ENVIRONMENTAL IMPACT ASSESSMENT STUDY
for
NAGALWADI MICRO LIFT IRRIGATION SCHEME
MADHYA PRADESH

Executive Summary

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Prepared for:

NARMADA VALLEY DEVELOPMENT AUTHORITY

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EXECUTIVE SUMMARY

1. PROJECT PROFILE

The project is a lift irrigation scheme; consisting of lifting water from Narmada river and distribution through a pressurized piped system to cultivators for irrigation during Rabi season. Water will be supplied upto 2.5 ha chak size under adequate pressure (minimum 20m head) for drip/sprinkler system to be installed by cultivators. The Project consists of piped system with Supervisory Control and Data Acquisition (SCADA) and have following Components:

1. Pumping Stations (5)
2. Rising mains (5)
3. Distribution Network (MS/DI/HDPE) up to 2.5 ha chak
4. Flow & Pressure Control Valves, Air valves
5. Power Transmission Line

In Nagalwadi Micro Lift Irrigation Scheme water will be lifted from Narmada river by pumping station PS1, near the south bank of the river; to other pumping locations to reach the higher elevations in command to serve the command area of 47,000 ha in Barwani and Khargone districts. Keeping in view the terrain, forest area enroute and maximum head requirement, Rising main route and pumping locations have been optimized so as to avoid the forest diversion and ensure full coverage of the command. It is proposed to lay 16.0 Km long rising main with MS pipe of 3000 mm diameter to deliver 15 cumecs water from PS1 to PS3 and further distributed from PS3 as per data given below.

Pumping Station details

S.No.	Pumping Station	Flow (cumec)	Head	Lifting level (m)	Delivery level (m)
1	Pump House 1	15.00	59.30	125	176
2	Pump House 2	15.00	116.50	175	285
3	Pump House 3	15.00	70.90	284	335
4A	Pump House 4A	1.00	45.00	335	345
4B	Pump House 4B	0.51	83.50	335	385
5A	Pump House 5A	3.46	60.00	335	360
5B	Pump House 5B	1.22	80.00	335	375
5C	Pump House 5C	2.08	120.00	335	415

Rising Main details

S. No.	Rising Main	Segment	Delivery HGL (m)	Diameter (m)	Length (m)
1	RM1	PS1 to PS2	176	3.0	9000
2	RM2	PS2 to PS3	285	3.0	7000
3	RM3	PS3 to PS4 & PS5	335	3.0	2200
4A	RM4A	PS 4 to J-830	370	1.1	1169
4B	RM4B	PS 4 to R1	410	1.1	8000
5A	RM5A	PS5 to J2	385	1.5	9200

S. No.	Rising Main	Segment	Delivery HGL (m)	Diameter (m)	Length (m)
5B	RM5B	PS5 to J1041	400	1.0	8932
5C	RM5C	PS5 to J1379	440	1.2	7936

2. LOCATION

The project area lies in Barwani & Khargone District. The supply source i.e. River Narmada near Brahmangaon chichali village of Barwani District and command area lies in Segaon, Khargone, Rajpur & Thikri tehsils of Barwani & Khargone districts. Project Location Map is given at **Figure 1.**

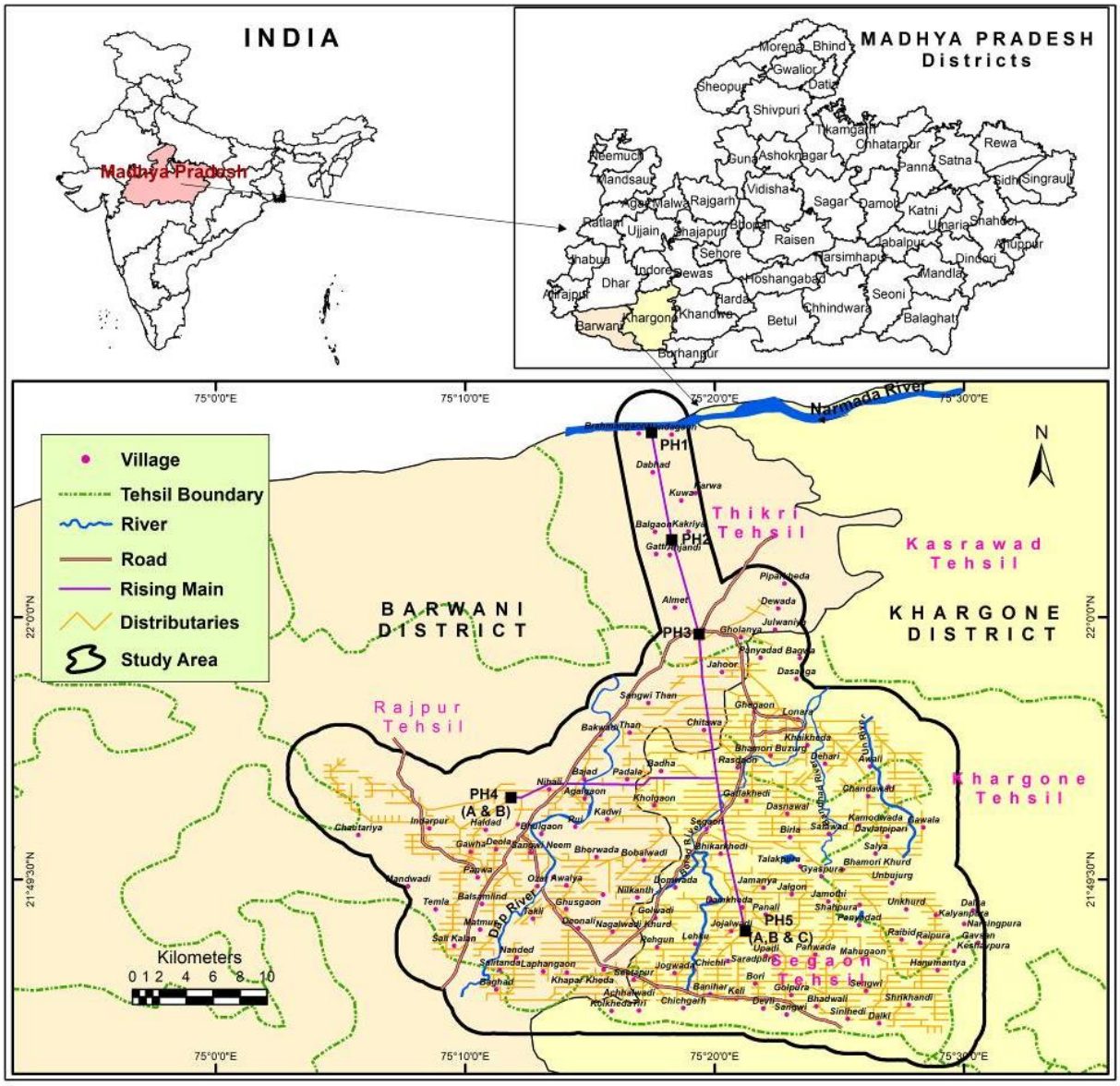

Figure 1: Location Map of the Project Area

3. LAND REQUIREMENT

Permanent Land Requirement

For the construction of pump-houses, sub-stations, valve chambers and staff quarters; land would be required permanently. These locations are so planned to avoid any forest land diversion for the purpose. Permanent land requirement has been worked out as 4 ha, which is government/private land; there is no forest land requirement for permanent use.

Land for Transmission Lines

132 KV dedicated transmission line is required to bring power to the three pump-houses. Power Line will be brought from 400KV Julwania substation; total length will be 50 Kms and 350 towers will be erected along the road for the purpose. Further for Pump house 4 and 5, 33 KV dedicated transmission line will be required; total length is calculated 30 kms and 750 two pole structures will be erected. Transmission line routes are planned in a manner so that these towers will not be erected on forest land.

Temporary Land for Laying of Pipeline

The pipe shall be laid 1.00 m below average ground level and land will be restored immediately on completion of the work, therefore, no land for laying of pipes shall be acquired permanently. Wherever, the pipeline will be passing through private land, temporary land acquisition will be done as per Bhumigat pipe line laying act. Total temporary private/ govt. land requirement is worked out as 119.30 ha.

4. STUDY AREA

The data on environmental parameters was collected from the study marked for EIA study. The Study Area for assessment of environmental baseline status was delineated as follows:

- The area within 10 km radius of the main project components like proposed reservoir area and dam site
- Area within 2.5 km buffer on either side of pipeline (water conductor system) in proposed command area

Water Conductor System - The water conductor system is the piped network designed to lift water from the canal and distribute in the command area.

Command Area - The command area is the area of Nagalwadi Micro Lift Irrigation Project covering 47000 ha land which will be irrigated by drip/sprinkler irrigation under the proposed irrigation Project. Entire command falls within the study area.

5. ENVIRONMENTAL BASELINE STATUS

Environmental baseline status has been ascertained using secondary as well primary data. Secondary data has been presented for meteorology, geomorphology, ground water, cropping pattern, socio-economic parameters etc. Primary data has been collected for soil, surface & ground water, air, noise, traffic and vegetation. Data has been presented in EIA report in detail. Analysis Results of surface as well as ground water samples are within permissible limits as per Inland surface water quality and drinking water standards. As per land use map, study area has 80.10% of agriculture/fallow land, 9.84 of scrub land, 2.49% water bodies, 0.43% Mining, 0.51% settlement, 4.32% scrub forest and 2.32% of Deciduous Forest.

In command area agriculture is the dominant land use pattern. Agriculture is main land use with 80.10%. Among the agricultural crops wheat, chillis, cotton, maize, lentil and linseed are most common. For vegetation sampling, 7 locations have been identified. In order to understand the general vegetation in the study area, inventory of plant species belonging to different groups found in the study area was prepared and community structure in the

crop fields as well as scattered patches of trees was assessed through quadrat sampling. No rare or endangered flora/fauna species are found in study area. Data has been presented in EIA report.

6. SOCIO ECONOMIC PROFILE OF THE STUDY AREA

Study area comprises of 121 villages falling under Segaon & Khargone Tehsils of Khargone and Thikri & Rajpura Tehsils of Barwani district. Study area villages include 106 benefited villages also. The villages which are located in the command area have been termed as Project Benefited Villages. List of study area villages is given in **Table 1**.

Table 1: List of Study Area Villages

S. No.	Village Name	Village Category
District: Barwani		
Tehsil: Rajpur		
1	Agalgaon	Benefited
2	Awalya	Benefited
3	Baghad	Benefited
4	Bajad	Benefited
5	Bakwadi	Benefited
6	Balsamund	Benefited
7	Bhorwada	Benefited
8	Bhulgaon	Benefited
9	Bobalwadi	Benefited
10	Chautariya	Benefited
11	Chitawal	Benefited
12	Deola	Benefited
13	Deonali	Benefited
14	Gawha	Benefited
15	Ghusgaon	Benefited
16	Golpura	Benefited
17	Haldad	Benefited
18	Indarpur (Rehatiya)	Benefited
19	Jahoor	Benefited
20	Julwaniya Road	Benefited
21	Kadwi	Benefited
22	Khapar Kheda	Benefited
23	Lahadgaon	Benefited
24	Laphangaon	Benefited
25	Mandwadi	Benefited
26	Matmur	Benefited
27	Naded	Benefited
28	Nagalwadi Buzurg	Benefited
29	Nagalwadi Khurd	Benefited
30	Nihali(Jodai)	Benefited
31	Nilkanth	Benefited
32	Ozar	Benefited
33	Padala (Kadwi)	Benefited
34	Panwa	Benefited
35	Rui	Benefited
36	Salikalan	Benefited
37	Salitanda	Benefited
38	Sangwi (Than)	Benefited
39	Sangwi (Bhulgaon)	Benefited
40	Takli	Benefited
41	Temla Buzurg	Benefited
42	Than	Benefited
Tehsil: Tikri		
43	Dewada	Benefited
44	Gholanya	Benefited
45	Julwaniya	Benefited
46	Piparkheda	Benefited
47	Ajandi	Study Area
48	Brahamangaon	Study Area
49	Dabhad	Study Area
50	Deola	Study Area
51	Hasankhedi	Study Area
52	Kakariya	Study Area
53	Kalapani	Study Area
54	Kuwa	Study Area
55	Nandgaon	Study Area
56	Radkot	Study Area
57	Rangaon	Study Area
58	Sundarla	Study Area
59	Temla	Study Area
60	Titgaria	Study Area
District: Khargone		
Tehsil: Khargone		
61	Awali	Benefited

S. No.	Village Name	Village Category
62	Baghwa	Benefited
63	Bhamori Buzurg	Benefited
64	Bhamori Khurd	Benefited
65	Dalka	Benefited
66	Dasanga	Benefited
67	Davlatpipari	Benefited
68	Dehari	Benefited
69	Gavsan	Benefited
70	Gawala	Benefited
71	Ghegaon	Benefited
72	Kalyanpura	Benefited
73	Lonara	Benefited
74	Raibid	Benefited
75	Raipura	Benefited
76	Saikheda	Benefited
77	Salya	Benefited
78	Shahpura	Benefited
79	Unbujurg	Benefited
80	Unkhurd	Benefited
81	Vanihar [Ghotiya]	Benefited
Tehsil: Segaon		
82	Badha	Benefited
83	Bhikharkhedi	Benefited
84	Birla	Benefited
85	Bori	Benefited
86	Chandawad	Benefited
87	Chichgarh	Benefited
88	Chichli	Benefited
89	Damkheda	Benefited
90	Dasnawal	Benefited
91	Domwada	Benefited
92	Gandhawad	Benefited
93	Gatlakhedi	Benefited
94	Golpura	Benefited
95	Golwadi	Benefited
96	Gyaspura	Benefited
97	Hanumantya	Benefited
98	Jalgon	Benefited
99	Jamanya	Benefited
100	Jamothi	Benefited
101	Jogwada	Benefited
102	Jojalwadi	Benefited
103	Keshavpura	Benefited

S. No.	Village Name	Village Category
104	Kham Kheda	Benefited
105	Kholgaon	Benefited
106	Kmodwada	Benefited
107	Lehakoo	Benefited
108	Mahugaon	Benefited
109	Panali	Benefited
110	Panwada	Benefited
111	Panyadad	Benefited
112	Rasgaon	Benefited
113	Rehgun	Benefited
114	Saradpura	Benefited
115	Satawad	Benefited
116	Seetapuri	Benefited
117	Segaon	Benefited
118	Sengwi	Benefited
119	Shrikhandi	Benefited
120	Talakpura	Benefited
121	Upadi	Benefited
TOTAL VILLAGES IN RAJPUR TEHSIL		42 (Benefited)
TOTAL VILLAGES IN TIKRI TEHSIL		18 (4 Benefited + 14 Study Area)
TOTAL VILLAGES IN KHARGONE TEHSIL		21 (Benefited)
TOTAL VILLAGES IN SEGAON TEHSIL		40 (39 Benefited + 1 Study Area)
TOTAL NUMBER OF VILLAGES		121 (106 Benefited + 14 Study Area)

Demographic profile, literacy, occupation pattern, per capita income, socio-economic profiling of the project benefitted villages and brief description of villagers' opinion/perception regarding the project, have been presented in EIA report. The analysis shows a clear picture that the construction of this project will be able to bring improved quality of life paving a path of development for the present and future generation which in turn can improve their life and prevailing circumstances. This Project may open new avenues for giving an opportunity to the people for accessing their rights on health, education, livelihood and other empowerments. The increased yield due to assured irrigation will lead to integrated development of agriculture in the region.

7. IMPACT ASSESSMENT AND MITIGATION

Noise and air quality: In a water resources project, air and noise pollution occurs mainly during project construction phase. During operation phase, no major impacts are envisaged.

Mitigation measures have been recommended to control dust emissions and other sources of air pollution such as emissions from DG sets and construction equipment, etc. to have minimum impact in the surrounding of construction sites. Similarly, mitigation measures have been recommended for control of noise for workers at construction sites as well as for residents of surrounding areas.

Water resources: Water conductor system shall be crossing 63 small seasonal nallas. These will be crossed on culverts or underground by push method; in both the cases, course of the drainage will not be altered. Conservation of water should be implemented at construction sites to minimize the generation of wastewater.

Improved availability of irrigation water during Rabi season in the area shall lead to reduced extraction of ground water for irrigation and domestic uses thus reversing ground water decline in the region and increasing availability of ground water for drinking and irrigation use during summer.

Muck Management: The tentative quantity required to be disposed off form primarily rising mains and gravity distributaries has been worked out as nearly 12.80 lakh cum.

The excavated material will be utilized for refilling of the trenches and the approach road proposed to be constructed for carrying the pipes at site and preparation of platform for crane. Total excavated surplus material requiring disposal is estimated as 1280296.03 m3, however, this surplus quantity will be generated from a network of trenches with total length of 3245.717 km; therefore per m dug material generation will be of the order of 0.39 m3 only.

During excavation, care will be taken that top fertile soil is kept aside and will be used for re-filling the top area after laying pipe line. This top soil will be spread on adjoining farming fields with consent of farmers or alternatively will be used for green belt development.

Balance muck will be managed by spreading along the route in the low lying areas. As the topography is undulating, such low lying areas are available along the route. Any further

surplus muck, shall be laid in the community undulating area of the connected villages with the consent of concerning Gram-panchayat or Janpad Panchayat. The muck may also be used by nearby Gram Panchayats for construction of village roads etc.

A lump sum provision of capital expenditure of Rs. 150.0 lakh has been made for muck disposal.

Construction Waste Management: Construction activities are associated with 3 types of waste generation:

- Construction and Demolition Waste
- Hazardous Waste
- Municipal Solid Waste from labour camps/colonies

Mitigation measures have been recommended in line with Construction & Demolition Waste Management Rules, 2016 to have minimum impact on this count.

Change in cropping pattern: There would be change in cropping pattern. More area would come under crops because of increase in irrigation intensity. Apart from additional crops, project will also have positive impacts in terms of improved efficiency leading to bumper crops in otherwise water scarce area.

Flora and fauna: No significant impact is envisaged on flora and fauna due to absence of significant vegetation/forest in the region. For the proposed Nagalwadi Micro irrigation project, no forest land shall be acquired.

Plantation in Command Area: To improve green cover for floral and faunal improvement in the command, it is proposed that plantation in 150 hectare in several patches in non-forest waste land will be done subject to availability of suitable land. These plantations will be maintained for five years & will be handed over to Panchayat for management. The plantations may be done by forest wing of NVDA, forest department or local Panchyats. A provision of Rs. 675 lakh has been made for the same.

Amenities for Workers: Construction phase of projects is generally associated with impacts related to labor congregation in an area, where labour camps/colonies are constructed and such phases last for a few years. However, micro irrigation schemes require laying of pipeline, where labour is scattered and mobile. Therefore, such construction phase impacts are not envisaged. Keeping in view the health concerns and reduce the impact of sanitation and hygiene of local area, where temporary labour camps will be set up, following minimum facilities are proposed at these locations with a budget of Rs. 91 lakhs:

- Potable drinking water
- Temporary shelters with sanitation facilities
- Mobile toilets
- Crèche for female workers
- First aid facilities
- Occupational health check up
- Personal Protective Equipment (PPEs), as required

Medical Facilities: Medical facility will be provided in the project area at a budget of Rs. 125 lakh to combat water and vector borne diseases and also at construction site to ensure safety and health of workers during the entire construction phase:

- One fully equipped ambulance need to be procured to provide pre-hospital care to accident victims during construction phase. The ambulance should always be stationed near major construction sites or the sites where risky operations are taking place.
- Provisions have been made for strengthening existing PHCs and PHSCs in the area.
- Provisions have been made to assist health department to combat outbreak of water/vector borne diseases due to implementation of the project.

Education and Awareness of farmers: Micro irrigation by lift irrigation is being introduced on large scale involving pumping and conveying water through pipe line, it is felt that awareness must be created amongst farmers through dissipation of information, training and motivated to adopt new technology. Thus farmers will be trained to adopt new technology by organizing awareness and training camps at village Water User Association (WUA), Panchayat and Jan Pad level. In awareness camps there will be emphasis on limited use of chemical fertilizers and increased use of bio fertilizers. An amount of Rs. 220 lakh has been provided to be spread over a period of 5 years for this purpose.

Preventive measures for leakages, bursting and corrosion in pipeline: The entire system is closed conduit for conveyance of water up to farm level. The arrangement for leak detection; preventive action for bursting of pipeline and preventive/ control measures for the various components like desilting arrangements, anti-corrosion measures, have been prescribed. A provision of two number of chassis mounted dewatering pumps of adequate capacity has been made in the project budget for the purpose of clearing the water logged areas during emergency. A budgetary provision of Rs 30 lakh has been made for the same.

8. FINANCIAL REQUIREMENT FOR MITIGATION & MANAGEMENT MEASURES

Financial requirement has been assessed for above aspects as **Rs. 1311.00 lakh** and same have been tabulated below:

S. No.	Activities	Quantities	Capital Cost (Rs. in lakh)	Maintenance/Recurring (Rs. In lakh)						Grand Total (Rs. in lakh)
				I Yr	II Yr	III Yr	IV Yr	V Yr	Total	
1	Muck Disposal	12,80,296 m^3	150							150
2	Plantation in Command Area	150 ha	450	45	45	45	45	45	225	675
3	Measures for Improvement in Public Health	100 peak manpower								
a	Amenities for Workers			40	31				71	71
b	PPEs			5	5				10	10
c	Medical and Health Care Facilities		45	16	16	16	16	16	80	125
d	Occupational Health Check-up			5	5				10	10
4	Educational and Awareness Program for Farmers	spread in entire command		60	60	40	30	30	220	220

S. No.	Activities	Quantities	Capital Cost (Rs. in lakh)	Maintenance/Recurring (Rs. In lakh)						Grand Total (Rs. in lakh)
				I Yr	II Yr	III Yr	IV Yr	V Yr	Total	
5	Dewatering pumps (for leakage management)	2 numbers	20	2	2	2	2	2	10	30
6	Control of dust emission during construction			10	10				20	20
	TOTAL (Rs. in lakh)		**665**	***183***	***174***	***103***	***93***	***93***	***646***	**1311**

9. ENVIRONMENTAL MONITORING PROGRAMME

The monitoring program for the Project will be undertaken to meet the following objectives:

- To monitor the environmental conditions of nearby area;
- To check on whether mitigation and benefit enhancement measures have actually been adopted, and are proving effective in practice

Plan for surface & ground water, soil, land use /land cover, air quality, noise, and ecological monitoring have been suggested and cost provisions of **Rs. 73.50 lakh** have been made accordingly, as tabulated below.

S. No.	Activities	Quantities	Capital Cost (Rs. in lakh)	Maintenance/Recurring (Rs. In lakh)						Grand Total (Rs. in lakh)
				I Yr	II Yr	III Yr	IV Yr	V Yr	Total	
1	Surface & Ground Water	14 locations twice a year	--	3.00	3.00	3.00	3.00	3.00	15.00	15.00
2	Soil characteristics	10 locations	--	2.00	2.00	2.00	2.00	2.00	10.00	10.00
3	Land use/Land cover	once a year for 3 years	--	5.00	5.00	5.00	0.0	0	15.00	15.00
4	Air Quality	5 locations thrice a year		3.00	3.00	3.00	3.00	3.00	15.00	15.00
5	Noise	once a month for 2 years	1.00	0.50	0.50	0.50	0.50	0.50	2.50	3.50
6	Ecological	once a year	--	3.00	3.00	3.00	3.00	3.00	15.00	15.00
	Total		**1.00**	**16.5**	**16.5**	**16.5**	**11.5**	**11.5**	**72.50**	**73.50**

Total financial requirement for mitigation/management and monitoring is tabulated below:

S. No.	Activities	Quantities	Capital Cost (Rs. in lakh)	Maintenance/Recurring (Rs. In lakh)						Grand Total (Rs. in lakh)
				I Yr	II Yr	III Yr	IV Yr	V Yr	Total	
	EMP BUDGET									
1	Muck Disposal	12,80,296 m^3	150							150
2	Plantation in Command Area	150 ha	450	45	45	45	45	45	225	675
3	Measures for Improvement in Public Health	100 peak manpower								
a	Amenities for Workers			40	31				71	71
b	PPEs			5	5				10	10
c	Medical and Health Care Facilities		45	16	16	16	16	16	80	125

S. No.	Activities	Quantities	Capital Cost (Rs. in lakh)	Maintenance/Recurring (Rs. In lakh)						Grand Total (Rs. in lakh)
				I Yr	II Yr	III Yr	IV Yr	V Yr	Total	
d	Occupational Health Check-up			5	5				10	10
4	Educational and Awareness Program for Farmers	spread in entire command		60	60	40	30	30	220	220
5	Dewatering pumps (for leakage management)	2 numbers	20	2	2	2	2	2	10	30
6	Control of dust emission during construction			10	10				20	20
	Sub Total (Rs. in lakh) (a)		***665***	***183***	***174***	***103***	***93***	***93***	***646***	**1311**
	MONITORING BUDGET									
1	Surface & Ground Water	14 locations twice a year	--	3.00	3.00	3.00	3.00	3.00	15.00	15.00
2	Soil characteristics	10 locations	--	2.00	2.00	2.00	2.00	2.00	10.00	10.00
3	Land use/Land cover	once a year for 3 years	--	5.00	5.00	5.00	0.0	0	15.00	15.00
4	Air Quality	5 locations thrice a year		3.00	3.00	3.00	3.00	3.00	15.00	15.00
5	Noise	once a month for 2 years	1.00	0.50	0.50	0.50	0.50	0.50	2.50	3.50
6	Ecological	once a year	--	3.00	3.00	3.00	3.00	3.00	15.00	15.00
	Sub Total (b)		***1.00***	***16.5***	***16.5***	***16.5***	***11.5***	***11.5***	***72.50***	***73.50***
	TOTAL (a+b)		**666.00**	**199.5**	**190.5**	**119.5**	**104.5**	**104.5**	**718.5**	**1384.5**

10. PROJECT BENEFITS

The project will bring water to 106 villages, which are presently water scarce and cannot irrigate their land efficiently due to shortage of water. The project will bring direct environment and social benefits, which in turn will bring prosperity to the area and increase spending power of farmers, bringing economic benefits to the region. Direct benefits include public health infrastructure, awareness and training programs for farmers, etc.

11. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

EMP deals with the description of the administrative aspects of ensuring that mitigation measures are implemented and their effectiveness monitored. NVDA is the project proponent/implementing agency for the entire scheme. NVDA has engaged M/s Laxmi Civil Engineering Services Pvt. Ltd. for design and execution of the work including its operation post commissioning. Institutional arrangement for planning and implementing various mitigation and management measures along with carrying out environment monitoring are discussed in detail in EIA report.