आईआरईएल (इंडिया) लिमिटेड
IREL (India) Limited
(Formerly Indian Rare Earths Limited)
(भारत सरकार का उपक्रम)
(A Govt of India Undertaking)
CIN : U15100MH1950GOI008187 Website : www.irel.co.in

Unleashing Values

TECHNOLOGIES FOR NEW INDIA@75
आज़ादी का अमृत महोत्सव

ISO 9001 : 2015, ISO 14001 : 2015 & ISO 45001-2018 Company

By Registered Post

TS/ENVR/01/ 3256A

25th September 2021

To

The Member Secretary,
State Pollution Control Board (SPCB), Odisha,
Dept. of Forest & Environment,
Government of Odisha,
Paribesh Bhawan, A- 118,
Nilakantha Nagar, Bhubaneswar - 751 012.

Sub: Environmental Statement of OSCOM & Rare Earth Extraction Plant (formerly named MoPP) for the financial year 2020-2021.

Dear Sir,

We are enclosing herewith two copies of Environmental Statement report for the financial year **2020-2021** for your information please.

Thanking you.

Yours truly,

For IREL (India) Limited

(A.J.Janarthanan)
CGM & HEAD, OSCOM

Copy :The Regional Officer,
State Pollution Control Board, Odisha
Dept. of Forest & Environment,
Government of Odisha,
Regional Office, IDCO Division, 2nd Floor,
Industrial Estate,Berhampur-760 008,Odisha.

: A copy of the same report is enclosed for information please

: Unit Head(OSCOM)'s file / TS.

उड़ीसा सैण्ड्स कांप्लेक्स, माटिखालो (डाक),छत्रपुर (गंजाम), ओड़िशा - 761045
Orissa Sands Complex, Matikhalo (P.O.),Chatrapur (Ganjam), Odisha - 761 045
फोन / **Tel. : 06811 - 257890 - 95** फैक्स / **Fax : 06811 - 257988**
पंजीकृत कार्यालय : प्लॉट नं. 1207, वीर सावरकर मार्ग, सिद्धिविनायक मंदिर के पास, प्रभादेवी, मुंबई - 400 028
Regd. Office : Plot No. 1207, Veer Savarkar Marg, Near Siddhivinayak Temple, Prabhadevi, Mumbai - 400 028

Unleashing Values

स्वच्छ भारत
एक कदम स्वच्छता की ओर

ISO:9001:2015
ISO:14001:2015
ISO:45001:2018

ENVIRONMENTAL STATEMENT

For the year 2020-21

September 2021

IREL (India) Limited
Orissa Sands Complex
Matikhalo, Chatrapur, Odisha-761 045

FORM - V"
(See Rule 14)

Environmental Statement for the financial year ending the 31st March 2021.

PART - A

(i)Name and address of the owner/Agent: A.J.Janarthanan
Occupier of the industry CGM & Head, OSCOM
Operation or process. IREL (India) Limited.
Orissa Sands Complex
Matikhalo,Chatrapur,
Dist. -Ganjam (Odisha)
PIN - 761 045

(ii) Industry category : Major scale Industry

(iii)Production capacity : Product Quantity (t/month)

OSCOM

As per consent order no 636/18-19 dated 01.03.2019,
Beach sand mineral products (Ilmenite, Rutile, Zircon, Sillimanite, Garnet,Monazite) : 30850(t/Month)

Zirconia/Stabilised Zirconia/zirconium chemicals : 0.29

As per consent order no 2794 dated 03.03.2018,
Rare Earth Extraction Plant (REEP)(t/ Mon)

Tri-Sodium Phosphate	:	1125
Ammonium Di-uranate (Nuclear grade)	:	2.16
Thorium oxalate	:	166.66
Thorium nitrate/oxide	:	12.5
Rare Earth Chloride	:	864.58

(iv) Year of establishment:

Dredge & Wet upgradation plant (D&WUP)-		October 1986
Mineral Separation Plant (MSP)	-	October 1986
*Thorium Plant (TP)	-	February 1992
(*: Merged with REEP)		
Zirconia semi Pilot Plant (ZPP)	-	December 2000
Rare Earths Extraction Plant		
(Earlier named MoPP)	-	August 2013

(v) Date of last environmental Statement submitted : September 25, 2020 **Vide our letter No.TS/ENVR/01/2770A**

PART - B

Water and Raw Material Consumption:

(1) **Water consumption(average),m^3/day** :

	Mining	MSP	REEP	BOILER	ZPP**
Process	1000*	1083.65	152.65	241.06	Nil
Cooling	0	0	40	0	Nil
Domestic		139.05 m^3/day for OSCOM & REEP and 416.2 m^3/day for IREL Housing Colony			

* About 90% of the water, after slurry transportation, is taken back to the Pond (in mining area). Thus, the actual water consumed is worked out to be 10% of the total quantity during slurry transportation from mining area to MSP.

'**' : ZPP was not under operation during the year 2019-20.

		Water consumption per unit of products	
1	Nature of Products	2	3
		During the year 2019-20	During the year 2020-21
(1)	Per ton of heavy minerals(MSP) (Ilmenite, Rutile, Zircon, Monazite, sillimanite, Garnet)	1.21m^3	1.14m^3
(2)	Per ton of total products of REEP i.e. Thorium nitrate, Rare earths chloride, Tri-Sodium phosphate	3.28 m^3	6.1 m^3*
(3)	Per Kg of Zirconia/Zirconium basic Sulphate (intermediate product)	NIL	NIL

Note:

i. Water consumption per unit of products has been assessed on the basis of total production of heavy mineral combined product and fresh water consumed.

ii. The water consumption for production of the total heavy mineral production in MSP is nearly same to the previous year.

iii. A major part of water was recycled from Pond No.1/Dredge pond for MSP process.

iv. Water consumption per unit of products in REEP has been assessed based on the total production of REEP and fresh water consumed . *Since the Rare Earths Chlorides are sold in the form of RECl3 solution with more than 200 g/l and also there is an increase in production from previous year hence the water consumption is increased Per ton of total products of REEP.

(2) Raw Material Consumption:

i. For OSCOM operation :

Sl. No.	*Nature of raw Material*		*during the year 2019-20*	*during the year 2020-21*
1	**Mining Plants**			
1.1	Raw sand, t	(for production of upgraded heavy minerals consisting of ilmenite, rutile, zircon, monazites sillimanite & garnet.	6.57	6.4
	Raw material consumption per ton of product output			
2	**MSP**			
2.1	Furnace oil,L	-do-	16.00	16.9
2.2	Sodium chloride, Kg	(for production of sillimanite)	1.43	1.58
2.3	Soda ash,Kg	-do-	0.96	0.49
2.4	Sodium silicate,Kg	-do-	0.33	0.48
2.5	Oleic acid,Kg	-do-	0.89	0.66
2	**ZPP (*Raw material consumption per Kg of product output*)**			
3.1	Zircon frit, Kg (avg. ZrO_2:60%)	(for production of zirconia/equivalent products interim products)	*Nil	*Nil
3.2	Hydrochloric Acid, Kg (~30% conc),	-do-	*Nil	*Nil
3.3	Sulphuric acid, L (~98% conc.),	-do-	*Nil	*Nil
3.4	Ammonia, Kg	-do-	*Nil	*Nil
3.5	Magnesium nitrate, Kg	-do-	*Nil	*Nil
3.6	Sodium hydroxide Flakes, Kg,	-do-	*Nil	*Nil
3.7	High speed diesel (HSD), L	-do-	*Nil	*Nil
3.8	Yttrium oxide, Kg	-do-	*Nil	*Nil
3.9	Hydrated lime, Kg	(for effluent neutralization.)	*Nil	*Nil

Note:

a. In the case of consumption of raw materials in DWUP & MSP (such as raw sand & furnace oil respectively) given is for the production of one ton heavy minerals.

b. The consumption of input chemicals like furnace oil, sodium chloride, sodium silicate in MSP are slightly more than previous year whereas soda ash & oleic acid has reduced.

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c. Number of day's plant operated during the year **2020-21:**

Mining: 365 **days**, MSP: 356 **days**, ZPP : NIL

ii. For Rare Earth Extraction Plant operation:

Sl. No.	*Raw material consumption per ton of product output*			
	Nature of raw Material		***during the year 2019-20***	***during the year 2020-21***
3	**Rare Earth Extraction Plant**			
1.1	Monazite, t	For processing & production total products in REEP	0.459	0.429
1.2	Hydrochloric acid (~30% w/w), t	For processing & production total products in REEP	0.742	0.64
1.3	Caustic lye, t	For processing & production total products in REEP	0.82	0.759
1.4	Barium chloride, Kg	For production of Rare earths chloride.	17.1	8.2
1.5	Sodium sulphide, Kg		9.4	6.9
1.6	Magnesium sulphate, Kg		16.82	4.8
1.7	Thorium oxalate, t	For production of Thorium nitrate	3.2	2.4
1.8	Soda ash, t		1.4	4.4
1.9	Hydrogen peroxide, t		0.029	0.004
1.10	Petrofin, Kg	For production of Thorium nitrate, Thorium oxalate& Ammonium di-uranate(ADU)	4.73	7.58
1.11	Nitric acid, t	For production of Thorium Nitrate &ADU	4.91	7.5
1.12	Alamine, t		0.09	0.13
1.13	Tri-n-butyl phosphate (TBP), t	For production of Thorium nitrate, &ADU	0.13	0.03
1.14	Ammonia, t	For production of ADU	0.23	0.31
1.15	Oxalic Acid,t	For production of Thorium oxalate	0.25	0.26

Sl. No.	*Raw material consumption per ton of product output*			
	Nature of raw Material		*during the year 2019-20*	*during the year 2020-21*
4.	**Boiler** ***(Raw material consumption per ton of steam output)***			
4.1	Coal,t	For steam generation	0.23	0.22
4.2	Furnace oil, Kg		Nil	NIL
4.3	Sodium hydroxide, Kg	For regeneration in DM Plant	3.2	1.5
4.4	Hydrochloric acid (~30% w/w), L	For regeneration in DM Plant	2.58	1.1

Note:

a. During the year 2020-21, 4615 ton of Monazite was processed and products e.g. 5418 ton of Tri-sodium phosphate, 4433 ton of Rare Earths Chloride,921 ton Thorium oxalate & 6.02 ton of Nuclear Grade (NGADU) and 20.70 ton Thorium nitrate products were produced.

b. Consumption norm of the raw materials/chemicals,such as Monazite, Hydrochloric acid, Barium Chloride, Sodium Sulphide, Thorium oxalate, caustic lye, TBP used were less than that of the previous year. However, for chemicals such as Soda ash, Nitric acid, Petrofin, Alamine, Ammonia were marginally higher.

c. The coal fired Boiler was operated for meeting the steam requirement of REEP.

d. Number of days plant operated during the year **2020-21:**

REEP (earlier named MoPP): 335 **days**, Boiler: 319 days.

PART - C

Pollution discharged to environment/unit of out put

Parameters as specified in the Consent issued

Pollutants	Quantity of pollutants, Pollutants discharged	Percentage of variation from prescribed standards with reasons
(a) Water		
MSP	1057 m^3/day	Nil*(all parameter are with in limit)
ZPP	Nil	
Boiler & DM Plant	9.4 m^3/day	
REEP(earlier named MoPP)	8.2 m^3/day	Nil#

Note:

i. The volume of waste water / treated effluents discharged are below 6400 **m^3/day** for OSCOM Plants.(as specified in consent)

ii: The volume of treated effluents discharged are below 30 **m^3/day** for Rare Earth Extraction Plant.(as specified in consent)

iii. Waste water containing slime, generated in MSP, was discharged to our Pond No.1/dredge pond.

iv. The effluent generated in Boiler & DM were neutralized and discharged to Pond No.1/dredge pond after effluent treatment.

v. The non-nitrate effluent (2932 **m^3**), generated in REEP, were neutralized, chemically treated, filtered, mixed with pond no1 and reused at MSP. The cake after filtration was stored in underground RCC trenches, as approved by AERB.

vi. Nitrate bearing effluent (61.5 **m^3**) was stored in impervious storage ponds under shed. After drying, the sodium nitrate crystals were stored in RCC trenches along with low level radioactive wastes.

vii. The qualities of effluents discharged in Pond No.1/Dredge pond & ETP outlet/pond 2 are given Under "Effluent quality".

EFFLUENT QUALITY (2020-2021):

The waste water/ treated effluent quality analysis for two discharge outlets i.e. Pond No.1/Dredge pond & ETP outlet/pond 2 was taken up by M/s Centre for Envotech & Management Consultancy Pvt. Ltd.,Bhubaneswar, a NABL Accredited & MoEF & CC Authorized Laboratory.
Total 24 numbers of samples were analyzed (12 for each outlet). The range of values obtained for different parameters on half-yearly basis for are well within the prescribed norm & is given in **annexure-I (Consists of 8 pages)**

Air QUALITY (2020-2021):

The emission monitoring for the stacks attached to the dryers, shaft dryers of MSP, REEP & Boiler was taken up by M/s Centre for Envotech & Management Consultancy Pvt.Ltd., Bhubaneswar, a NABL Accredited & MoEF & CC Authorized Laboratory.
The range of values obtained for different parameter on half-yearly basis are well within the prescribed norm & is given in **annexure-II (Consists of 2 pages)**

Note : During the period, number of measurements carried out was 144 for MSP, 48 for REEP & 24 for Boiler. The mean value for PM in all stacks & acid mist for REEP stack were lower than the stipulated limits i.e. 150 mg/m^3 for (for all stacks except REEP) & 50 mg/m^3 for REEP stack are given in **annexure-II (Consists of 2 pages)**

PART - D

HAZARDOUS WASTES

[As specified under Hazardous wastes/ Management and Handling Rules, 1989& Amendment thereof]

Authorization No. Ind/IV/HW-13527 dated 17th Dec 2019.

Hazardous Wastes		Total Quantity	
		during the year 2019-20	during the year 2020-21
(a) From Process :			
i.	Used oil, KL	1.2	3.9
ii.	Waste containing oil	1.0	0.0
ii.	Oily Sludge	**Nil**	**Nil**
iii.	Spent resin	**Nil**	**Nil**

(b).Used batteries, No.	44	235*
©From effluent treatment	Covered under radioactive wastes	
(d)Non-ferrous scrap(burnt Cu wire), Kg	Nil	NIL

*: 235 numbers were disposed under buy-back.

PART - E

SOLID WASTES

Solid wastes		Total Quantity	
		during the year 2019-20	during the year 2020-21
(a) From Process :			
i.	Reject Sand from mining, t	32,18,912	32,83,428
ii.	Reject sand from MSP (including HUS),t	1,04,736	1,31,272
iii.	Boiler ash, t	10905	7412
iv.	Rare Earth Extraction Plant,		
	Lead-Barium(Pb-Ba) cake(radioactive), t	724	470
	Iron-Carbonate cake(radioactive),t	371	191.77
	Insoluble muck (radioactive),t	667	908.34
	ETP Cake(radioactive),t	301	58.8
	Deactivated sludge(radioactive),t	NIL	NIL
(b) From pollution control facilities :			
i.	Neutralization sludge, m^3	Nil	NIL
(c) Quantity recycled or reutilized within the unit		Nil	NIL
(d) Sold		Nil	NIL
(e) Disposal		Details as given in page 21.	

Note: HUS: Heavies Upgradation Section

PART – F

Please specify the characterizations (in terms of composition and quantum) of Hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

I. Characteristics of Hazardous Wastes & disposal practices :

a. Used oil:
The oil generated from vehicles/transformers/lubrication is stored in impervious pits / containers under cover shed with adequate capacity having spill containment facility. The hazardous wastes are sold only to genuine recycler / re-processors having valid authorization and registration from the State Pollution Control Board, Odisha or concerned SPC Board.

b. Used batteries:
The used batteries, generated from vehicles & UPS systems, are stored under shed on impervious floor (in Stores go-down). 235 numbers of used batteries were disposed under buy-back policy to the manufacturer/authorized dealers during 2020-21.

II. Characteristics of solid wastes:

(i) Reject Sands: Average composition of tailings (process rejects), %

The tailings generated from mining and MSP operations had the following average composition during the year:

Constituents	Mining	MSP (HUS tails)
Ilmenite %	0.31	3.19
Garnet %	1.87	26.83
Monazite %	0.00	0.07
Rutile %	0.03	0.51
Zircon %	0.02	0.30
Sillimanite %	1.06	15.50
Quartz %	96.54	52.71
Others %	0.17	0.89

(HUS: Heavies Up gradation Section)

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(iii) Solid Waste from Rare Extraction Plant (REEP):

The composition of the waste generated during the year had the following average composition:-

Rare Earth Extraction Plant,	Moisture%	ThO_2%	REO %	U_3O_8%
Lead-Barium(Pb-Ba) cake	31.87	10.0	8.83	0.11
Iron-Carbonate cake	67.21	0.65		0.11
Insoluble muck	27.24	4.23	5.33	0.07
ETP Cake	34.60	1.8	13.8	0.18

'*' : BDL : Below detection level is less than 0.0001%.

(ii) Boiler Ash: Average composition, %

Constituent calculated as oxides	% by weight(as such basis)		
	Collected on 18.7.2020	Collected on 15.11.20	Collected on 11.02.2021
SiO_2	53.8	53.9	53.4
Al_2O_3	19.6	20.4	20.3
Fe_2O_3	7.8	7.3	7.5
Moisture	2.4	2.3	2.3
LOI	2.5	2.4	2.5
CaO	10.9	10.8	11.0
MgO	2.51	2.41	2.5
MnO	<0.001	<0.001	<0.001
V_2O_5	<0.001	<0.001	<0.001
Cr_2O_3	<0.001	<0.001	<0.001

Disposal practices :

i. Tailings from mining operation were used for back filling of mined out areas.
ii. MSP tailings are stockpiled in mined out area for future use as sub grade ore.
iii. Boiler ash was shifted to ash storage pond in mined out area.
iv. All the radioactive wastes generated in REEP, are handled & stored in RCC trenches as per the Atomic Energy Regulatory Board (AERB) Authorization No. AERB/OPSD/IREL-O/61011/2020/398 dated 28.5.2020 and the return submitted to AERB as per Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987 and amendments thereon.

PART - G

Impact of the pollution control abatement measures taken on conservation of natural resources and on the cost of production.

- Pollution control equipments like cyclones, bag filters, scrubbers etc. have been provided in different plants for reducing atmospheric emissions.
- Stack heights are maintained as per OSPCB norms. Roof extractors and exhaust fans are provided to keep the work-zone air quality clean.
- No untreated effluent was released into the environment.
- Cost of pollution control has already been included in the project cost.
- The wastes generated at Rare Earth Extraction Plant, both solid & liquid wastes, are handled, disposed as per the requirement of Atomic Energy Regulatory Board(AERB) and the returns are submitted to AERB as per (Safe Disposal of Radioactive Wastes) Rules,1987 and amendments thereon.
- Radioactive solid wastes from REEP are presently stored in underground RCC trenches.
- The sodium nitrate solution, generated in Rare Extraction Plant (REEP), was stored in sodium nitrate storage pond (lined). Time to time, the solution was pumped to solar evaporation ponds(lined) to reduce the volume (due to evaporation) and to increase the sodium nitrate content in the solution. After drying, the Sodium Nitrate salts were stored in RCC Trenches along with radioactive solid wastes.
- The ambient air monitoring were carried out in five permanent locations around OSCOM at a frequency of 3 times in a month during 2020-21 and the monitoring results have indicated that the air quality even in close proximity of the plant areas are well within the stipulated levels for PM_{10}, SO_2, NO_x& CO.
- Monitoring of surface /ground waters around the plant has also shown that the various constituents are within the limits.

- During the year, 22.5 ha area was mined. Trees number 53800 (Casuarina Cashew, date palm, coconut saplings) were planted in mined out area of 21.76 ha (details are mentioned in page number 24).

- Efforts have been underway to conserve water. Artificial recharge structures have already been constructed as approved by Central Ground Water Board, Bhubaneswar for effective rainwater harvesting in Plant premises as well as in IREL Housing Colony area.

PART - H

Additional measures/investment proposed for environmental protection including abatement of pollution, prevention of pollution.

- The expenditures incurred for environmental & pollution control measures were Rs.411.38 lakhs both for OSCOM & Rare Earth Extraction Plant (REEP) respectively which includes effluent treatment, solid waste disposal, stack emission, ventilation systems, green belt development, floor tiling at MoPP for radiation control, health checkup (occupational & nearby village population), payment of Water Cess/Consent fees to Odisha State Pollution Control Board, Corporate Social Responsibility(CSR) activities and other miscellaneous expenditures for environmental protection.

- Budget allocation of Rs 25 Lakh has already been made for planting about 53,800 numbers of trees during the year 2020-21.

PART – I

Any other particulars for improving the quality of the environment.

- Environment Management Cell is existing and functioning. In addition, quarterly Environment Management Review meetings are being conducted to review and monitored the implementation of the recommendations made by various Regulatory Agencies and the progress of requirements as per ISO 14001:2015.

- Technical Services Department of OSCOM and Health Physics Unit of Bhaba Atomic Research Center (B.A.R.C) oversee the pollution control activities and carry out necessary monitoring of the waste arising as well as other environmental aspects. Proper evaluation of the monitoring data, early identifications of trends and appropriate remedial activities are being carried out to ensure environmental protection.

AFFORESTATION AND GREEN BELT DEVELOPMENT IN OSCOM

YEAR	Area mined (Ha)	Area planted in, (Ha)			No. of trees Planted		
		Mined out area	Others (Plant & colony)	Total	Mined out area	Others (Plant & colony)	Total
1987-88	4.0	7.0	--	7.0	14,000	--	14,000
1988-89	5.0	10.0	--	10.0	20,000	--	20,000
1989-90	8.0	7.5	--	7.5	15,000	--	15,000
1990-91	6.0	3.0	--	3.0	6,000	--	6,000
1991-92	12.0	8.5	--	8.5	16,500	--	16,500
1992-93	8.0	14.5	--	14.5	29,000	--	29,000
1993-94	6.67	9.88	--	9.88	25,000	--	25,000
1994-95	12.92	8.23	3.0	11.23	40,000	8,500	48,500
1995-96	16.94	8.5	--	8.5	42,000	--	42,000
1996-97	11.7	8.5	2.0	10.5	40,000	6,000	46,000
1997-98	15.5	8.5	3.0	11.5	40,000	5,000	45,000
1998-99	14.16	9.0	4.4	13.4	45,000	5,000	50,000
1999-2000	12.42	5.0	--	5.0	50,900	--	50,900
2000-2001	20.94	7.5	1.5	9.0	74,800	3,575	78,375
2001-2002	13.12	10.23	--	10.23	80,000	1,959	81,959
2002-2003	14.51	16.8	--	16.8	75,300	--	75,300
2003-2004	17.25	18.5	Avenue plantation	18.5	82,000	400	82,400
2004-2005	26.76	18.0	Avenue plantation	18.0	80,000	500	80,500
2005-2006	21.02	17.0	0.24	17.24	75,600	5,500	81,100
2006-2007	25.2	21.47	0.13	21.6	95,553	5,500	1,01,053
2007-2008	22.11	22.68	--	22.68	1,00,583	229	1,00,812
2008-2009	24.62	16.95	Avenue plantation	16.95	75,130	5,400	80,530
2009-2010	28.45	24.89	--	24.89	1,10,623	--	1,10,623
2010-2011	28.73	13.79	--	13.79	59,482	--	59,482
2011-2012	25.03	18.61	--	18.61	84,523	--	84,523
2012-2013	26.55	16.0	0.5	16.5	60,674	640	61,314
2013-2014	24.86	10	--	10	62,870	--	62,870
2014-2015	35.42	20	0.12	20.12	54,500	300	54,800
2015-2016	32.78	22	0.5	22.5	54,000	500	54,500
2016-2017	29.44	32	0.2	32.2	80,000	200	80,200
2017-2018	33.32	16	0.2	16.2	40600	200	40800
2018-2019	63.50	22.0	0.1	22.1	54900	200	55100
2019-2020	24.28	23	0.6	24.88	56000	600	56600
2020-2021	22.5	20.23	1.53	21.76	50000	3800	53800

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Annexure-I

P-118

CENTRE FOR ENVOTECH AND MANAGEMENT CONSULTANCY PVT. LTD.

An ISO 9001-2008 & OHSAS 18001:2007 Certified Company, Empanelled with OCCL, ORSAC and SPCB of Govt. of Odisha
Accredited by NABET, QCI for EIA Studies as 'A' Category Consultant Organization.
Empanelled with PCCF(Wildlife) &CWLW,Odisha
Enlisted in CIDC (established by the Planning Commission Govt. of India), NABL
MoEF&CC, Govt. of India, Recognised Environment Laboratory under Environment (Protection) Act, 1986.

Certificate No.-TC 6646

Report no.-CEMC/IREL/WW1 **Date-20.11.2020**

EFFLUENT WATER QUALITY MONITORING TEST REPORT

Name & Address of the Client : **M/sIREL(India)Limited, Matikhala, Chatrapur, Ganjam, Odisha**

WorkOrderNo. : **R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1344, Dated-12.09.2019**

SamplingPeriod : April' 2020 to September'2020

Samplingby : Mr.S Pradhan & Mr. RDas

SampleDescription : **Treated Effluent Quality(Pond-1)**

SampleQuantity : 2.0Ltrs

ANALYSIS RESULT

Sl. No	Parameter	Unit	Permissible Norms by CPCB	Apr	May	June	July	August	September	Max	Min	Avg	SD
1	pH Value	--	5.5 to 9.0	7.28	7.46	6.53	6.62	7.41	7.68	7.68	6.53	7.16	0.47
2	Temp	°C	--	29.8	30.4	31.7	31.8	31.2	29.9	31.8	29.8	30.80	0.89
3	Turbidity	NTU	--	8	11	9	10	16	12	16	8	11.00	2.83
4	Colour	Hazen	--	5	5	5	5	10	10	10	5	6.67	2.58
5	Alkalinity	mg/l	--	96	102	96	98	102	108	108	96	100.33	4.63
6	TDS	mg/l	--	264.2	282.6	271.4	262.2	231.4	242.2	282.6	231.4	259.00	18.93
7	TSS	mg/l	100	12.8	17.4	12.6	15.2	21.2	23.4	23.4	12.6	17.10	4.45
8	O&G	mg/l	20	<5	<5	<1	<1	<1	<1	<1	<1	<1	<1
9	BOD	mg/l	100	3.4	3.2	3	3.2	3.8	4.2	4.2	3	3.47	0.45
10	COD	mg/l	250	20	24	20	25	30	25	30	20	24.00	3.74
11	DO	mg/l	--	5.2	4.8	5.6	5.4	5.2	5	5.6	4.8	5.20	0.28
12	Chloride	mg/l	--	31.9	33.6	31.9	29.9	26.9	36.9	36.9	26.9	31.85	3.37
13	Sulphate	mg/l	--	11.1	12.3	11.7	10.2	8.2	10.2	12.3	8.2	10.62	1.44
14	Fluoride	mg/l	15.0	0.12	0.13	0.13	0.12	0.11	0.13	0.13	0.11	0.12	0.01
15	TH	mg/l	--	106	120	112	108	100	106	120	100	108.67	6.77
16	Calcium	mg/l	--	28.86	33.67	32.06	31.26	29.6	29.66	33.67	28.86	30.85	1.82
17	Magnesium	mg/l	--	8.3	8.75	7.78	7.29	6.32	7.8	8.75	6.32	7.71	0.84
18	Sodium	mg/l	--	31.2	31.9	30.2	29.8	26.2	29.6	31.9	26.2	29.82	1.98
19	Potassium	mg/l	--	10.8	11.2	10.4	9.4	8.9	10.2	11.2	8.9	10.15	0.86
20	TN#	mg/l	--	2.7	2.9	2.5	2.6	2.8	3.4	3.4	2.5	2.82	0.32
21	Diss PO_4	mg/l	--	0.32	0.34	0.31	0.32	0.38	0.39	0.39	0.31	0.34	0.03
22	Iron	mg/l	3.0	0.39	0.41	0.38	0.36	0.32	0.37	0.41	0.32	0.37	0.03
23	Copper	mg/l	3.0	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
24	Cadmium	mg/l	2.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Lead	mg/l	2.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
26	Zinc	mg/l	15.0	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
27	TCr	mg/l	2.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
28	Cr^{+6}	mg/l	1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
29	C_6H_5OH	mg/l	5.0	<0.001	<0.001	<0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001
30	RFC#	mg/l	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31	TKN#	mg/l	100	1.22	1.28	1.25	1.22	1.78	1.91	1.91	1.22	1.44	0.31
32	Free NH_3#	mg/l	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	Arsenic	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
34	Mercury#	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
35	Selenium#	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
36	Nickel	mg/l	5.0	<0.01	<0.01	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
37	Cyanide	mg/l	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38	Sulphides#	mg/l	5.0	0.21	0.23	0.21	0.2	0.18	0.22	0.23	0.18	0.21	0.02
39	Manganese	mg/l	2.0	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05
40	Vanadium#	mg/l	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
41	NO_3	mg/l	20	1.4	1.51	1.49	1.42	1.38	1.74	1.74	1.38	1.49	0.13
42	Bio-assay Test#	--	90% Survival of Fish after 96hrs in 100%Effluent	93%	92%	93%	92%	93%	92%	93%	92%	93%	0.01
43	- emitters*	Bq/l	3.7	0.06	0.13	0.06	0.09	0.13	0.08	0.13	0.06	0.09	0.03
44	- emitters*	Bq/l	37	0.36	0.42	0.31	0.31	0.34	0.28	0.42	0.28	0.34	0.05

N.B: ND-Not Detectable, MPN-Most Probable Number,NA- Not Applicable
*Sample Tested By Health Physics Unit of BARC, OSCOM
#- Analyzed by Eko Pro Engineers, Gaziabad, Certificate No.-TC-5063

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Seal of Laboratory

Notes:

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Certificate No.-TC 6646

Report no. - CEMC/IREL/WW1 **Date-22.05.2021**

EFFLUENT WATER QUALITY MONITORING TEST REPORT

Name & Address of the Client : **M/s.IREL(India) Limited, Matikhala, Chatrapur, Ganjam, Odisha**
Work Order No. : **R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1424, Dated-10.08.2020**
Sampling Period : October' 2020 to March' 2021
Sampling by : Mr.Suresh Pradhan
Sample Description : **Treated Effluent Quality (Pond-1)**
Sample Quantity : 2.0 Ltrs

ANALYSIS RESULT

Sl. No	Parameter	Unit	Permissible Norms by CPCB	Oct	Nov	Dec	Jan	Feb	Mar	Max	Min	Avg	SD
1	pH Value	--	5.5 to 9.0	7.02	6.89	7.73	7.31	6.94	7.42	7.73	6.89	7.241	0.327
2	Temp	°C	--	30.1	31.2	29.6	27.4	29.8	32.7	32.7	27.4	30.112	1.765
3	Turbidity	NTU	--	14	11	5	7	5	5	14	5	8.25	3.816
4	Colour	Hazen	--	15	12	6	8	7	5	15	5	9.125	3.868
5	Alkalinity	mg/l	--	120	104	116	82	76	104	120	76	99.75	17.81
6	TDS	mg/l	--	310.8	212.4	256.32	238.3	268.8	250.6	310.8	212.4	257.55	32.89
7	TSS	mg/l	100	21.8	16.9	12.3	10.4	9.5	14.2	21.8	9.5	14.55	4.586
8	O&G	mg/l	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
9	BOD	mg/l	100	4.6	4.2	4	2.2	2.2	4.4	4.6	2.2	3.55	1.102
10	COD	mg/l	250	20	15	20	14	16	20	20	14	17.375	2.81
11	DO	mg/l	--	5.2	4.9	4.4	5.4	5.2	4.2	5.4	4.2	4.8625	0.483
12	Chloride	mg/l	--	42.9	31.6	38.1	29.6	30.1	37.6	42.9	29.6	35.3	5.357
13	Sulphate	mg/l	--	12.8	9.1	10.7	9.3	9.7	10.3	12.8	9.1	10.475	1.357
14	Fluoride	mg/l	15.0	0.16	0.14	0.14	0.11	0.12	0.14	0.16	0.11	0.135	0.017
15	TH	mg/l	--	126	102	108	94	98	102	126	94	106.25	11.29
16	Calcium	mg/l	--	32.06	27.25	30.46	26.05	26.85	28.86	32.06	26.05	28.705	2.318
17	Magnesium	mg/l	--	11.17	8.26	7.78	7.05	7.53	7.29	11.17	7.05	8.4125	1.523
18	Sodium	mg/l	--	33.6	21.46	30.5	25.6	26.1	28.3	33.6	21.46	27.577	4.215
19	Potassium	mg/l	--	12.8	9.2	10.9	7.2	7.7	10.6	12.8	7.2	9.8	2.114
20	TN#	mg/l	--	3.9	3.1	3.7	3.9	4.4	3.8	4.4	3.1	3.7875	0.419
21	Diss PO_4	mg/l	--	0.42	0.31	0.36	0.21	0.23	0.34	0.42	0.21	0.3125	0.079
22	Iron	mg/l	3.0	0.39	0.29	0.39	0.31	0.33	0.36	0.39	0.29	0.3437	0.041
23	Copper	mg/l	3.0	0	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
24	Cadmium	mg/l	2.0	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Lead	mg/l	2.0	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
26	Zinc	mg/l	15.0	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
27	TCr	mg/l	2.0	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
28	Cr^{+6}	mg/l	1.0	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
29	C_6H_5OH	mg/l	5.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
30	RFC#	mg/l	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31	TKN#	mg/l	100	2.28	1.8	1.83	1.18	1.21	1.77	2.28	1.18	1.691	0.418

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													5
32	Free NH_3#	mg/l	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	Arsenic	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
34	Mercury#	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
35	Selenium#	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
36	Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
37	Cyanide	mg/l	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38	Sulphides#	mg/l	5.0	0.05	0.18	0.24	0.21	0.23	0.21	0.24	0.05	0.1762	0.07
39	Manganese	mg/l	2.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
40	Vanadium#	mg/l	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
41	NO_3	mg/l	20	1.94	1.43	1.81	1.41	1.39	1.75	1.94	1.39	1.6325	0.24
42	Bio-assay Test#	--	90% Survival of Fish after 96 hrs in 100% Effluent	91%	93%	93%	91%	92%	91%	93%	91%	91.8%	0.98 %
43	α- emitters*	Bq/l	3.7	0.16	0.15	0.16	0.21	0.13	0.3	0.3	0.13	0.1925	0.062
44	β- emitters*	Bq/l	37	0.21	0.45	0.24	0.57	0.48	1.08	1.08	0.21	0.54	0.314

N.B: ND-Not Detectable, MPN-Most Probable Number,NA- Not Applicable
*Sample Tested By Health Physics Unit of BARC, OSCOM
#- Analyzed by Eko Pro Engineers, Gaziabad, Certificate No.-T-6646

MRout

Authorized Signatory

Seal of Laboratory

Notes:

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Certificate No.:-TC 6646

Report no.-CEMC/IREL/WW2 **Date-20.11.2020**

EFFLUENT WATER QUALITY MONITORING TEST REPORT

Name & Address of the Client : **M/s. IREL(India)Limited, Matikhala, Chatrapur, Ganjam,Odisha**

WorkOrderNo. : **R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1344, Dated-12.09.2019**

SamplingPeriod : April' 2020 to September'2020

Samplingby : Mr.S Pradhan & Mr. RDas

SampleDescription : **Pond-2 (RPP Pit, Inlet)**

SampleQuantity : 2.0Ltrs

ANALYSISRESULT

Sl. No	Parameter	Unit	Permissible Norms by CPCB	Apr	May	June	July	August	September	Max	Min	Avg	SD
1	pH Value	--	5.5 to 9.0	7.51	7.42	7.36	7.41	6.94	7.24	7.51	6.94	7.31	0.20
2	Temp	°C	--	29.7	30.2	31.5	31.6	31	29.7	31.6	29.7	30.62	0.87
3	Turbidity	NTU	--	9	10	9	10	18	16	18	9	12.00	3.95
4	Colour	Hazen	--	5	5	5	5	10	10	10	5	6.67	2.58
5	Alkalinity	mg/l	--	100	108	102	104	100	100	108	100	102.33	3.20
6	TDS	mg/l	--	278.8	296.3	283.2	276.6	243.2	264.4	296.3	243.2	273.75	18.18
7	TSS	mg/l	100	18.6	19.8	13.5	17.6	23.6	25.6	25.6	13.5	19.78	4.34
8	O&G	mg/l	20	<5	<5	<1	<1	<1	<1	<1	<1	<1	<1
9	BOD	mg/l	100	3.2	3.4	3.2	3.4	4.2	4.8	4.8	3.2	3.70	0.65
10	COD	mg/l	250	25	28	26	30	30	30	30	25	28.17	2.23
11	DO	mg/l	--	5	4.8	5	5.2	5	4.9	5.2	4.8	4.98	0.13
12	Chloride	mg/l	--	33.9	35.3	34.1	32.9	27.9	37.4	37.4	27.9	33.58	3.18
13	Sulphate	mg/l	--	11.8	12.9	12.2	11.4	8.9	9.8	12.9	8.9	11.17	1.52
14	Fluoride	mg/l	15.0	0.13	0.14	0.13	0.12	0.11	0.14	0.14	0.11	0.13	0.01
15	TH	mg/l	--	116	128	120	116	104	108	128	104	115.33	8.55
16	Calcium	mg/l	--	31.26	35.27	34.07	32.86	30.46	30.46	35.27	30.46	32.40	2.00
17	Magnesium	mg/l	--	8.75	9.72	8.5	8.26	6.8	7.77	9.72	6.8	8.30	0.98
18	Sodium	mg/l	--	30.5	32.3	31.6	30.9	27.4	30.8	32.3	27.4	30.58	1.69
19	Potassium	mg/l	--	11.2	11.8	11.1	10.2	9.1	11.4	11.8	9.1	10.80	0.99
20	TN#	mg/l	--	2.9	3.4	3.1	3.2	3	3.6	3.6	2.9	3.20	0.26
21	Diss PO_4	mg/l	--	0.33	0.35	0.33	0.34	0.4	0.36	0.4	0.33	0.35	0.03
22	Iron	mg/l	3.0	0.42	0.43	0.42	0.4	0.34	0.38	0.43	0.34	0.40	0.03
23	Copper	mg/l	3.0	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
24	Cadmium	mg/l	2.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Lead	mg/l	2.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
26	Zinc	mg/l	15.0	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
27	TCr	mg/l	2.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
28	Cr^{+6}	mg/l	1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
29	C_2H_5OH	mg/l	5.0	<0.001	<0.001	<0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001
30	RFC#	mg/l	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31	TKN#	mg/l	100	1.24	1.32	1.29	1.25	1.82	2.1	2.1	1.24	1.50	0.37
32	Free NH_3#	mg/l	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	Arsenic	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
34	Mercury#	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
35	Selenium#	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
36	Nickel	mg/l	5.0	<0.01	<0.01	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
37	Cyanide	mg/l	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38	Sulphides#	mg/l	5.0	0.24	0.25	0.23	0.22	0.2	0.27	0.27	0.2	0.24	0.02
39	Manganese	mg/l	2.0	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05
40	Vanadium#	mg/l	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
41	NO_3	mg/l	20	1.42	1.58	1.52	1.49	1.41	1.82	1.82	1.41	1.54	0.15
42	Bio-assay Test#	--	90% Survival of Fish after 96 hrs in	92%	93%	92%	92%	93%	91%	93%	91%	92%	0.01

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Certificate No.:-TC 6646

			Effluent										
43	- emitters*	Bq/l	3.7	0.04	0.1	0.07	0.11	0.09	0.1	0.11	0.04	0.09	0.03
44	- emitters*	Bq/l	37	0.3	0.39	0.3	0.34	0.3	0.37	0.39	0.3	0.33	0.04

N.B: ND-Not Detectable, MPN-Most Probable Number,NA- Not Applicable
*Sample Tested By Health Physics Unit of BARC, OSCOM
#- Analyzed by Eko Pro Engineers, Gaziabad, Certificate No.-TC-5063

Authorized Signatory

Seal of Laboratory

Notes:

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Certificate No.-TC 6646

Report no. - CEMC/IREL/WW2 **Date-22.05.2021**

EFFLUENT WATER QUALITY MONITORING TEST REPORT

Name & Address of the Client : **M/s.IREL(India) Limited, Matikhala, Chatrapur, Ganjam, Odisha**
Work Order No. : **R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1424, Dated-10.08.2020**
Sampling Period : October' 2020 to March' 2021
Sampling by : Mr.Suresh Pradhan
Sample Description : **Treated Effluent Quality (Pond-2)**
Sample Quantity : 2.0 Ltrs

ANALYSIS RESULT

Sl. No	Parameter	Unit	Permissible Norms by CPCB	Oct	Nov	Dec	Jan	Feb	Mar	Max	Min	Avg	SD
1	pH Value	--	5.5 to 9.0	7.46	6.58	7.65	7.58	7.06	7.46	7.65	6.58	7.252	0.406
2	Temp	°C	--	29.9	30.6	29.9	27.6	29.4	32.4	32.4	27.6	29.97	1.565
3	Turbidity	NTU	--	11	10	7	7	5	5	11	5	7.625	2.509
4	Colour	Hazen	--	10	9	6	6	8	5	10	5	7.375	1.966
5	Alkalinity	mg/l	--	110	112	120	84	78	110	120	78	101.5	17.03
6	TDS	mg/l	--	282.4	220.6	276.8	242.5	271.4	268.3	282.4	220.6	258.1	23.83
7	TSS	mg/l	100	18.2	17.3	13.2	10.8	9.9	15.6	18.2	9.9	14.13	3.423
8	O&G	mg/l	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
9	BOD	mg/l	100	4.2	4	4.4	2.2	2.4	4.2	4.4	2.2	3.5	0.9912
10	COD	mg/l	250	15	16	24	16	18	24	24	15	19	4.119
11	DO	mg/l	--	5	5.1	4.8	5.4	5.6	4.4	5.6	4.4	5.037	0.427
12	Chloride	mg/l	--	39.9	32.1	38.9	29.9	30.6	38.9	39.9	29.9	35.01	4.651
13	Sulphate	mg/l	--	10.6	9.8	11.2	9.6	9.9	11.4	11.4	9.6	10.43	0.765
14	Fluoride	mg/l	15.0	0.14	0.15	0.15	0.12	0.13	0.14	0.15	0.12	0.137	0.0116
15	TH	mg/l	--	116	108	116	96	100	110	116	96	107.2	8.238
16	Calcium	mg/l	--	31.26	28.86	33.67	26.45	27.25	32.06	33.67	26.45	29.95	2.854
17	Magnesium	mg/l	--	9.23	8.75	7.78	7.29	7.78	7.29	9.23	7.29	8.08	0.797
18	Sodium	mg/l	--	31.2	23.5	32.6	25.9	26.7	30.4	32.6	23.5	28.3	3.539
19	Potassium	mg/l	--	11.6	9.8	11.8	7.8	7.9	11.2	11.8	7.8	9.96	1.818
20	TN#	mg/l	--	3.5	3.4	3.9	4.2	4.7	3.9	4.7	3.4	3.962	0.47
21	Diss PO_4	mg/l	--	0.34	0.33	0.38	0.23	0.24	0.38	0.38	0.23	0.313	0.06
22	Iron	mg/l	3.0	0.36	0.31	0.41	0.33	0.35	0.39	0.41	0.31	0.358	0.03
23	Copper	mg/l	3.0	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
24	Cadmium	mg/l	2.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Lead	mg/l	2.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
26	Zinc	mg/l	15.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
27	TCr	mg/l	2.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
28	Cr^{+6}	mg/l	1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
29	C_6H_5OH	mg/l	5.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

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30	RFC#	mg/l	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31	TKN#	mg/l	100	2	1.9	1.98	1.21	1.24	1.89	2	1.21	1.678	0.37
32	Free NH_3#	mg/l	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
33	Arsenic	mg/l	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
34	Mercury#	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
35	Selenium#	mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
36	Nickel	mg/l	5.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
37	Cyanide	mg/l	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
38	Sulphides#	mg/l	5.0	0.32	0.19	0.29	0.22	0.24	0.26	0.32	0.19	0.253	0.047
39	Manganese	mg/l	2.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
40	Vanadium#	mg/l	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
41	NO_3	mg/l	20	1.9	1.51	1.89	1.43	1.42	1.82	1.9	1.42	1.66	0.231
42	Bio-assay Test#	--	90% Survival of Fish after 96 hrs in 100% Effluent	92%	92%	92%	91%	91%	91%	92%	91%	91.5 %	0.547 %
43	α- emitters*	Bq/l	3.7	0.12	0.14	0.12	0.18	--	--	0.18	0.12	0.143	0.028
44	β- emitters*	Bq/l	37	0.31	0.39	0.33	0.32	--	--	0.39	0.31	0.341	0.035

N.B: ND-Not Detectable, MPN-Most Probable Number,NA- Not Applicable
*Sample Tested By Health Physics Unit of BARC, OSCOM
#- Analyzed by Eko Pro Engineers, Gaziabad, Certificate No.-T-6646

Authorized Signatory

Seal of Laboratory

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Certificate No:-TC 6646

Report no. - CEMC/IREL/St1 **Issued Date-20.11.2020**

STACK EMISSION MONITORING TEST REPORT

Issued to	**M/s. IREL(India) Limited, Matikhalo, Chatrapur, Ganjam, Odisha**
Work Order No.	**R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1344, Dated-12.09.2019**
Locations	**ST-1 Boiler, ST-2- Main Dryer, ST-3- Shaft Dryer-Ilmenite, ST-4- Shaft Dryer- Rutile, ST-5- Sillimanite Dryer, ST-6-Monazite Upgradation Section, ST-7-Zircon Dryer, ST-8-MoPP Processing Plant-Stack-1, ST- MoPP Processing Plant-Stack-2**
Nature of Sampling	**Source Emission**
Sampling By	**Mr.S Pradhan and Mr. R. Das**
Instrument Used	**Stack monitoring kit, Flue Gas Analyzer**
Sampling Period	**April' 2020 to September'2020**
Parameter	**Particulate Matter**

FREQUENCY		LOCATIONS								
Month	Week	ST-1	ST-2	ST-3	ST-4	ST-5	ST-6	ST-7	ST-8	ST-9
April	3rd	102.2	49.2	49.6	49	50.4	48.2	50.2	6.4	6.5
May	1st	117.4	51.5	48.4	49.6	49.7	51.2	50.2	6.7	6.2
	3rd	108.6	50.3	49.7	50.7	48.8	49.8	49.8	6.4	6.3
June	1st	108.1	50.2	49.7	51.2	50.9	49.6	49.6	6.2	6.2
	3rd	113.6	49.1	50.3	49.5	48.7	49.3	50.2	6	6.1
July	1st	107.4	50.4	49.4	51	50.6	52.2	49.8	6	6.1
	3rd	112.8	49.6	50.6	49.2	48.4	49.6	50.8	6.2	6.1
August	1st	102.8	48.6	48.2	49.6	49.2	51.6	48.6	5.8	6
	3rd	100.4	47.2	46.6	48.2	48.8	50.4	48	6	6.2
September	1st	103.5	51.2	50.3	49.1	49.7	50	50.1	6	5.8
	3rd	113.6	49.1	50.3	49.5	48.7	49.3	50.2	5.8	6
MAXIMUM		117.4	51.5	50.6	51.2	50.9	52.2	50.8	6.7	6.5
MINIMUM		100.4	47.2	46.6	48.2	48.4	48.2	48	5.8	5.8
AVERAGE		108.2	49.7	49.4	49.7	49.4	50.1	49.8	6.1	6.1
STD DEVIATION		5.6	1.2	1.2	0.9	0.9	1.2	0.8	0.3	0.2

OSPCB Permissible Limits- 150 mg/Nm^3

Authorized Signatory **Seal of Laboratory**

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Certificate No.:TC 6646

Report no. - CEMC/IREL/St1 **Issued Date-22.05.2021**

STACK EMISSION MONITORING TEST REPORT

Issued to	**M/s.IREL(India) Limited , Matikhala, Chatrapur, Ganjam, Odisha**
Work Order No.	**R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1424, Dated-10.08.2020**
Locations	**ST-1 Boiler, ST-2- Main Dryer, ST-3- Shaft Dryer-Ilemenite, ST-4- Shaft Dryer- Rutile, ST-5- Sillimanite Dryer, ST-6-Monazite Upgradation Section, ST-7-Zircon Dryer, ST-8-REEP Processing Plant-Stack-1, ST-9- REEP Processing Plant-Stack-2**
Nature of Sampling	**Source Emission**
Sampling By	**Mr.Suresh Pradhan**
Instrument Used	**Stack monitoring kit, Flue Gas Analyzer**
Sampling Period	**October' 2020 to March'2021**
Parameter	**Particulate Matter**

FREQUENCY		LOCATIONS								
Month	Week	ST-1	ST-2	ST-3	ST-4	ST-5	ST-6	ST-7	ST-8	ST-9
October	1st	104.6	52.4	51.6	50.1	50.8	51.2	51.8	6.1	5.7
	3rd	108.2	51.2	50.8	48.6	50.2	51.6	49.4	5.9	6.1
November	1st	118.3	50.7	49.4	48.9	51.6	49.5	50.2	6.3	6.1
	3rd	107.9	50.1	49.2	50.8	48.7	49.3	51.1	6.1	6.2
December	1st	112.3	49.6	51.2	50.7	51.4	48.9	49.8	6.3	6.1
	3rd	109.6	49.1	50.3	49.5	48.7	49.3	50.2	6.0	--
January	1st	117.3	50.5	49.8	51.4	48.7	50.1	51.2	6.4	6.5
	3rd	111.6	48.9	50.3	49.8	50.5	--	50.7	6.1	6.2
February	1st	114.7	49.3	48.6	50.2	51.4	--	49.8	6.1	6.1
	3rd	109.8	50.1	51.3	49.4	48.9	--	49.6	6.4	6.2
March	1st	121.4	50.3	49.4	51.2	50.4	--	51.1	6.2	6
	3rd	114.8	50.6	--	--	51.4	--	49.5	5.9	6.1
MAXIMUM		**121.4**	**52.4**	**51.6**	**51.4**	**51.6**	**51.6**	**51.8**	**6.4**	**6.5**
MINIMUM		**104.6**	**48.9**	**48.6**	**48.6**	**48.7**	**48.9**	**49.4**	**5.9**	**5.7**
AVERAGE		**112.54**	**50.29**	**50.16**	**50.04**	**50.214**	**50.044**	**50.4**	**6.15**	**6.12**
STD DEVIATION		**4.9046**	**0.973**	**0.9768**	**0.914728**	**1.175604**	**1.036707**	**0.792388**	**0.1732**	**0.1888**

OSPCB Permissible Limits- 150 mg/Nm^3

Authorized Signatory

Seal of Laboratory

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Certificate No.-TC 6646

Report no. - CEMC/IREL/St2 **Issued Date-20.11.2020**

STACK EMISSION MONITORING TEST REPORT

Issued to	**M/s. IREL(India) Limited, Matikhalo, Chatrapur, Ganjam, Odisha**
Work Order No.	**R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1344, Dated-12.09.2019**
Locations	**ST-8-REEP(MoPP) Plant-Stack-1, ST- REEP(MoPP) Plant-Stack-2**
Nature of Sampling	**Source Emission**
Sampling By	**Mr.S Pradhan and Mr. R. Das**
Instrument Used	**Stack monitoring kit, Flue Gas Analyzer**
Sampling Period	**April' 2020to September'2020**
Parameter	**Acid Mist**

FREQUENCY		LOCATIONS	
Month	**Week**	**ST-8**	**ST-9**
April	**3rd**	6	6.1
May	**1st**	6.2	6
	3rd	5.8	6.1
June	**1st**	5.8	6
	3rd	5.9	5.7
July	**1st**	5.7	5.8
	3rd	5.8	5.6
August	**1st**	5.6	5.7
	3rd	5.6	5.8
September	**1st**	5.5	5.6
	3rd	5.7	5.8
MAXIMUM		6.2	6.1
MINIMUM		5.5	5.6
AVERAGE		5.8	5.8
STD DEVIATION		0.2	0.2

OSPCB Permissible Limits- 50 mg/Nm^3

Authorized Signatory **Seal of Laboratory**

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Certificate No.-TC 6646

Report no. - CEMC/IREL/St2 **Issued Date-22.05.2021**

STACK EMISSION MONITORING TEST REPORT

Issued to	**M/s.IREL(India) Limited, Matikhala, Chatrapur, Ganjam, Odisha**
Work Order No.	**R-07/O/01692 3532A OSCOM/SOP/07/O/01692 S.C.-1424, Dated-10.08.2020**
Locations	**ST-8- Processing Plant-Stack-1, ST-9- REEP Processing Plant-Stack-2**
Nature of Sampling	**Source Emission**
Sampling By	**Mr.Suresh Pradhan**
Instrument Used	**Stack monitoring kit, Flue Gas Analyzer**
Sampling Period	**October' 2020 to March'2021**
Parameter	**Acid Mist**

FREQUENCY		LOCATIONS	
Month	**Week**	**ST-8**	**ST-9**
October	**1st**	5.7	5.8
	3rd	5.6	5.8
November	**1st**	5.9	5.9
	3rd	5.8	6.1
December	**1st**	5.9	5.9
	3rd	5.5	--
January	**1st**	6.1	6
	3rd	5.8	6.1
February	**1st**	6	5.9
	3rd	6.2	6.1
March	**1st**	6.1	6.1
	3rd	6.2	6.1
MAXIMUM		**6.2**	**6.1**
MINIMUM		**5.5**	**5.8**
AVERAGE		**5.90**	**5.98**
STD DEVIATION		**0.2296**	**0.1250**

OSPCB Permissible Limits- 50 mg/Nm^3

Authorized Signatory **Seal of Laboratory**

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