

# Environmental Monitoring Report

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Project No. 47101-002  
Semestral Report  
January–June 2016

## India: Assam Power Sector Investment Program –Tranche 1

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## **Environmental Safeguard Monitoring Report**

**Assam Power Sector Investment Program- Project 1**

**Loan No 3140**

**Reporting Period from January 2016 to June 2016**

**Prepared By Assam Power Generation Corporation Limited for the Asian Development Bank**

## A. PROJECT INFORMATION

i.	Name of Project	Assam Power Sector Investment Program (Tranche1)
ii.	Loan Number	3140-IND
iii.	Name of Monitoring / Reporting Agency and address	The Director, Project Management Unit (PMU)APDCL Assam Power Generation Corporation Limited (APGCL), 3rd Floor, Bijulee Bhawan, Guwahati, 781001, Assam
iv.	Monitoring Period (Season / month)	January 2016 to June, 2016
v.	Report No.	01
vi.	Report for the period	January2016 to June, 2016
vii.	Date of reporting	September, 2016
viii.	Type of Contract	Multi-Tranche Financing Facility (MFF)
ix.	Package	Procurement of Plant: “Design and Engineering, Manufacture, Supply, Erection, Testing and Commissioning including all Civil and Allied Works of 70MW (Nominal) Gas Engine based Lakwa Replacement Power Project (LRPP) at Lakwa Thermal Power Station, Maibella, Sivasagar District, Assam, India.

## **B. IMPLEMENTATION STATUS**

- The LRPP contract was awarded to consortium of Wartsila India Pvt Ltd and Wartsila Finland Oy and the 'signing of contract' was done on 19.01.2016.
- As per the contract seven numbers of gas engine gensets of capacity 9.965 MW and balance of plant will be supplied for LRPP.
- The Lakwa Replacement Power Project effective date has been established as 09.03.2016 i.e. the date of receipt of advance payment by the EPC contractor. The project kick off meeting was held on 15th, 16th & 17th, March, 2016 and subsequently the Contractor has started the mobilization works.

Note: In compliance with Para 192 of Initial Environmental Examination report of LRPP the Environmental report is prepared.

## **C. TABLE DETAILS OF WORK AWARD**

<b>Locations</b>	<b>Sub-project components (Package No.)</b>	<b>Starting date of Implementation</b>	<b>Projected months of completion</b>	<b>Schedule date of completion (Extended date of completion)</b>	<b>Physical progress (%) as on -----</b>
Lakwa Thermal Power Station	70 MW (nominal) Lakwa Replacement Power Project	09 <sup>th</sup> March 2016	March 2018	Nil	7.63%

#### D. TABLE: DETAILS OF ON-GOING WORKS

Locations	Sub-project Components (Package No.)	Listing of works under the package	What type of works continued at present	Expected changes from approved scope	Fulfillment of Objectives - Type of remedial	Key assumptions and risks that affect attainment of the objectives
Lakwa Thermal Power Station	70 MW (nominal) Lakwa Replacement Power Project	Design and Engineering, Manufacture, Supply, Erection, Testing and Commissioning including all Civil and Allied Works of 70MW (Nominal) Gas Engine based Lakwa Replacement Power Project (LRPP) at Lakwa Thermal Power Station, Maibella, Sivasagar District, Assam, India.	The EPC contractor Completed the soil investigation And submitted a Soil & topography investigation report to APGCL on June 2016. Currently Preliminary Engineering, Basic Engineering and Detail Engineering of civil, electrical and mechanical works along with Technical documents and drawings for review, approvals are going on.	Nil	Nil	Nil

## E. PROGRESS OF ENVIRONMENTAL MANAGEMENT PLAN

Sl No	Environmental components related to project activities	Compliance		Explanation (in case of done or not done justification necessary)
	PRECONSTRUCTION STAGE			
		YES	NO	
1	Site preparation work completed by PIU Including necessary clearance.	√		LRPP is located inside the premises of Lakwa Thermal Power Project (LTPS). A section of the vacant land is used for LRPP. The site is handed over to the contractor as level land with some earth filing.
	CONSTRUCTION STAGE			
2	PCBs not used in transformers or other project facilities or equipment. Processes, equipment and systems not to use chlorofluorocarbons (CFCs), including halogen Use of PCBs and CFCs in the existing systems should be	√		Handling and dispose of hazardous wastes (PCBs, CFCs etc) will be done in accordance to CPCB Guidelines.
3	Better design to ensure noise will not be a nuisance	√		Contractors are advised to take care in detailed engineering design to ensure noise will not be a nuisance.
4	Appropriate placement of equipment to avoid drainage/channel interference.	√		The necessary measures will be taken to avoid disturbance to natural drainage pattern.
5	Equipment specification with respect to potential pollutants.	√		Contractors are advised to engage Construction equipment meets GOI emissions and noise control standards.
6	Construction technique and machinery selection to minimize noise disturbance.	√		Contractors are advised to choose Construction technique and machinery having minimum noise disturbance.
7	Construction equipment to be well maintained and turn of the plant not in use to avoid noise, Vibration and operator safety.	√		Contractors are advised to manage Construction equipment with minimum noise as much as possible.
8	Construction workers prohibited from harvesting wood in the project area.	√		Contractors are advised to use gas or kerosene instead of wood for cooking.

9	Dispose scrap materials such as batteries, transformers, conductors, capacitors etc in environmentally sound manner.	√		Being Complied. Disposal of hazardous materials will be done as per CPCB and APCB guidelines.
10	Excavated earth to be stored and reused for back filling.	√		Being Complied. Contractors are advised to store Excavated earth and reused for back filling.
11	Fuels and other hazardous materials to be stored above high flood level.	√		Being Complied. Contractors are advised to store Fuels and other hazardous materials managed properly and stored above high flood level
12	Noisy construction activities shall be carried out during day time.	√		Being Complied. Contractors are advised to carry out Noisy construction activities during day time only.
13	Construction workforce facilities to include proper sanitation, water supply	√		Being Complied. Contractors are advised
14	Ensure health and safety of workers.	√		Being Complied. Contractors are advised to use Personnel Protective Equipments during construction time and First aid box and fire extinguisher should be kept at work site for safe.
15	Training to the APGCL environmental monitoring personnel.	√		To be provided as and when necessary
16	Effective environmental monitoring system using checklist.	√		To be complied
17	Hiring of Environment and Social Consultant (s)		√	Under process



## F: EMP COMPLIANCES

Environmental Component	Project Stage	Parameters to be Monitored	Responsibility	Frequency	Compliance Status
Air Quality	Pre-construction stage	PM10, PM2.5, SO2, NOx, SPM, CO	Contractor/EA	One time	Test Report, 2013 enclosed as <b>Annexure A</b>
	Construction Stage.	PM10, PM2.5, SO2, NOx, SPM, CO	Contractor	Two times	Monitoring will be done by the contractor as per specified in the bid
	Operation Stage.	PM10, PM2.5, SO2, NOx, SPM, CO	EA	One time	Will be monitored during operation stage.
Water Quality	Pre-construction stage	EC, TSS, DO, BOD, PH, Oil and grease,	Contractor/EA	One time	Test Report, 2013 enclosed as <b>Annexure B</b>
	Construction Stage.	EC, TSS, DO, BOD, PH, Oil and grease, Pb,.	Contractor	Three times/year	Monitoring will be done by the contractor as per specified in the bid
	Operation Stage	EC, TSS, DO, BOD, PH, Oil and grease,	EA	Yearly	Will be monitored during operation stage.
Noise/ Vibration.	Pre-construction stage	Noise level [dB (A)]	Contractor/EA	One time	Test Report, 2013 enclosed as <b>Annexure C</b>
	Construction Stage.	Noise level [dB (A)]	Contractor	Two times/year	Monitoring will be done by the contractor as per specified in the bid
	Operation Stage.	Noise level [dB (A)]	EA	Three times/ year	Will be monitored during operation stage.
Soil	<b>Pre-Construct ion stage</b>	PH, Sulfate (SO3), Chloride, ORP, water Soluble salts EC, Organic Matter,	Contractor/EA	One time	Test Report, 2013 enclosed as <b>Annexure D</b>
	<b>Construction Stage.</b>	PH, Sulfate (SO3), Chloride, ORP, water Soluble salts EC, Organic Matter,	Contractor	Two times	Monitoring will be done by the contractor as per specified in the bid.
	Operation Stage.	PH, Sulfate (SO3), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	EA	One time	Will be monitored during operation stage.



### 3.2 AMBIENT AIR QUALITY

The ambient air quality was monitored in the impact area as per MoEF guidelines. The prime objective of the baseline air quality study was to assess the existing ambient air quality of the area.

#### 3.2.1 Methodology Adopted for the Study

The baseline status of the ambient air quality has been assessed through a scientifically designed ambient air quality network. The design of monitoring network in the air quality surveillance programme has been made based on the following considerations:

- ❖ Meteorological parameters on synoptic scale
- ❖ Topography of the study area
- ❖ Representatives of regional background air quality for obtaining baseline status
- ❖ Representatives of likely impact areas.

Ambient Air Quality Monitoring (AAQM) stations were set up at 10 locations with due consideration to the above mentioned points. AAQ locations were selected in downwind, cross wind and upwind direction of the proposed Project location. The details of the monitoring stations are given in **Table 3.3**. The sampling locations are given in **Figure 3.2.1**

At each sampling station monitoring was carried for a frequency of 2 days per week for 4 weeks in a month during the study period. The Common air pollutants namely Suspended Particulate Matter (SPM), Respirable Particulate Matter (PM<sub>2.5</sub>µm, PM<sub>10</sub>µm), sulphur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), Mercury (Hg), Carbon Monoxide (CO), Ozone (O<sub>3</sub>) were sampled on 24 hourly and the results were averaged to were sampled on 24 hourly as per MoEF guidelines and results are compared with the standards stipulated by CPCB.

**Table 3.3**  
**Ambient Air Quality Monitoring Locations**

S.No	Code	Name of the Station	Wind Type	Elevation (M)	W.R.T. Site		Latitude (North)	Longitude (East)
					Direction	Distance (Km)		
1	A1	Plant Site	Core	112.3	-	-	26°59'8"	94°55'46"
2	A2	Bhahatagoon	Down wind	103.4	WSW	3.8	26°58'56"	94°53'37"
3	A3	Suffry	Up wind	116	NE	2.5	26°59'39"	94°57'14"
4	A4	Rangapathar	Up wind	97.1	NNE	4	27°01'4"	94°57'02"
5	A5	Mohangaon	Cross Wind	99	N	5.5	27°01'57"	94°55'58"
6	A6	Solapathar	Cross Wind	97.7	NW	5	27°01'29"	94°54'38"
7	A7	Madhurapur	Down wind	82.9	SW	2.8	26°58'27"	94°54'28"
8	A8	Singloo	Cross Wind	92.1	SE	4.5	26°57'28"	94°56'19"
9	A9	Naharhobi	Cross Wind	82.7	W	8	26°59'35"	94°50'42"
10	A10	Chasmutiya	Down wind	83.8	SW	9.5	26°58'56"	94°50'12"



The existing values of air pollutants of concern as mentioned above are presented in **Table 3.4 a to d**. Statistical parameters like minimum, maximum, mean and 98<sup>th</sup> percentiles have been computed from the observed raw data for all sampling stations. These are compared with the standards prescribed by Central Pollution Control Board (CPCB) for Industrial, Residential and Rural zone.

**Table 3.4 a**  
**SPM Levels in the Study Area ( $\mu\text{g}/\text{m}^3$ ) - SPM**

Code	Location	Suspended Particulate Matter (SPM)			
		Min	Average	95 <sup>th</sup> Percentile	Max
A1	Project Site	92.8	107.1	128.5	135.3
A2	Bhahatagoon	98.4	111.9	135.1	142.2
A3	Suffry	96.1	111.0	133.2	140.2
A4	Rangapathar	93.5	108.4	122.2	128.6
A5	Mohangaon	92.2	107.1	120.9	127.3
A6	Solapathar	81.1	96.6	113.0	118.9
A7	Madhurapur	94.2	110.1	119.0	125.3
A8	Singloo	93.3	109.2	118.2	124.4
A9	Naharhobi	92.7	108.6	117.6	123.8
A10	Chasmutiya	91.6	107.5	116.6	122.7

**Table 3.4b**  
**Ambient Air Quality Levels in the Study Area ( $\mu\text{g}/\text{m}^3$ )**

Code	Location	Particulate Matter <2.5 $\mu$				Particulate Matter <10 $\mu$			
		Min	Avg.	95 <sup>th</sup> Per	Max	Min	Avg.	95 <sup>th</sup> Per	Max
A1	Project Site	20	24	26	26	44	49	53	54
A2	Bhahatagoon	20	23	27	29	33	38	46	54
A3	Suffry	20	23	27	28	30	38	47	51
A4	Rangapathar	15	18	21	23	28	32	36	36
A5	Mohangaon	19	25	32	33	35	43	52	54
A6	Solapathar	16	21	25	26	30	37	42	43
A7	Madhurapur	17	22	27	29	31	39	44	45
A8	Singloo	20	24	28	29	36	41	46	48
A9	Naharhobi	18	24	29	29	35	43	54	54
A10	Chasmutiya	21	24	27	29	38	42	46	48



**Table 3.4c**  
**Ambient Air Quality Levels in the Study Area ( $\mu\text{g}/\text{m}^3$ )**

Code	Location	Sulphur dioxide ( $\text{SO}_2$ )				Nitrogen dioxide ( $\text{NO}_x$ )			
		Min	Avg.	95 <sup>th</sup> Per	Max	Min	Avg.	95 <sup>th</sup> Per	Max
A1	Project Site	6.9	9.6	12.8	13.1	9.7	14.3	18.4	20.1
A2	Bhahatagoon	7.2	8.7	11.4	12.3	9.2	11.5	13.5	18.2
A3	Suffry	6.1	7.7	9.4	10.3	10.7	16.5	23.6	25.7
A4	Rangapathar	6.1	8.2	10.1	10.6	8.9	11.9	16.2	17
A5	Mohangaon	5.5	7.2	9.3	9.6	7.1	10.6	14	16.1
A6	Solapathar	7.2	8.2	9	10.4	10.4	12.2	14.1	15.8
A7	Madhurapur	7	8.6	11.2	12.4	9	14.6	26.4	28.8
A8	Singloo	7.7	9.2	10.5	11	10.4	15.7	24.1	24.9
A9	Naharhobi	7.3	10.1	13.2	17.6	10	15	20	26.5
A10	Chasmutiya	6.3	10.4	12.2	13	9.4	15.2	18.1	19.2

**Table 3.4 d**  
**Ambient Air Quality Levels in the Study Area ( $\mu\text{g}/\text{m}^3$ )**

Code	Location	Carbon Monoxide ( $\text{CO}$ )		Ozone ( $\text{O}_3$ )	
		Min	Max	Min	Max
A1	Project Site	1120	1210	7.5	9.5
A2	Bhahatagoon	950	1015	6.8	9.3
A3	Suffry	890	930	7.1	8.6
A4	Rangapathar	1030	1065	6.6	8.7
A5	Mohangaon	920	990	7.3	8.3
A6	Solapathar	980	1035	7.0	8.1
A7	Madhurapur	900	970	7.2	8.5
A8	Singloo	915	955	7.7	9.5
A9	Naharhobi	960	1025	6.5	7.9
A10	Chasmutiya	910	960	6.9	8.5

Note: Below Detectable Limit of  $\text{O}_3 = 6\mu\text{g}/\text{m}^3$



**Table 3.5**  
**Water Sampling Locations**

S.No	Code	Name of the Station	Source Type	Elevation in (M)	W.R.T. Site		Latitude (North)	Longitude (East)
					Direction	Distance (Km)		
Subsurface (Ground Water)								
1	GW1	Plant Site	Bore Well	99	-	-	26°59'14"	94°56'11"
2	GW2	Bhahatagoon	Hand Pump	88.3	SW	3	26°58'55"	94°53'38"
3	GW3	Suffry	Hand Pump	85.5	NE	2.5	26°59'29"	94°56'34"
4	GW4	Rangapathar	Hand Pump	91.2	NE	3	27°01'04"	94°57'03"
5	GW5	Mohangaon	Hand Pump	94.7	N	6	27°01'56"	94°55'58"
6	GW6	Solapathar	Hand Pump	91	NW	5	27°01'29"	94°54'38"
7	GW7	Madhurapur	Hand Pump	90.6	SW	4	26°58'23"	94°54'28"
8	GW8	Singloo	Hand Pump	87.3	SE	3.5	26°57'29"	94°56'21"
9	GW9	Naharhobi	Hand Pump	81.9	W	8	26°59'35"	94°50'42"
10	GW10	Chasmutiya	Hand Pump	80.3	SW	7	26°58'59"	94°50'10"
Surface Water								
1	SW1	Suffry	River (Upstream)	82.8	NE	0.5	26°59'26"	94°56'11"
2	SW2	Suffry	River(downstream)	78.5	NNW	6	27°02'07"	94°54'31"
3	SW3	Disang	River (Up stream)	80.9	NNW	7	27°02'47"	94°54'52"
4	SW4	Disang	River(downstream)	80.7	NNW	6	27°02'08"	94°54'22"

The water samples collected from the above locations were analyzed for important major & minor ions and the analytical results of the water samples were compared with IS: 10500 drinking water standards and the results are shown in **Tables 3.6**.





Table 3.6  
Water Sample Analysis Results

S. No	Parameter	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10	SW1	SW2	SW3	SW4
1	pH	8.13	8.55	8.01	8.35	8.47	8.34	7.84	8.34	8.25	6.79	6.58	7.3	7.34	7.01
2	Elec. Cond	160	194	143	241	314	310	187	238	286	178	156	137	83	102
3	Colour	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4	TSS	34	25	39	39	34	34	38	15	21	24	12	<10	21	12
5	Total Dissolved solids	101	122	90	152	198	195	118	150	180	112	98	86	52	64
6	Turbidity	0.1	29.1	0.1	0.1	1	3.2	3.2	1	37.3	3.7	1.2	1.1	58.9	3.8
7	Total Hardness	62	79	60	78	114	115	70	86	109	74	66	57	36	42
8	Iron as Fe	<0.1	1.63	<0.1	<0.1	0.14	0.69	0.13	0.46	4.66	0.45	<0.2	<0.2	<0.2	<0.2
9	Chlorides as Cl <sup>-</sup>	22	24	19	30	40	40	22	30	35	22	22	19	10	13
10	Sulphates as SO <sub>4</sub>	12	18	10	25	25	25	15	25	28	15	12	12	7	8
11	Calcium as Ca	15	17	11	15	19	23	15	16	19	15	15	11	8	10
12	Magnesium as Mg	6	9	8	10	16	14	8	11	15	9	7	7	4	4
13	Fluoride as F	<0.1	0.38	0.12	0.53	1.16	0.33	<0.1	<0.1	<0.1	<0.1	<0.1	3.1	1.43	1.67
14	Alkalinity as CaCO <sub>3</sub>	37	45	34	52	75	72	47	50	65	42	34	28	20	23
15	Sodium as Na	8	8	5	13	19	17	10	15	15	7	5	5	2.5	3.5
16	Potassium as K	0.9	1	0.5	1.6	0.8	1.6	1.2	1.1	0.8	0.8	0.8	0.5	0.4	0.5
17	Hexavalent chromium as Cr6+	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2
18	Copper as Cu	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
19	Zinc as Zn	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
20	Nitrate as NO <sub>3</sub>	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	0.11
21	COD	-	-	-	-	-	-	-	-	-	-	<80	<80	<80	<80
22	BOD	-	-	-	-	-	-	-	-	-	-	<4	<4	<4	<4
23	DO	-	-	-	-	-	-	-	-	-	-	7.2	7.1	6.9	7.3



EIA for proposed 70 MW Lakwa Replacement Power Project (LRPP) of APGCL at Mybella (V), Lakwa (T), Sivasagar (Dt), Assam (State)

Table 3.7

## Noise Monitoring Locations

S.No	Code	Name of the Station	W.R.T. Site		Latitude (North)	Longitude (East)
			Direction	Distance (Km)		
1	N1	Plant Site	-	-	26°59'08"	94°55'47"
2	N2	Plant Gate	-	-	26°59'13"	94°55'57"
3	N3	Suffry Hospital	NE	1.8	26°59'44"	94°56'56"
4	N4	Suffry School	NE	2.2	26°59'46"	94°57'02"
5	N5	Rangapathar	NNE	4	27°01'03"	94°57'02"
6	N6	Mohangaon	N	4.2	27°01'27"	94°55'58"
7	N7	Bhahatagaon	W	4	26°58'55"	94°53'38"
8	N8	Plant Quarters	S	0.5	26°58'58"	94°55'51"
9	N9	Madhurapur	SW	2.8	26°58'24"	94°54'29"
10	N10	Singloo	SSE	3.3	26°57'29"	94°56'21"
11	N11	Naharhobi	NW	8.7	26°59'35"	94°50'42"
12	N12	Chasmutiya	W	9.5	26°58'57"	94°50'12"

## 3.4.3 Regional Scenario

The values of noise observed in some of the rural areas are primarily owing to vehicular traffic and other anthropogenic activities. In rural areas wind blowing and chirping of birds would contribute to noise levels especially during the nights. The day equivalents during the study period are ranging in between 50.2 to 66.5 dB (A) and the night equivalents were in the range of 41.1 to 44.8 dB (A). From the results it can be seen that the Day equivalents and the Night equivalents were within the Ambient Noise standards of residential and industrial area standards.





Table 3.8  
Noise Levels in the Study Area – dB (A)

Time – Hours	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
1	40.2	42.0	41.2	41.3	41.0	41.6	40.5	40.6	40.1	41.8	41.4	41.3
2	40.6	42.8	41.6	41.7	41.4	42.0	40.9	41.0	41.2	42.2	41.8	41.7
3	45.1	47.1	42.6	42.2	42.0	43.0	41.8	42.0	40.9	42.7	42.3	42.7
4	43.8	47.7	43.1	42.7	43.1	43.5	45.3	42.5	43.2	41.5	42.8	43.2
5	45.4	48.3	45.0	43.2	43.6	45.4	45.8	43.0	43.7	43.0	47.6	43.7
6	47.4	48.8	46.5	43.9	43.7	46.9	46.4	43.5	45.0	45.2	49.0	44.2
7	56.9	54.8	51.8	44.0	48.1	50.2	49.7	49.0	50.9	48.7	51.5	49.8
8	59.4	60.3	53.1	45.1	49.0	52.5	51.1	52.8	52.4	51.8	54.0	53.6
9	68.4	68.2	54.2	49.6	50.2	54.2	53.2	54.0	54.5	53.8	56.1	54.8
10	71.8	68.2	54.8	50.7	51.1	55.2	51.4	55.2	55.6	57.7	57.1	56.1
11	71.6	67.8	54.3	53.2	48.6	52.4	50.9	54.2	52.3	58.6	57.2	55.1
12	68.1	66.0	54.0	53.0	47.6	52.1	52.6	53.2	53.9	56.8	57.7	54.0
13	66.8	64.7	48.6	52.2	45.8	47.0	52.0	51.4	52.9	53.9	55.2	52.2
14	67.6	58.3	47.2	51.1	46.7	45.6	49.5	50.5	50.7	52.3	55.9	51.3
15	70.1	64.7	47.6	53.3	51.9	50.1	50.2	52.4	53.3	53.2	54.7	53.2
16	63.1	65.4	51.5	53.9	55.2	54.2	53.0	53.3	54.3	56.0	55.2	54.1
17	63.6	55.7	58.4	52.0	56.3	47.3	49.1	52.4	55.2	57.3	56.1	53.2
18	57.3	50.7	55.5	52.5	50.6	44.4	47.2	49.8	52.3	56.0	55.2	50.5
19	54.4	50.0	50.0	48.6	45.6	43.5	45.3	47.9	51.5	54.1	49.7	48.6
20	52.5	49.1	49.1	45.7	44.7	42.6	44.4	47.0	51.0	52.9	50.6	47.7
21	54.4	48.5	48.2	45.2	43.8	41.7	43.9	45.1	49.7	49.0	45.6	45.8
22	46.4	45.0	45.0	43.2	41.6	41.1	43.0	43.9	48.8	45.8	43.4	44.6
23	42.7	43.8	45.4	41.8	41.2	40.6	42.1	42.5	48.0	41.4	42.7	41.2
24	41.5	40.3	44.9	41.0	41.0	40.2	41.3	41.7	46.9	40.9	38.4	38.4
Minimum	40.2	40.3	41.2	41.0	41.0	40.2	40.5	40.6	40.1	40.9	38.4	38.4
Maximum	71.8	68.2	58.4	53.9	56.3	55.2	53.2	55.2	55.6	58.6	57.7	56.1
Lday	66.5	63.5	52.9	50.8	50.3	50.6	50.2	51.8	52.8	54.7	54.8	52.6
Lnight	42.9	44.2	43.1	41.5	41.1	41.3	41.8	41.5	44.8	42.0	41.5	41.6
Ldn	64.8	62.0	52.9	51.0	50.6	50.9	50.8	51.7	53.6	54.0	53.9	52.3





EIA for proposed 70 MW Lakwa Replacement Power Project (LRPP) of APGL at Mybella (V), Lakwa (T), Sivasagar (Dt), Assam (State)

### 3.6 SOIL QUALITY

The present study on soil quality establishes the baseline characteristics in the study area surrounding the project site. The study has been addressed with the following objectives.

- To determine the base line characteristics
- To determine the soil characteristics of proposed project site.
- To determine the impact of industrialization/ urbanization on soil characteristics
- To determine the impacts on soils from agricultural productivity point of view.

#### 3.6.1 Criteria Adopted for Selection of Sampling Locations

For studying the soil types and soil characteristics, 10 sampling locations were selected to assess the existing soil conditions representing various land use conditions and geological features. The homogenized soil samples collected at different locations were packed in a polyethylene plastic bag and sealed. The sealed samples were sent to laboratory for analysis. The important physical, chemical parameter concentrations were determined from all the samples.

#### 3.6.2 Soil Sampling Locations

Details of the soil sampling locations are given in **Table 3.10**. The soil analysis results are shown in **Table 3.11**.

**Table 3.10**  
**Soil Sampling Locations**

Code	Name of the Station	Elevation in (M)	W.R.T. Site		Latitude (North)	Longitude (East)
			Direction	Distance(Km)		
S1	Plant Site	96.6	-	-	26°58'59"	94°55'51"
S2	Bhahatagoon	89.2	W	3.5	26°58'56"	94°53'37"
S3	Suffry	94.9	NE	1.5	26°59'29"	94°56'35"
S4	Rangapathar	97.1	NE	4	27°01'04"	94°57'02"
S5	Mohangaon	78	N	5.3	27°01'57"	94°55'59"
S6	Solapathar	97.7	NW	5	26°58'56"	94°53'37"
S7	Madhurapur	82.9	NNW	5.5	27°01'29"	94°54'28"
S8	Singloo	87.7	SE	4.5	26°57'28"	94°56'21"
S9	Naharhobi	81.4	W	8	26°59'36"	94°50'42"
S10	Chasmutiya	87	SW	7	26°58'56"	94°50'11"



Table 3.11  
Soil Analysis Results

S. No	Parameters	Unit	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	pH(10% Solution)	-	8.45	8.17	7.67	7.61	9.1	8.32	7.72	8.72	7.98	7.63
2	EC(10% solution)	μMho/cm	85	81	62	69	113	97	77	86	67	64
3	Total Carbon	%	1.53	2.01	1.85	1.42	1.68	1.3	1.3	1.94	1.56	1.8
4	Organic Carbon	%	1.15	1.51	1.39	1.07	1.26	0.98	0.98	1.46	1.17	1.35
5	Texture	-	Wet Lumps	Wet Lumps	Wet Lumps	Wet Lumps	Wet Lumps	Wet Lumps	Wet Lumps	Wet Lumps	Wet Lumps	Wet Lumps
6	Bulk Density	gr/cc	1.29	1.3	1.32	1.3	1.33	1.32	1.29	1.3	1.3	1.29
7	Sodium as Na	mg/ kg	64	90	95	104	152	84	88	45	82	80
8	Potassium as K	kg/ha	33.54	83.2	54.12	36.4	79.8	34.3	140.6	111.8	31.2	268.3
9	Lead as Pb	mg/ kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	Calcium as Ca	mg/ kg	275	173	244	189	244	291	212	259	196	298
11	Magnesium as Mg	mg/ kg	162	81	128	129	205	160	124	148	114	162
12	Chloride as Cl	mg/ kg	197	177	216	256	216	157	197	256	236	216
13	SAR	-	7.58	1.41	1.22	1.43	1.73	0.98	1.18	0.55	1.15	1.07
14	Total Nitrogen as N	%	0.13	0.24	0.13	0.12	0.22	0.27	0.13	0.1	0.2	0.1
15	Phosphates as P	Kg/Ha	1.6	7.5	2.6	3.8	5.2	2.0	7.2	3.5	2.4	1.6
16	Sulphates as SO <sub>4</sub> <sup>-2</sup>	mg/ kg	88.4	155	109	201	293	287	350	168	135	93