taluks and also contributing to the economic and social objectives of the Karnataka State are the expected outcomes of the proposed scheme. Some of the important project benefits are given below:
- Agricultural linkages will be considerably improved.
- The project improves total farm output and hence raises farm income.

- Project improves yields through reduced crop loss due to erratic, unreliable or insufficient rainfall. The details before and after the advent of irrigation is given below.
- Extensive agricultural production supplies raw materials to the nearby small scale industries thereby increasing the economy in the region.
- Increased benefits from flood control, soil erosion, etc
- Altogether, population of 68382 belonging to command area will be benefitted directly under the scheme.
- Employment opportunities for 150 members, 25 technical staff and 125 construction labourers. Further, indirectly labor opportunities will be substantially improved since irrigation facility is made available.
- It improves fodder crops and in turn dairy farming in the command area.
- The project requires only 28 Ha for implementation of the scheme and does not envisage rehabilitation and resettlement.
- No tree cutting involved and no forest land required for implementation of the scheme.
- Agro forestry shall be taken up in command area and it improves the ecosystem services.

9. Environmental Management Plan

Although agriculture is usually associated with its positive impacts on human life, irrigation practices may be associated with impacts on environmental conditions, which may eventually curtail the sustainability of irrigation projects. For this reason, Environmental Impact Assessment (EIA) has been recognized as an integral part of the early planning studies of irrigation projects in order to identify any expected negative impacts and suggest the necessary mitigation plans to curb these impacts through formation of Environmental Management Plan (EMP).

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitroing Agency	Time frame
A. Construction Phase						
1. Air Environment						
Fuel combustion from construction equipments	Emission of pollutants (PM, SO_2)	High speed Diesel with low sulphur content will be used for the construction equipments/ vehicles which has low ash content	Reduction in pollutants level	Intake canal, jack well cum pump house	Contractor & KNNL	Thorough out the construction period (24 months)
Vehicular movement and operation of batching plants	Dust pollution	Water sprinkling and vehicles should be covered with tarpaulin, speed limit restrictions	Reduction in fugitive emissions	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Water sprinkling – 3 times/day
Burning of fire wood	Emission of pollutants (C, SO_2)	Labor camps supplied with LPG facility	Reduction in emission levels	Labor camp	Contractor & KNNL	Thorough out the construction period (24 months)

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitroing Agency	Time frame
Operation of DG sets, excavation	Health problems to labors	Usage of Nose masks	Healthy working environment	Intake canal, jack well cum pump house, access roads, around construction site,	Contractor & KNNL	Thorough out the construction period (24 months)
2. Noise Environment						
Operation of DG sets and usage of construction equipments	Increase is noise levels	PPEs such as, ear plugs and ear muffs will be provided to the workers, Acoustic enclosures for DG sets	Reduction in noise levels	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
Vehicular Movement	Increase is noise levels	Construction activities shall be restricted only to day time	Reduction in noise levels	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
3. Water Environment						
Sewage from labor camps	Surface and ground water pollution	Treatment through septic tank and soak pit	Reduction in pollution load	Labor camps	Contractor & KNNL	Thorough out the construction period (24 months)
Stagnation of water	Mosquito breeding grounds	Providing proper sanitary facilities	Healthy environment	Labor camps	Contractor & KNNL	Thorough out the construction period (24 months)
Excavation and operation of DG sets	Muck generation, blockage of natural drains and	Reuse of muck at site, disposal of used oil KSPCB authorized preprocessors	Reduction in surface and ground water contamination	Intake canal, jack well cum pump house, disnets	Contractor & KNNL	Thorough out the construction period (24 months)

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitroing Agency	Time frame
	contamination of ground water					
Construction of intake canal	Increase in turbidity levels in river	Provision of sand bags	Healthy aquatic ecosystem	Intake canal	Contractor & KNNL	4 Months
4. Soil Environment						
Construction of labor camps, stock yards	Loss of fertile soil	Waste land will be used for erection of labor camps	Land resource optimization	Waste land	Contractor & KNNL	Thorough out the construction period (24 months)
Mantainance of DG sets and construction machineries	Soil contamination	Maintenance at service centres	Reduction in soil contamination	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
5. Solid and Hazardous waste Environment						
Excavation	Change in hydraulic regime	Reuse of excavated earth	Natural drainage pattern maintained	Intake canal, jack well cum pump house, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
Improper dumping of solid waste from labor camps	Water pollution	Labor camps at 1 km away from river, Disposal to Municipal Authorities	Reduction in siltation and eutrophication	Intake canal and river course	Contractor & KNNL	Thorough out the construction period (24 months)
6. Biological Environment						
Construction activities	Wilting of plants	Water sprinkling	Normal photosynthetic activity	Intake canal, jack well cum pump house, access roads, around construction site,	Contractor & KNNL	Thorough out the construction period (24 months)

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitroing Agency	Time frame
				disnets		
Labor camps	Riverine water pollution	Labor camps at 1 km away from river, restrictions for not using the river water	Zero water pollution	Labor camps	Contractor & KNNL	Thorough out the construction period (24 months)
Use of fire wood	Cutting of trees	LPG for labor camps	Positive ecosystem services	Labor camps and its surrounding	Contractor & KNNL	Thorough out the construction period (24 months)
Washing of construction equipments	Reduced DO levels	Washing at authorized service stations	Aquatic system maintained	Krishna river	Contractor & KNNL	Thorough out the construction period (24 months)
7. Socio-economic environment						
Land acquisition	Affecting livelihood	Compensation as RFCLA&TRR Act 2013	Sustainability for livelihood opportunities	Kalahalli, Bandigani, Kullahalli, Navalagi, Chimmada, Yallatti	KNNL	6 months
Vehicular movement	Health problems	Water sprinkling and movement of vehicles carrying raw materials only during night time.	Healthy environment	Kullahalli village	Contractor & KNNL	Thorough out the construction period (24 months)
B. Operation phase						
Excess application of fertilizers and pesticides	Soil and water contamination	Awareness on organic farming practices	Reduction in pollution load	Command area	KNNL and Water user Associations	3 years

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9.1 Command Area Development Plan

9.1.1 Water Users' Association (WUA)

The modern irrigation management aims at high efficiency of water conveyance and appropriate methods of water application, through participatory irrigation management at each stage of irrigation development. In Karnataka, it is essential to promote and implement the theme of participatory irrigation management in all the Irrigation projects through formation of Water Users' Association. The construction of OFD works will be taken up after formation of WUAs under the supervision of CADA, Belgaum.

The efficient management of irrigation water for maximizing productivity requires, firstly the efficient on farm water management and secondly the optimization of the use of water and land, through appropriate methods of water application. The efficient on-farm water management is related to water delivery system and allied works in the command area, which distributes the water to each farm. The items of works pertaining to on farm water management are termed as "On Farm Development Works".

The On Farm Development works comprise of the following,

- Maintenance of disnets, sumps
- Control structures
- Maintenance of Automation
- Surface Drainage system
- Farm roads
- Land forming (Smoothening / grading/leveling)

9.1.2 Green belt development plan

9.1.2.1 Plantation around intake canal and jack well cum pump house

Green belt development activities will be taken up on either side of the intake canal and in and around jack well cum pump house along with canal bank plantation.

9.1.2.2 Agro forestry activates in command area

Agro-forestry refers to the practice of Agriculture and Forestry in the same piece of land. The Karnataka Forest Department (KFD) has accorded high emphasis on farm forestry as a component in the afforestation programmes. The sector of Agro-forestry or Farm Forestry has a good potential as most of the agriculture lands are devoid of any trees, in the district. The trees if planted on the bunds and on the boundary of the lands protect the crops from the desiccating high winds and also provide additional income from the trees to the farmer apart from providing him fodder and fuel as well.

Silvi-Pasture refers to the planting of the trees in a predominately grassland so as to provide fodder all the year round. This afforestation is aimed at not only addition of tree species, but also addition of highly nutritive and palatable grass species in the area, thereby providing much needed nutritious fodder to the livestock population.

Table 16 Green belt development Plan around intake canal and jack well

Area proposed for Green belt	No. of saplings	Source for saplings	Time frame	Responsible agency for implementation
Intake canal	30	Bagalkot KFD Nursery	After completion of inspection path works	KNNL
Jack well cum pump house	80	Bagalkot KFD Nursery	After completion of site works	KNNL
Command area	10/ ha	Bagalkot KFD Nursery	First 2 years - 36000 Next 2 years - 36000	KNNL and KFD
Canal bank plntation	4720	Bagalkot KFD Nursery	After completion of Canal and inspection path works	KNNL and KFD

Table 17 Species recommended for green belt development

Sl.No	Local Name	Botanical Name	Sl.No	Local Name	Botanical Name
1	Ala	*Ficus bengalensis*	17	Kadugeru	*Semecarpus anacardium*
2	Basari	*Ficus infectoria*	18	Kadivala	*Stephegyne parviflora*
3	Beete	*Dalbergia latifolia*	19	Kadnugge	*Moringa pterygosperma*
4	Buruga	*Bombax ceiba*	20	Kakke	*Cassia fistula*
5	Dindiga	*Anogeissus latifolia*	21	Kanagalu	*Dillenia pentagyna*
6	Godda	*Lannea coromandclica*	22	Kaval	*Careya arborea*
7	Goni	*Ficus mysorensis*	23	Mathi	*Terminalia tomentsa*
8	Hebbalasu	*Artocarpus hirsuta*	24	Muthuga	*Butea monosperma*
9	Honne	*Pterocarpus marsupium*	25	Nandi	*Lagerstroemea lanceolata*
10	Hunalu	*Terminalia paniculata*	26	Nelli	*Emblica officinalis*
11	Ippe	*Madhuca Indica*	27	Neralu	*Syzygium cumini*
12	Jagalaganti	*Diospyros montana*	28	Shivani	*Gmelina arborea*
13	Jambe	*Xylia xylocarpa*	29	Tadasalu	*Grewia tilaefolia*
14	Saguvani	*Tectona grandis*	30	Tare	*Terminalia bellerica*
15	Yethiga	*Adina cordifolia*	31	Hunase	*Tamarindus indica*
16	Mavu	*Mangifera indica*	32	Honge	*Pongamia pinnata*

9.2 Fisheries Development Plan

The richness of the wide spectrum of native flora and fauna, especially, in the lotic and lentic water bodies is governed by their zoogeographical locations. Majority of the rivers in the country, on account of such precise demarcations, inherently, do not harbor the fast – growing fish species of commercial importance. Thus, in order to auger enrichment of indigenous fish species and to boost recognizable fish production from such biotopes, efforts to transplant several indigenous as also exotic fish from one river to the other are in practice. Often, selected fish species are transplanted from one river to the other or from rivers to the tanks, rivers, lakes and reservoirs. Farm – grown fish fingerlings of Indian major carp – *Catla catla, Labeo rohita, Cirrhinus mirgala* and the exotic carp *ctenophatyngodon idella, Hypopthalmichyta molitrix & Cyorinus carpio communis* are also introduced in lotic and lentic water bodies in order to boost fish production, improve the stock and to retard the extinction of existing fish species.

To a large extent, it is possible to enhance the productivity if a water mass by introducing and acclimatization process may be carried – out through 'supplanting' a more valuable and compatible fish species of commercial importance into the water body which, based on its feeding habits, uses the same food web as the less valuable member of the indigenous fauna. This leads to establishment of new food niches, finally resulting in high to very – high fish yield.

Transplantation of indigenous and exotic fish species in rivers system in the state, however, is not so common, but, whatever little has been accomplished by the department of fisheries in Karnataka in the recent past, has produced quite encouraging results. Proper attention in this sphere has to be directed towards large – sized indigenous fish species, sport – fish, cold – water fish after studying the preferable environmental facts and zoogeographical distribution patterns of each.

So, as a follow – up to this 'Objective', around 10 Lakhs fish fingerlings comprised of Gangetic carp, *Catla catla, Cirrhinus mirgala* and *Labeo rohita* accounting *to 40.00%, 30.00% and 30.00%* respectively and in the size of over 75mm are to be introduced *annually* in the Krishna river, in and around the project site. Fisheries Division of the State functioning there in their respective fish farms at Narayanpur reservoir complex, Vijayapura district, Tungabhadra Dam area, Bellary district and Bhadra reservoir zone, Shivamogga district will be quite happy and supportive to meet the requirement. The project authorities related to this project could also contribute their services in this regard. Indents/ requests for fish seed supply are to be made well –in – advance, say, during January – February of each year to the respective officers at these fish farms who, on their part, will make sure to effect the supply around August – September of each successive year. The process helps in increased fish production from the Krishna river and related impounded water areas. The entire exercise will positively help scores of poor fishermen engaged in the profession since years, generation after generation, to modestly and honourably ekk – out their livelihood.

9.3 Muck Disposal plan

Table 18 Muck disposal plan

Total excavated quantity cum	Service Road and Inspection Path	Formation of embankment	Filling trenches	Land leveling	Construction of CD works
540000	162000	81000	216000	54000	27000

9.4 Cost for implementing EMP

Table 19 Cost for implementing Environmental Management Plan

Item	Particulars	Estimated Cost in Rs.
I. Construction Phase		
A. Air Pollution Control		
Water sprinkling	400/- x 2 tractors x 3 trips per day x 24 months X 25 days (excluding rainy season and holidays)	14,40,000.00
Personnel protective equipments	Lumpsum	10,000.00
Chimney to DG sets	Lumpsum	15,000.00

LPG as cooking fuel	4 cylinders per unit x 25 units x 550 x 2 years	55,000.00
	Sub-total A	**15,20,000.00**
B. Noise Pollution Control		
Personnel protective equipments	Lumpsum	10,000.00
	Sub-total B	**10,000.00**
C. Water Pollution Control		
Septic and soak pit	Lumpsum	50,000.00
Sand bags	Lumpsum	20,000.00
	Sub-total C	**70,000.00**
D. Solid & Hazardous Waste Management		
Solid waste collection bins with shed	Lumpsum	25,000.00
Hazardous waste collection area with shed	Lumpsum	25,000.00
	Sub-total D	**50,000.00**
E. Biological Environment		
Plantation around intake canal and jack well	110 saplings x Rs. 1990/-	2,18,900.00
Agro forestry development	72,000 saplings x Rs.10	7,20,000
Fisheries development	Lumpsum	10,00,000
Canal bank plantation	23.6 Km x 1 sapling per every 5 m=4720 samplings x Rs. 1990/-	93,92,800.00
	Sub-total E	**1,13,31,700.00**
F. Socio-economic Environment		
Land acquisition	72.84 Lakhs X 2X 100% Solatium x 28 ha	2,91,36,000.00
Awareness and Training	3 lakhs per year x 3 years	9,00,000.00
	Sub-total F	**3,00,36,000.00**
G. Environmental Monitroing during construction period		
	Sub-total G	**12,46,000.00**
	Total (A-G)	**4,42,63,700.00**
II. Operation Phase		
Environmental Monitoring for 3 years		5,58,000.00
Green Belt mainatainence for 3 years		10,00,000.00
Awareness and Training for 3 years		5,00,000.00
Soil conservation measures and implementation of CAT plan for 5 years		5,41,18,000.00
	Total	**5,61,76,000.00**