

# Environmental Monitoring Report

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Project No. 47101-002  
Semestral Report  
July–December 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 July 2016 to December 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,
iv.	Monitoring Period (Season / month)	July 2016 to Dec, 2016
v.	Report No.	02
vi.	Report for the period	July 2016 to December, 2016
vii.	Date of reporting	February 2017
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 DURING THE PERIOD OF JULY TO DECEMBER 2016**

- Detail Engineering of Civil, electrical and mechanical works along with Technical documents and Drawing for review / approval is going on. 90% of detailed engineering has been completed.
- Piling works started from 27.07.16 and 100% piling works completed for all areas. Completed piles in different areas are-Engine foundation: 112/112, Engine hall: 81/81 & Filter Platform: 20/20, Utility Building: 80/80, LO tank area: 10/10, Stack Foundation I: 16/16. Stack Foundation II: 16/16, Firewater tank: 60/60. Radiator: 26/30, Transformer area: 18/18.
- Casting of Engine foundation #01- #03 completed and PCC completed for Stack -I.
- Factory Acceptance Test (FAT) of all the seven engine gensets is completed.
- Third Party Inspection (TPI) of engine gensets is completed at Wartsila Factory, Vaasa, Finland by engaging M/S Tuv Sud South Asia Pvt Ltd Personnel.
- L/C for Offshore supply is established.
- Material Inspection and Clearance Certificates for gas engines is issued.
- Offshore equipment from Finland is dispatched, expected to reached at Haldia port by 08.02.17 and will be delivered at LRPP site by 1<sup>st</sup> week of April, 2017.
- Route Survey from Haldia port to Maibella site is completed.
- Complete Custom Duty Exemption Certificate is received from Govt of Assam and the same is handed over to the EPC contractor for availing zero custom duty.
- First Excise duty exemption certificate for onshore supply of items handed over to Wartsila India Pvt Ltd.
- Purchase Orders for the following items released by Wartsila India Pvt Ltd

### **Mechanical items**

- 3-way Dampers
- EOT Cranes
- Working air compressor

### **Electrical items**

- LV Switchgear
- MV Switchgear

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

### C. TABLE DETAILS OF WORK AWARD

Locations	Sub-project components (Package No.)	Starting date of Implementation	Projected months of completion	Schedule date of completion (Extended date of completion)	Physical progress (%) as on -----
Lakwa Thermal Power Station	70 MW (nominal) Lakwa Replacement Power Project	09 <sup>th</sup> March 2016	March 2018	Nil	21.60%

**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 measures needed	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.	<u>Works completed</u> 1) Detail Engineering of Civil, electrical and mechanical works along with Technical documents and Drawing for review / approval is going on. 90% of detailed engineering completed 2) Piling works started from 27.07.16 and 100% piling works completed for all areas 3) Casting of Engine foundation #01-#03 completed and PCC completed for Stack -I. 4) Offshore equipment from Finland is dispatched, expected to reached at Haldia port on 08.02.17 and will be delivered at LRPP site by 1 <sup>st</sup> week of April, 2017. <u>Works continued at site</u> a) RCC for Engine foundations b) Rebar/Formwork for Stack I c) Pile chipping for Stack II and Fire/Raw water tank d) Laying of cable conduits for Engine Hall area e) Radiator area vertical and lateral pile testing	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 dismantled and to be disposed of in a manner consistent with the requirements of the Government.	√		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.



Sl No	Environmental components related to project activities	Compliance		Explanation (in case of done or not done justification necessary)
	PRECONSTRUCTION STAGE			
		YES	NO	
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 and waste disposal facilities.	√		Being Complied. Contractors are advised to provide sanitary and waste disposal facilities at construction camp
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.	√		Being Complied.
17	Hiring of Environment and Social Consultant (s) by APGCL for implementation and monitoring of EMP.		√	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	Complied , Report submitted along with the Report no 1 (for the period Jan16 to June16)
	Construction Stage.	PM10, PM2.5, SO2, NOx, SPM, CO	Contractor	Two times	Test Report , enclosed as <b>Annexure A</b>
	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, P <sub>H</sub> , Oil and grease, Pb.,	Contractor/EA	One time	Complied , Report submitted along with the Report no 1 (for the period Jan16 to June16)
	Construction Stage.	EC, TSS, DO, BOD, P <sub>H</sub> , Oil and grease, Pb.,	Contractor	Three times/year	Test Report, enclosed as <b>Annexure B</b>
	Operation Stage	EC, TSS, DO, BOD, P <sub>H</sub> , Oil and grease, Pb.,	EA	Yearly	Will be monitored during operation stage.
Noise/ Vibration.	Pre-construction stage	Noise level [dB (A)]	Contractor/EA	One time	Complied , Report submitted along with the Report no 1 (for the period Jan16 to June16)
	Construction Stage.	Noise level [dB (A)]	Contractor	Two times/year	Test Report, enclosed as <b>Annexure C</b>
	Operation Stage.	Noise level [dB (A)]	EA	Three times/ year	Will be monitored during operation stage.
Soil	<b>Pre-Construction stage</b>	PH, Sulfate (SO <sub>3</sub> ), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	Contractor/EA	One time	Complied , Report submitted along with the Report no 1 (for the period Jan16 to June16)
	<b>Construction Stage.</b>	PH, Sulfate (SO <sub>3</sub> ), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	Contractor	Two times	Test Report, enclosed as <b>Annexure D</b>
	Operation Stage.	PH, Sulfate (SO <sub>3</sub> ), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	EA	One time	Will be monitored during operation stage.

\* APGCL also carried out Environmental Test to check the air, water and noise quality in the project area during July 2016. Copy of the report is enclosed as **Annexure E**.



# ग्रीन टेक एनवायर्नमेंटल इंजीनियर और कंसल्टेंट्स

## GREEN TECH ENVIRONMENTAL ENGINEER & CONSULTANTS

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House No-11, Champaknagar, Narayan Path, Bhetapara, Guwahati-781028, www.greentecheec.in  
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### TEST REPORT

Test Report No:	GEEC/FL/22/2016/12/08		Date of Reporting:	05/01/2017	
Customer Name:	Wartsila India Pvt. Ltd.		Lab. ID No.:	GEEC/AA/2016/12/15	
Customer Address:	Lakwa Replacement Power project(LRPP) Maibella, Assam		Date of Sampling:	20/12/2016 & 21/12/2016	
Sampling Location:	Near existing control room		Duration:	24 hours	
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle		Sample Receipt Date	22/12/2016	
Humidity	Max.	Min.	Ambient Temperature:	Max.	Min.
	98%	59%		24.1°C	12.1°C
Equipments Details:	Ecotech, RDS AAS Sampler 217 BL & ADS PM Sampler		Test Start Date:	22/12/2016	
Monitored By:	Mr.S Dutta		Test End Date:	26/12/2016	

### AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	62	100	IS 5182(23)
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	38	60	CPCB Guidelines
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	7	80	IS 5182(2)
4	Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	16	80	IS 5182(VI)
5	Ammonia(NH <sub>3</sub> )	µg/m <sup>3</sup>	32	400	CPCB Guidelines

\*\*\*\*\* End of Report \*\*\*\*\*

Authorised by: Lab -in-Charge

*Blahon*  
(Dr. Belinda Lahon)

The parameters tested on the specific date are found to be within the NATIONAL AMBIENT AIR QUALITY STANDARDS, CPCB NOTIFICATION DATED 18TH NOVEMBER, 2009

- \* The results relate only to the item tested.
- \* The test report shall not be reproduced except in full, without written approval of the laboratory .
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## TEST REPORT

Test Report No:	GEEC/FL/22/2016/12/09		Date of Reporting:	05/01/2017	
Customer Name:	Wartsila India Pvt. Ltd.		Lab. ID No.:	GEEC/AA/2016/12/16	
Customer Address:	Lakwa Replacement Power project(LRPP) Maibella, Assam		Date of Sampling:	20/12/2016 & 21/12/2016	
Sampling Location:	Radiator area		Duration:	24 hours	
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle		Sample Receipt Date	22/12/2016	
Humidity	Max.	Min.	Ambient Temperature:	Max.	Min.
	98%	59%		24.1°C	12.1°C
Equipments Details:	Ecotech, RDS AAS Sampler 217 BL & ADS PM Sampler		Test Start Date:	22/12/2016	
Monitored By:	Mr.S Dutta		Test End Date:	26/12/2016	

## AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	64	100	IS 5182(23)
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	36	60	CPCB Guidelines
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	<5	80	IS 5182(2)
4	Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	14	80	IS 5182(VI)
5	Ammonia(NH <sub>3</sub> )	µg/m <sup>3</sup>	21	400	CPCB Guidelines

\*\*\*\*\* End of Report\*\*\*\*\*

Authorised by: Lab -in-Charge

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(Dr. Belinda Lahon)

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## TEST REPORT

Test Report No:	GEEC/FL/22/2016/12/10		Date of Reporting:	05/01/2017	
Customer Name:	Wartsila India Pvt. Ltd.		Lab. ID No.:	GEEC/AA/2016/12/17	
Customer Address:	Lakwa Replacement Power project(LRPP) Maibella, Assam		Date of Sampling:	20/12/2016 & 21/12/2016	
Sampling Location:	Near Labour colony		Duration:	24 hours	
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle		Sample Receipt Date	22/12/2016	
Humidity	Max.	Min.	Ambient Temperature:	Max.	Min.
	98%	59%		24.1°C	12.1°C
Equipments Details:	Ecotech, RDS AAS Sampler 217 BL & ADS PM Sampler		Test Start Date:	22/12/2016	
Monitored By:	Mr.S Dutta		Test End Date:	26/12/2016	

## AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	48	100	IS 5182(23)
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	16	60	CPCB Guidelines
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	< 5	80	IS 5182(2)
4	Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	11	80	IS 5182(VI)
5	Ammonia(NH <sub>3</sub> )	µg/m <sup>3</sup>	15	400	CPCB Guidelines

\*\*\*\*\* End of Report \*\*\*\*\*

Authorised by: Lab -in-Charge

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### TEST REPORT

Ref. No.: GEEC/FL/23/2016/12/2	Date of Reporting:	31/12/2016
Customer Name:	Wartsila India Pvt. Ltd.	Lab. ID No.: GEEC/WS/16/12/02
Customer Address:	Lakwa Replacement Power project(LRPP) Maibella, Assam	Date of Sampling: 20/12/2016
Sampling Location: Radiator Area	Sample Receipt Date: 21/12/2016	
Sample Description: Waste Water	Test Start Date: 21/12/2016	
Sample Drawn By: Mr. S. Dutta	Test Completion Date: 26/12/2016	
Sample Condition: Fixed & Sealed	Sampling Method: GEEC/SOP/2	

SL. NO.	DESCRIPTION	METHOD	UNIT	RESULTS	LIMITS The Environment (Protection) Rules, 1986
1	pH	APHA 22nd Edn, 2012	-	6.25	5.5 - 9.0
2	TSS	APHA 22nd Edn, 2012	mg/l	96	100
3*	BOD	IS 3025 (Part 44):1993	mg/l	9	30
4	COD	APHA 22nd Edn, 2012	mg/l	25	250
5	Oil & Grease	APHA 22nd Edn, 2012	mg/l	<5	10

\*\*\*\*\* End of Report\*\*\*\*\*

Authorised by: Laboratory In-charge

*Blahon*

(Dr. Belinda Lahon)

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TEST REPORT

Ref. No.: GEEC/FL/23/2016/12/3	Date of Reporting:	31/12/2016
Customer Name:	Wartsila India Pvt. Ltd.	Lab. ID No.: GEEC/WS/16/12/03
Customer Address:	Lakwa Replacement Power project(LRPP) Maibella, Assam	Date of Sampling: 20/12/2016
Sampling Location: Behind Chimney Area	Sample Receipt Date: 21/12/2016	
Sample Description: Waste Water	Test Start Date: 21/12/2016	
Sample Drawn By: Mr.S. Dutta	Test Completion Date: 26/12/2016	
Sample Condition: Fixed & Sealed	Sampling Method: GEEC/SOP/2	

SL. NO.	DESCRIPTION	METHOD	UNIT	RESULTS	CPCB LIMIT
1	pH	APHA 22nd Edn, 2012	—	6.12	5.5 - 9.0
2	TSS	APHA 22nd Edn, 2012	mg/l	89	100
3*	BOD	IS 3025 (Part 44):1993	mg/l	6	30
4	COD	APHA 22nd Edn, 2012	mg/l	16	250
5	Oil & Grease	APHA 22nd Edn, 2012	mg/l	<5	10

\*\*\*\*\* End of Report\*\*\*\*\*

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(Dr. Belinda Lahon)

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Test Report No:	GEEC/WS/SLM/2016/12/01	Date of Reporting:	05/01/2017
Customer Name:	Wartsila India Pvt. Ltd.	Date of Sampling:	20/12/2016 & 21/12/2016
Customer Address:	Lakwa Replacement Power project(LRPP) Maibella, Assam	Monitored By:	Mr.S.Dutta

Sl. No.	Location	Sound Level (in dB(A) L <sub>eq</sub> )	
		Day time	Night time
<b>INSIDE INDUSTRIAL AREA</b>			
1	Near Existing Control Room	68.4	67.5
2	Near working Area (At source)	72.6	69.8
3	Radiator Area (Near site office M/s S. Sahewalla )	65.7	64.6
4	Near working Area (At source)	73.4	70.0
<b>OUTSIDE INDUSTRIAL AREA</b>			
9	Labour colony	48.2	37.8
11	Office Room (Wartsila India Pvt. Ltd.)	54.4	44.3
***** End of report *****			
CPCB Standards The Environment (Protection) Rules, 1986.			
Area		Residential	Commercial
Day Time (6am -10pm) Limit		55	65
Night time (22hrs – 06hrs)		45	55
Sl. No.	Type of Instrument	Model No.	Model Make
1	Sound Level Meter	SLM 4023SD	Lutron
For, GREEN TECH Environmental Engineer & Consultants			
 (Dr.Belinda Lahon) Laboratory In-Charge			

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## TEST REPORT

Test Report No:	GEEC/WIPL/2016-17/12/01	Date of Reporting:	05/01/2017
Customer Name:	Wartsila India Pvt. Ltd.	Date of Sampling:	20/12/2016
Customer Address:	Lakwa Replacement Power project(LRPP) Maibella, Assam		
Sampling Location:	Near Existing Control room	Time	9.30 Hrs -10.30 hrs

### Vibration Monitoring

Sl. No.	Parameters	Unit	Results	DGMS prescribed permissible limit of ground vibration		
				< 8 Hz	8-25 Hz	>25 Hz
1	Vibration (PPV)	mm/s	0.15	10	20	25

\*\*\*\*\* End of Report\*\*\*\*\*

Authorised by: Lab -in-Charge

*Belinda Lahon*  
(Dr. Belinda Lahon)

The parameters tested on the specific date are found to be complied

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## GREEN TECH ENVIRONMENTAL ENGINEER & CONSULTANTS

नारायण पथ, चम्पक नगर, गुवाहाटी, असम-781028

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Telefax -0361 2300278 Mobile: 9435046677, 9954089052, E-mail: green\_pranjal@hotmail.com, info@greentecheec.in

### TEST REPORT

Test Report No:	GEEC/WIPL/2016-17/12/02	Date of Reporting:	05/01/2017
Customer Name:	Wartsila India Pvt. Ltd.	Date of Sampling:	20/12/2016
Customer Address:	Lakwa Replacement Power Project(LRPP) Maibella, Assam		
Sampling Location:	Near Radiator Area	Time	10.30 Hrs -11.30 hrs

### Vibration Monitoring

Sl. No.	Parameters	Unit	Results	DGMS prescribed permissible limit of ground vibration		
				< 8 Hz	8-25 Hz	>25 Hz
1	Vibration (PPV)	mm/s	0.15	10	20	25

\*\*\*\*\* End of Report \*\*\*\*\*

Authorised by: Lab -in-Charge

*Belinda Lahon*

(Dr. Belinda Lahon)

The parameters tested on the specific date are found to be complied

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To,  
The Deputy General Manager, Project.  
LTPS, Maibella.

1<sup>st</sup> Feb '2017

Sub: Submission of Water soil test report -reg

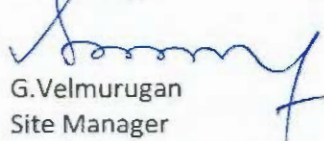
Ref: 22/LRPP (P/15302)/Wartsila

Dear Sir,

We are hereby submitting the soil test report as part of environment test report, since we didn't bring soil from outside the plant during the civil construction work and managed with soil available at the project site. As we have carried out the soil investigation test prior to commence our civil work which will be considered till the end of the project and there is no change in it.

Thanking you and we remain, assuring you our best services.

Yours truly,



G. Velmurugan  
Site Manager

CC: K. Manikumar- Project Manager

**Wärtsilä India Private Limited**  
**Registered Office**

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Tel. +91 22 2781 8300 / 8550  
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[www.wartsila.com](http://www.wartsila.com)  
CIN : U99999MH1986PTC062170



caving in. The bottom of excavation shall be checked against any heaving. The stagnating water from the excavated pit shall be conveniently drained out.

- 5.1.6 For seismic conditions the capacities provided above will require to be adequately modified as per Table-I of IS:1893-2002.

## 5.2 CHEMICAL TEST RESULTS

The soil samples were tested for pH, Chloride and Sulphate. pH values in soil varied between 6.6 to 6.9, Chloride concentrations varied between 266ppm to 390.1ppm. Sulphate was not detected in any of the soil samples.

The water samples were tested for pH, Chloride and Sulphate. pH values in water varied between 6.5 to 7.3, Chloride concentrations varied between 8.9ppm to 12.4 ppm. Sulphate was not detected in any of the water samples.

No precaution will be needed against chemical attack on concrete as outlined in IS:456. The chemical test results are provided in Annexure-A.

## 5.3 ELECTRICAL RESISTIVITY TEST

The average apparent resistivity values observed at ERT-1 test location had small variations and was observed to vary between 61.83  $\Omega$ -m and 67.23  $\Omega$ -m. At the ERT-2 location had large variation in apparent resistivity. Apparent resistivity decreased with increasing depth. The value of the apparent resistivity varied between 132.26  $\Omega$ -m to 21.43  $\Omega$ -m. Electrical resistivity test results are provided in Annexure-B.

## CBR RESULTS

The pit logs for the trial pits excavated are provided in Annexure-C. The proposed roads are internal roads, hence the minimum traffic load has been considered for the proposed road formation. The thickness of the road formation are based on CBR value of 5%. The







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### TEST REPORT

Test Report No:	GEEC/AA/2016/7/1	Date of Reporting:	26/07/2016
Customer Name:	Lakwa Thermal Power Station	Lab. ID No.:	GEEC/AA/2016/7/5
Customer Address:	APGCL, Maibella Sivasagar	Date of Sampling:	21/07/2016 & 22/07/2016
Sampling Location:	Guest House	Time of Monitoring:	9.45 am to 9.50 am
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle	Duration:	24 hours(approx.)
Wind Direction/ Weather Condition:	Cloudy	Ambient Temperature:	Max. Min. 30.9°C 26.3°C
Equipments Details:	Ecotech, RDS AAS Sampler 217 BL & ADS PM Sampler	Test Start Date:	22/07/2016
Monitored By:	Mr. S. Dutta	Test End Date:	26/07/2016

### AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	42	100	IS 5182(23)
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	19	60	CPCB Guidelines
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	8	80	IS 5182(2)
4	Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	16	80	IS 5182(VI)
5	Lead (Pb)	µg/m <sup>3</sup>	<0.01	1	IS 5182(22)

\*\*\*\*\* End of Report\*\*\*\*\*

Authorised by: Lab -in-Charge

*Belinda Lahon*

(Dr. Belinda Lahon)

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### TEST REPORT

Test Report No:	GEEC/AA/2016/7/2	Date of Reporting:	26/07/2016
Customer Name:	Lakwa Thermal Power Station	Lab. ID No.:	GEEC/AA/2016/7/6
Customer Address:	APGCL, Maibella Sivasagar	Date of Sampling:	21/07/2016 & 22/07/2016
Sampling Location:	New Colony	Time of Monitoring:	10.30 am to 10.20 am
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle	Duration:	24 hours(approx.)
Wind Direction/ Weather Condition:	Cloudy	Ambient Temperature:	Max. Min. 30.9°C 26.3°C
Equipments Details:	Ecotech, RDS AAS Sampler 217 BL & ADS PM Sampler	Test Start Date:	22/07/2016
Monitored By:	Mr. S. Dutta	Test End Date:	26/07/2016

### AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	39	100	IS 5182(23)
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	22	60	CPCB Guidelines
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	7	80	IS 5182(2)
4	Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	18	80	IS 5182(VI)
5	Lead (Pb)	µg/m <sup>3</sup>	<0.01	1	IS 5182(22)

\*\*\*\*\* End of Report\*\*\*\*\*

Authorised by: Lab -in-Charge

*Belinda Lahon*  
(Dr. Belinda Lahon)

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## TEST REPORT

Test Report No:	GEEC/AA/2016/7/3	Date of Reporting:	26/07/2016
Customer Name:	Lakwa Thermal Power Station	Lab. ID No.:	GEEC/AA/2016/7/7
Customer Address:	APGCL, Maibella Sivasagar	Date of Sampling:	21/07/2016 & 22/07/2016
Sampling Location:	Old Colony	Time of Monitoring:	10.45 am to 10.40 am
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle	Duration:	24 hours(approx.)
Wind Direction/ Weather Condition:	Cloudy	Ambient Temperature:	Max. Min. 30.9°C 26.3°C
Equipments Details:	Ecotech, RDS AAS Sampler 217 BL & ADS PM Sampler	Test Start Date:	22/07/2016
Monitored By:	Mr. S. Dutta	Test End Date:	26/07/2016

## AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	40	100	IS 5182(23)
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	19	60	CPCB Guidelines
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	6	80	IS 5182(2)
4	Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	19	80	IS 5182(VI)
5	Lead (Pb)	µg/m <sup>3</sup>	<0.01	1	IS 5182(22)

\*\*\*\*\* End of Report\*\*\*\*\*

Authorised by: Lab -in-Charge

*Belinda Lahon*  
(Dr. Belinda Lahon)

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## ANALYSIS REPORT - FLUE GAS

Test Report No:	GEEC/STK/LT/2016/07/1	Date of Reporting:	26/07/2016
Customer Name:	Lakwa Thermal Power Station	Lab ID No.	GEEC/STK/LT/2016/07/01
Customer Address:	APGCL, Maibella Sivasagar	Sampling Location:	Diesel Engine of GT#3
Date of Sampling:	21/07/2016	Monitored By:	Mr S.Dutta
Ambient Temperature:	30.2°C	Weather Condition:	Clear

## RESULT OF SAMPLING

Sl. No.	Parameters	Results
1	Temperature of Emission in degree Centigrade	156
2	Concentration of O <sub>2</sub> in %	9.70
3	Concentration of CO <sub>2</sub> in %	11.30
4	Concentration of CO in %	0.10
5	Concentration of SO <sub>2</sub> in mg/Nm <sup>3</sup>	< 4
6	Concentration of NO <sub>x</sub> in mg/Nm <sup>3</sup>	< 4

\*\*\*\*\* End of Report \*\*\*\*\*

Sampling Equipments Details:	Stack Monitoring Kit :	Model: SMS -4 Politech Instruments Pvt. Ltd.
	Orsat Apparatus:	Model: N.A.
Authorised by: Lab -in-Charge <i>Belinda Lahon</i> (Dr. Belinda Lahon)		
Remarks:	The above findings are based on reading collected on the specific date. The engines were running in full load at the time of testing and the parameters tested were within the CPCB limit.	

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### TEST REPORT

Ref. No.:	GEEC/WW/2016/07/1	Date of Reporting:	26/07/2016
Customer Name:	Lakwa Thermal Power Station	Lab. ID No.:	GEEC/WS/16/07/01
Customer Address:	APGCL, Maibella Sivasagar	Sampling Location:	ETP Outlet
Sample Description:	Waste Water	Date of Sampling:	21/07/2016
Sample Drawn By:	Mr. S. Dutta	Sampling Method:	GEEC/SOP/02
Sample Receipt Date: 22/07/2016		Test Start Date: 22/07/2016	Test Completion Date: 26/07/2016

Sl. No.	DESCRIPTION	PROTOCOL	UNIT	RESULTS	STANDARDS FOR THERMAL POWER PLANT
1	BOD (Bio Oxygen Demand)	IS 3025 (Part 44)	mg/l	12	30 (GENERAL STANDARD)
2	COD (Chemical Oxygen Demand)	APHA 22nd EDN 2012	mg/l	28	250 (GENERAL STANDARD)
3	Suspended Solids	APHA 22nd EDN 2012	mg/l	38	100
4	pH	APHA 22nd EDN 2012	-	6.7	6.5-8.5
5	Iron as Fe	APHA 22nd EDN 2012	mg/l	0.2	1
6	Copper	APHA 22nd EDN 2012	mg/l	< 0.01	1
7	Zinc	APHA 22nd EDN 2012	mg/l	0.2	1
8	Chromium Total	APHA 22nd EDN 2012	mg/l	< 0.01	0.2
9	Phosphorous (as Phosphate (total))	APHA 22nd EDN 2012	mg/l	< 1.0	5
10	Oil & Grease	APHA 22nd EDN 2012	mg/l	1.2	20

\*\*\*\*\* End of Report \*\*\*\*\*

Authorised by: Laboratory In-charge

*B. Lahon*

(Dr. B. Lahon)

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Report No: GT/SLM/LTPS/2016/07/01

Date: 26/07/2016

### SOUND LEVEL MONITORING

Sl. No.	Location	Date	Sound Level (in dB(A) L <sub>eq</sub> )	
			Day time (0600 – 2200)	Night time (2200 – 0600)
INSIDE INDUSTRIAL AREA				
	PH I Operating Floor (Source)	21.07.2016 & 22.07.2016	107.8	102.4
2	PH II Operating Floor (Source)		93.2	85.6
3	WH I Operating Floor (Source)		95.7	93.6
4	PH I Control Floor		68.2	65.6
5	PH II Control Floor		65.3	64.3
6	WH I Control Floor		62.8	60.2
7	Gas Compressor Cabin		74.5	74.3
8	Gas Compressor Operating Floor (Source)		97.5	92.3
OUTSIDE INDUSTRIAL AREA				
9	Gate No-2	21.07.2016 & 22.07.2016	62.2	57.8
10	Gate (Guest House)		54.4	50.7
11	Administrative Building		47.4	44.8

Remarks: Monitoring was done by **Sound Level Meter**. The sound level recorded are within the CPCB Limit.

*B. Lahon*

(Dr. B. Lahon)  
Lab in Charge

Green tech Environmental Engineer & Consultants