

***ENVIRONMENTAL MONITORING REPORT
OF
KOLKATA PORT TRUST***

PERIOD: - August' 2020 to October'2020

Directed by:

KOLKATA PORT TROST

15, Strand Road, Kolkata - 700001.



Conducted by:

M/S. R.V. BRIGGS & CO. PRIVATE LIMITED.

8-9, Bentinck Street, Kolkata – 700 001.

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PREFACE

Kolkata Port Trust Kolkata, the renowned Dock of West Bengal, has entrusted us the services for Environmental monitoring work during the period from 16.12.2019 to 15.12.2022, on behalf of the Management of the company. The Present Report has been prepared on the basis of Pollution Monitoring & Analysis Data of M/S .R.V. BRIGGS & CO (P) LTD., Kolkata, a WBPCB approved Laboratory, during the period from Aug' 2020 to Oct' 2020.

For R. V. Briggs & Co (P) Ltd.

1.0 INTRODUCTION: Pollution is emerging as one of the most significant and challenging environmental problems of our modern Society. The Kolkata Port Trust (KoPT) is situated on the left bank of the Hooghly River at 22°32'53"N 88°18'05"E about 203 km (126 mi) upstream from the sea. The pilotage station is at Gasper/ Saugor roads, 145 Kilometres to the south of the KDS (around 58 km from the sea). The system consists of Kidderpore Docks (K.P. Docks): 18 Berths, 6 Buoys / Moorings and 3 Dry Docks. Kolkata Port Trust (officially renamed after the name of BJS founder as Dr. Syama Prasad Mukherjee Port Trust), is the only riverine major port of India located in the city of Kolkata, India, It is the oldest operating port in India, and was constructed by the British East India Company.

Major air pollutants generated by port activities include carbon monoxide (CO), volatile organic compounds (VOCs), nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM). Prolonged exposure to these compounds can effect health include respiratory diseases, cardiovascular disease, lung cancer and premature death.

Noise from port areas comes not only from ferries, ships and trade but also from industrial and shipyards activities as well as auxiliary services. In this way, noise pollution can produce negative effects both to the natural eco-system and to the urban population.

Port operations can cause significant damage to water quality—and subsequently to marine life and ecosystems, as well as human health. These effects may include bacterial and viral contamination of commercial fish and shellfish, depletion of oxygen in water, and bioaccumulation of certain toxins in fish.⁸ Major water quality concerns at ports include wastewater and leaking of toxic substances from ships, stormwater runoff, and dredging

Waste management is the most important part in the port areas. Waste management relates to all kinds of wastes, both liquid and solid, likely to be disposed of in the port area. These wastes include dredged materials, garbage and oily mixtures discharged from ships, wastes from cargo operations, and all types of discharges from municipal and waterfront industry activities.

1.1.0 Scope of Work: The periodic measurement of Ambient Air quality, Meteorological observation, Ambient Noise quality, Surface water quality, Drinking water quality and also Effluent quality studies were carried out for the session June to August. M/s R. V. Briggs & Co. Pvt. Limited, 9, Bentinck Street, Kolkata – 700001, performed the whole work. Funding and other logistic supports were provided by KPT, Khidderpore. According to the work order, the scope of work included:

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1.1.1 Systematic evaluation of **Ambient Air quality** took place for 8 hourly basis at four (04) locations

i) Near Dry Dock Area-2

ii) Beside Shed No. 22

iii) Administrative Building

iv) Gate No. 4, Near 4 & 5 No. Jaty

and for 24 hours duration at one (01) location respectively. The whole work was executed for determination of Respirable Particulate matter (RPM), Oxides of Sulfur (SO₂), Oxides of nitrogen (NO_x), Carbene Monoxide(CO) from each sample.

On each day of sampling at each stations samples for all five parameters (PM₁₀, PM_{2.5}, SO₂ and NO₂) were collected as follows:

i) PM₁₀ 3 (three) shifts of 8 (eight) hrs. each twice in a week for every 3 months for a period of one year

ii) PM_{2.5} 1 (one) shift of 24 (twenty four) hrs. twice in a week for a every 3 months for a period of one year

iii) SO₂ 3 (three) shifts of 8 (eight) hrs. each twice in a week for every 3 months for a period of one year

iv) NO₂ 3 (three) shifts of 8 (eight) hrs. each twice in a week for every 3 months for a period of one year

v) CO 8 (eight) hrs. each twice in a week for every 3 months for a period of one year

1.1.2 Ambient Noise level monitoring: It was carried out for 24 hourly basis in every month from the following four (04) Locations:

i) Near Dry Dock Area-2

ii) Beside Shed No. 22

iii) Administrative Building

iv) Gate No. 4, Near 4 & 5 No. Jaty

All the study work was carried out for determination of Leq, Lmax, Lmin, Lday, L night, L 10, L50 and L90, Ldn etc from each locations as per the Principal rules were published in the Gazette of India vide number, S.O 123 (E), dated 14th February, 2000 and subsequently amended vide S.O 1046 (E), dated 22nd November, 2000, S.O 1088 (E), dated 11th October, 2002, S.O, 1569 (E), dated the 19th September, 2006 and S.O 50 (E) dated 11th January, 2010.).

1.1.3 Water sample collection:

- **Drinking Water** samples collected from

(i) Head Office Canteen

(ii) 51 CGR Road, Civil Engg. Dock Office, 2nd Floor Tap.

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- (iii) Remount Road Quarter, 9 No. Civil Site Office
- (iv) Port Land Park Quarter, Civil Site Office
- (v) KOPT Hospital Canteen # 09
- (vi) Container Terminal Office, (NSD)
- (vii) NS Dock Office ,(WTP)
- (viii) KP Dock Office

Following parameters were determined from the sample: pH, Colour, TURBIDITY, Chloride, Residual chlorine, Total Dissolved Solid, Coliform Bacteriological count as per stipulated norms for analysis of Drinking Water Quality of Central Pollution Control Board,

The following parameters were taken into consideration for drinking water analysis:

(a) **Microbiological Tests:** (i) Total Coliform Organism / 100 ml. of water, (ii) Faecal (E.Coli) coliform Count

- **Dock Basin Water** samples collected from
 - (i) 7/8 N.S. Dock
 - (ii) N.S. D. Lock Entrance
 - (iii) KPD 2 (26-28 KPD)
 - (iv) KPD 1 (11 KPD)
- **River Water** samples collected from
 - (i) NSD Lock Entrance
 - (ii) KPD Lock Entrance from River

Following parameters were determined from the sample: pH, Colour, TURBIDITY, Dissolved Oxygen (D.O), Bio Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil & Grease, Sulphate, Ammoniacal Nitrogen (NH₄ – N), Total Dissolved Solid, Total Suspended Solid, Salinity, Coliform Bacteriological count as per stipulated norms for analysis of **Dock Basin&River**Water Quality of Central Pollution Control Board,

1.2.0 Period of Study: The entire study period was on selected days between June to August 2020.

1.3.0 Work load Completed: The environmental sampling and related studies that were carried out in the field and at the R.V.Briggs laboratory

2.0 AMBIENT AIR QUALITY STUDIES

2.1.0 Objective: The most important objective of the study was to obtain a valid idea about the prevailing ambient air quality over the entire project area, during June to August 2020

2.2.0 Work Elements: The main objectives of the study are:-

As per the work order, the following work elements were evaluated:

(a) Collection of ambient air samples for 24 hourly period from 4 air sampling stations as per para 1.3.1, for determination of the concentration of the following pollutants :

i) Respirable Particulate matter (RPM), (ii) Suspended Particulate Matter (SPM), (iii) Sulphur Di Oxide (SO₂), (iv) Nitrogen Oxide (NO_x), (v) Carbene Monoxide respectively.

2.3.0 Preparation of Sampling Sites: At each of the air sampling stations, the actual site of placement of air sampling equipments were prepared according to the guide lines stipulated in IS: 5182 of Bureau of Indian Standard approved by the Ministry of Environment & Forests (MoEF), Government of India.

2.4.0 Duration of Air Sampling: Air sampling operations were fixed for 24 hours in 3 shifts and were splits into eight hours duration in each shift for 4 stations. So, 12 samples were collected from these stations. Therefore, altogether 12 samples were taken into consideration.

2.6.0 Sampling Equipment & Methodology: Air samples collected by using High Volume Air sampler Machine (Envirotech, APM 460 BL)

2.7.0 Laboratory Determination:

2.7.1 Respirable Particulate Matter:- For every station and for every shift, one Glass micro fibre filter paper with a dimension of 203 mm x 254 mm was used to collect air samples. At each station, a total time period of 24 hours duration was taken into consideration for collection of samples. Which was splits into 3 shifts each of 8 hours duration. Thus, for a 24 hours monitoring a total number of 3 filter papers were used. So, for four (4) stations in total 3 x 4 = 12 samples were collected.

Before sampling, all these filter papers were dried in an air oven followed by drying in desiccators. The dried filter papers were weighed and then fitted in the high volume air sampler. The filter papers were re-weighted at the end of the duration of sampling (8 hours or 6 hours). From the weight indicate the weight of RPM particle collected over a period of 8 hours or 6 hours. From the corresponding data on total volume of air, which passed through the sampling machine over the same duration of time, the concentration of RPM was computed in terms of $\mu\text{g}/\text{m}^3$ of air. The assessments were made according to their respective land use categories.

2.7.2: Suspended Particulate Matter (SPM):

The pre-weighed empty sample bottles, in which SPM particles were collected, were weighed both in the pre and post monitoring times. The gain in weight indicated the total weight of SPM collected during 8 or 6 hours sampling times. From the corresponding data on total volume of air drawn in by the sampling machine, the concentration of SPM was computed in $\mu\text{g}/\text{m}^3$ of air.

2.7.3: Sulphur Di Oxide (SO₂):

SO₂ in the ambient air was absorbed in 0.05 (M) potassium tetrachloromercurate solution at a flow rate 0.5 litre / minute. It was analysed spectrophotometrically after developing the colour for 30 minutes by adding sulphamic acid, Formaldehyde and P – rosaniline hydrochloride solution as per IS :5182 (Part – II) 2001 (West & Gacke method) and recorded the absorbance at 560 nm. Then the concentration of SO₂ was measured by standard curve and represented the results as µg/m³ in respect of air volume.

2.7.4: Nitrogen Oxides (NO_x):

NO_x was collected by bubbling air through 0.1 (N) sodium hydroxide and sodium arsenite solution at flow rate 0.4 lit /min. It was analyzed spectrophotometrically after developing the colour for 10 minutes by adding Hydrogen peroxide, sulphanilamide and NEDA solution as per IS : 5182 (Part – VI) 2006 (Jacobs & Hochheiser method) and recorded the absorbance at 540 nm. Then the concentration of NO_x was measured by standard curve and represented the result as µg/m³ in respect of air volume.

2.7.5: Carbone monoxides (CO):

CO was collected in a bladders and estimated by CO Analyzer and Orsat.

2.8.0 Results of laboratory determinations:

The salient findings of concentrations of RPM, SPM,CO, SO₂ and NO_x (Table 2.1) of this study are as follows:

2.8.1 Ambient Air Quality in the areas under Industrial, Residential, Rural and Other areas:

(a) Residential Areas:

- *Near Dry Dock Area-2:-*

The concentration of **PM_{2.5}** ranged from 47.0 µg/m³ to 86.0 µg/m³ with a mean value of 75.0 µg/m³.

The concentration of **PM₁₀** ranged from 72.0 µg/m³ to 198.0 µg/m³ with a mean value of 137 µg/m³ of air.

Concentration of **SO₂** ranged from 4.2 µg/m³ to 7.1 µg/m³ of air with a mean value of 5.4 µg/m³ of air While the

concentration of **NO_x** ranged from 21.6 µg/m³ to 49.1 µg/m³ of air with a mean value of 35.5 µg/m³ of air and

the concentration of **CO** ranged from 1.16 mg/m³ to 1.34 mg/m³ of air with a mean value of 1.29 mg/m³ of air.

Observation : All the parameters are found to be above the norms as per National ambient Air Quality of MINISTRY OF ENVIRONMENT AND FOREST NOTIFICATION New Delhi, on 16th November 2009 except concentration CO due to continuous movement of vehicles, loading of container and other activities.

- *Beside Shed No:22:-*

The concentration of **PM_{2.5}** ranged from 45 µg/m³ to 87.0 µg/m³ with a mean value of 65.0 µg/m³.

The concentration of **PM₁₀** ranged from 53.0 µg/m³ to 168 µg/m³ with a mean value of 114 µg/m³ of air.

Concentration of **SO₂** ranged from 4.2 µg/m³ to 6.9 µg/m³ of air with a mean value of 5.4 µg/m³ of air While the

concentration of **NO_x** ranged from 21.0 µg/m³ to 44.7 µg/m³ of air with a mean value of 35.2 µg/m³ of air and

the concentration of **CO** ranged from 1.17 mg/m³ to 1.33 mg/m³ of air with a mean value of 1.26 mg/m³ of air.

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Observation : All the parameters are found to be above the norms as per National ambient Air Quality of MINISTRY OF ENVIRONMENT AND FOREST NOTIFICATION New Delhi, on 16th November 2009 except concentration CO due to continuous movement of vehicles, loading of container and other activities.

• *Administrative Building:-*

The concentration of **PM_{2.5}** ranged from 49.0 µg/m³ to 73.0 µg/m³ with a mean value of 60.0 µg/m³.

The concentration of **PM₁₀** ranged from 64.0 µg/m³ to 147.0 µg/m³ with a mean value of 110 µg/m³ of air.

Concentration of **SO₂** ranged from 4.2 µg/m³ to 6.3 µg/m³ of air with a mean value of 5.2 µg/m³ of air.

While the concentration of **NO_x** ranged from 26.0 µg/m³ to 43.1 µg/m³ of air with a mean value of 35.6 µg/m³ of air and

the concentration of **CO** ranged from 1.15 mg/m³ to 1.36 mg/m³ of air with a mean value of 1.26 mg/m³ of air.

Observation : All the parameters are found to be above the norms as per National ambient Air Quality of MINISTRY OF ENVIRONMENT AND FOREST NOTIFICATION New Delhi, on 16th November 2009 except concentration CO due to continuous movement of vehicles, loading of container and other activities.

• *Gate No; 4, Near 4&5 No Jaty:-*

The concentration of **PM_{2.5}** ranged from 41.0 µg/m³ to 115.0 µg/m³ with a mean value of 69.0 µg/m³.

The concentration of **PM₁₀** ranged from 57.0 µg/m³ to 184.0 µg/m³ with a mean value of 125 µg/m³ of air.

Concentration of **SO₂** ranged from 4.2 µg/m³ to 6.1 µg/m³ of air with a mean value of 5.3 µg/m³ of air.

While the concentration of **NO_x** ranged from 18.3 µg/m³ to 52.1 µg/m³ of air with a mean value of 33.0 µg/m³ of air and

the concentration of **CO** ranged from 1.00 mg/m³ to 1.34 mg/m³ of air with a mean value of 1.24 mg/m³ of air.

Observation : All the parameters are found to be above the norms as per National ambient Air Quality of MINISTRY OF ENVIRONMENT AND FOREST NOTIFICATION New Delhi, on 16th November 2009 except concentration CO due to continuous movement of vehicles, loading of container and other activities.

AMBIENT AIR QUALITY STUDY HAD BEEN DEPICTED THROUGH PHOTOGRAPHS



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Table - 2.1

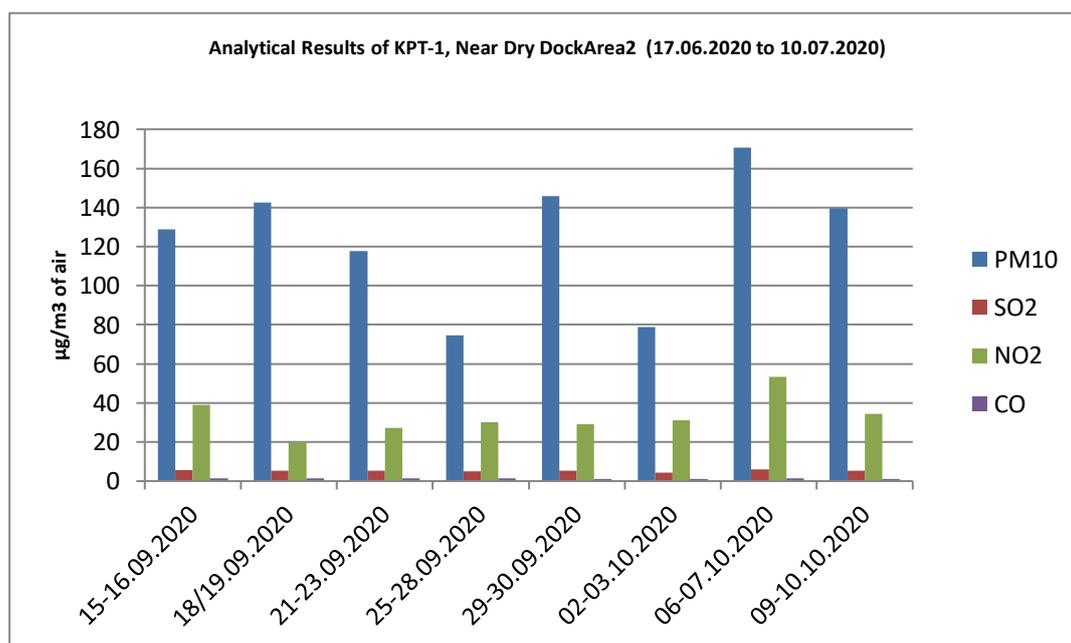
LAND USE CATEGORY – WISE DISTRIBUTION OF AIR SAMPLING STATIONS AND ITS ANALYTICAL RESULTS
(15.09.2020 TO 09.10.2020)

Location : KPT-1, Near Dry Dock Area 2

Period : 15.09.2020 TO 09.10.2020

Date of Inspection	Unit in $\mu\text{g}/\text{m}^3$													Unit in mg/m^3			
	PM2.5	PM10				SO2				NO2				CO			
	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.
15-16.09.2020	47	78	72	104	85	5.7	4.4	5.1	5.1	41.6	39.4	32.1	37.7	1.32	1.29	1.16	1.26
18-19.09.2020	82	198	118	112	143	6.3	5.3	4.4	5.3	40.2	35.8	28.0	34.7	1.33	1.29	1.28	1.30
21-29.09.2020	71	120	146	173	146	6.7	5.5	4.3	5.5	33.7	32.2	29.1	31.7	1.32	1.34	1.21	1.29
25-28.09.2020	81	92	141	150	128	5.1	5.7	4.9	5.2	30.7	33.8	25.2	29.9	1.31	1.29	1.21	1.27
29-30.09.2020	86	125	174	147	149	6.5	6.1	4.2	5.6	48.3	35.1	30.4	37.9	1.32	1.28	1.24	1.28
02-03.10.2020	78	178	189	115	161	7.1	5.8	4.4	5.8	49.1	46.8	41.3	45.7	1.30	1.34	1.26	1.30
06-07.10.2020	73	147	140	134	140	5.3	5.1	4.8	5.1	37.7	21.6	25.4	28.2	1.34	1.31	1.24	1.30
09-10.10.2020	81	160	139	143	147	6.1	5.4	6.3	5.9	38.2	41.3	35.9	38.5	1.33	1.30	1.29	1.31
Norms NAAQM	60				100				80				80				5.0

HISTOGRAM OF RESULTS OF AMBIENT AIR QUALITY MONITORING of KPT-1, Near Dry Dock Area 2 (15.09.2020 to 09.10.2020)



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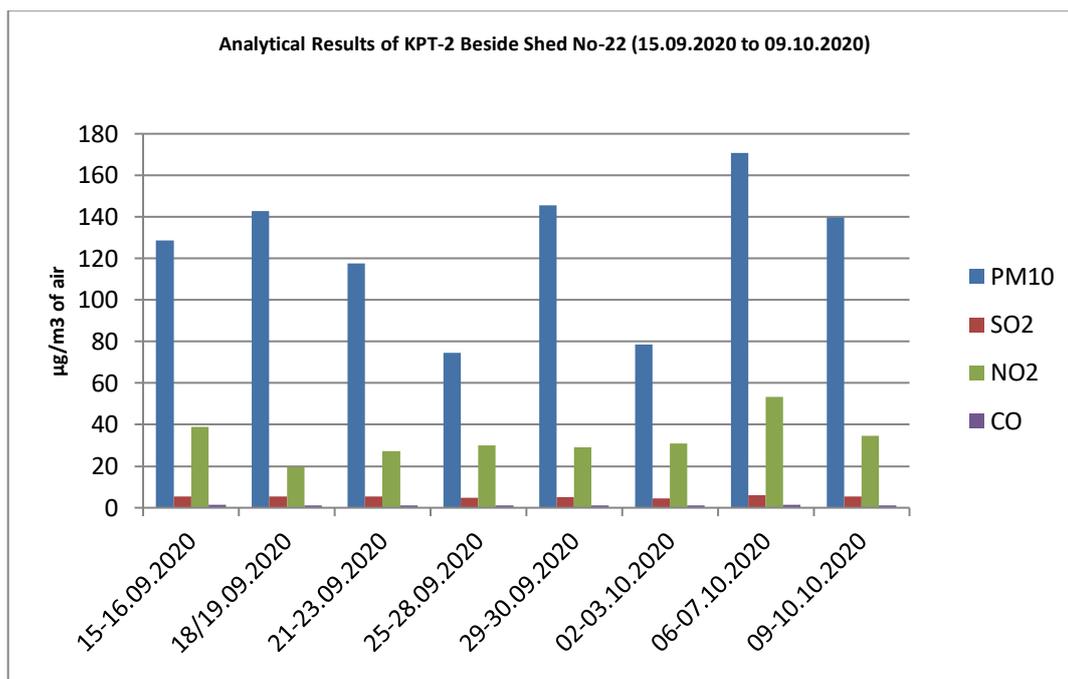
Location : KPD-2, Beside Shed No. 22

Period : 17.06.2020 TO 10.07.2020

Date of Inspection	Unit in $\mu\text{g}/\text{m}^3$													Unit in mg/m^3			
	P M 2. 5	PM10				SO2				NO2				CO			
		Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3
15-16.09.2020	75	125	135	143	134	6.1	4.8	4.6	5.2	44.7	35.9	33.0	37.9	1.33	1.29	1.21	1.28
18-19.09.2020	87	168	138	170	159	6.9	5.9	5.1	6.0	38.5	42.9	33.4	38.3	1.32	1.30	1.25	1.29
21-23.09.2020	58	125	140	99	121	5.5	5.0	4.4	5.0	31.3	32.1	37.6	33.7	1.29	1.25	1.21	1.25
25-28.09.2020	56	73	99	76	83	5.2	6.5	5.6	5.8	33.5	34.3	30.4	32.7	1.28	1.27	1.18	1.24
29-30.09.2020	56	86	99	107	97	5.9	5.5	5.7	5.7	40.1	33.8	33.0	35.6	1.30	1.26	1.24	1.27
02-03.10.2020	73	118	128	154	133	5.6	5.9	5.2	5.6	41.9	48.5	36.2	42.2	1.30	1.25	1.24	1.26
06-07.10.2020	45	91	67	53	70	5.9	5.0	4.2	5.0	21.0	31.1	23.1	25.1	1.29	1.25	1.17	1.24
09-10.10.2020	69	107	114	130	117	5.2	5.6	5.0	5.3	36.2	38.3	33.3	35.9	1.31	1.29	1.24	1.28
Norms NAAQM	60				100				80				80				5.0

HISTOGRAM OF RESULTS OF AMBIENT AIR QUALITY MONITORING of KPD-2, Beside Shed No. 22 (15.09.2020 to 09.10.2020)

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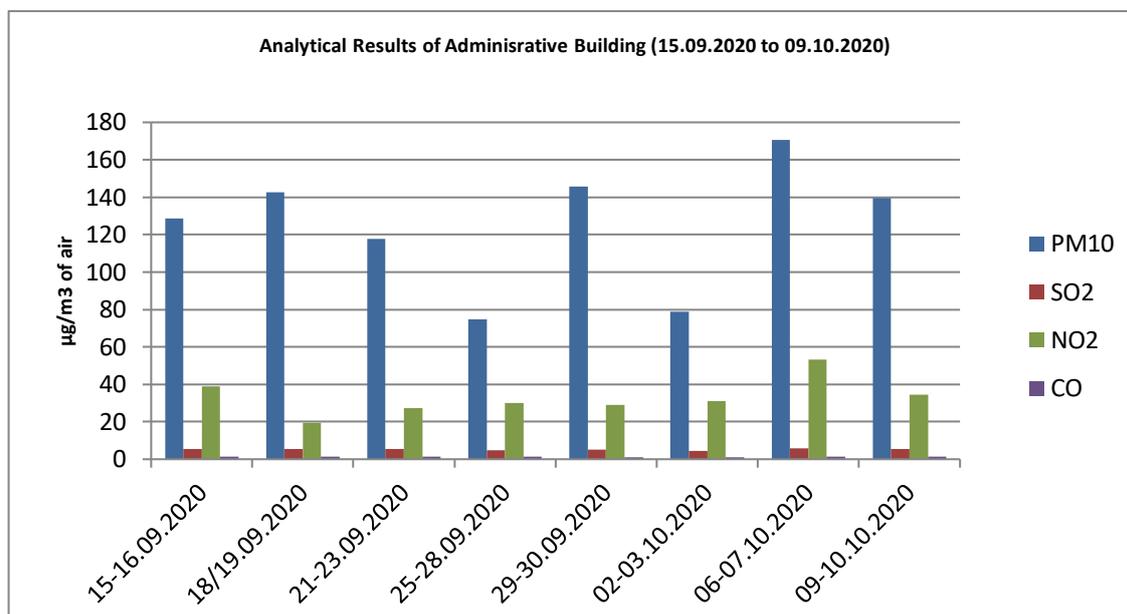


Location : Administrative Building
Period : 15.09.2020-09.10.2020

Date of Inspection	Unit in µg/m ³													Unit in mg/m ³			
	PM2.5 Daily Avg.	PM10				SO2				NO2				CO			
		Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.
15-16.09.2020	68	144	107	112	121	5.7	6.3	5.1	5.7	30.7	37.1	32.1	33.3	1.29	1.35	1.21	1.28
18/19.09.2020	65	143	121	105	123	5.3	5.1	4.8	5.1	37.8	40.0	30.0	35.9	1.29	1.31	1.22	1.27
21-23.09.2020	51	127	101	94	107	5.3	5.7	4.6	5.2	40.9	34.6	29.9	35.1	1.36	1.32	1.23	1.30
25-28.09.2020	49	66	79	64	70	6.3	4.8	5.4	5.5	42.7	28.2	26.0	32.3	1.29	1.25	1.20	1.25
29-30.09.2020	50	134	118	89	114	4.8	5.3	4.4	4.8	43.1	40.8	29.2	37.7	1.22	1.19	1.16	1.19
02-03.10.2020	53	96	82	77	85	4.8	4.4	4.2	4.5	35.3	31.4	28.4	31.7	1.25	1.20	1.15	1.20
06-07.10.2020	69	94	128	148	123	5.4	5.6	5.2	5.4	28.9	46.8	58.5	44.7	1.32	1.33	1.27	1.31
09-10.10.2020	73	147	135	122	135	5.5	5.1	4.8	5.1	36.9	35.4	30.8	34.4	1.30	1.32	1.24	1.29
Norms NAAQM	60				100				80				80				5.0

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**HISTOGRAM OF RESULTS OF AMBIENT AIR QUALITY MONITORING of KPD-2, Beside Shed No. 22
(15.09.2020 to 09.10.2020)**



Location : Gate No. 4, Near 4 & 5 No. Jaty

Period : 15.09.2020-09.10.2020

Date of Inspection Unit in mg/m³
Unit in µg/m³

	PM2.5	PM10				SO2				NO2				CO			
	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.	Shift-1	Shift-2	Shift-3	Daily Avg.
15-16.09.2020	73	164	115	107	129	5.9	5.2	5.5	5.5	40.9	38.7	37.2	38.9	1.28	1.33	1.29	1.30
18/19.09.2020	72	184	128	116	143	6.1	5.5	4.4	5.3	21.2	19.1	18.3	19.5	1.26	1.31	1.13	1.23
21-23.09.2020	55	143	129	81	118	5.9	5.3	5.1	5.4	28.5	29.2	23.9	27.2	1.28	1.30	1.21	1.26
25-28.09.2020	41	69	91	64	75	5.3	4.8	4.4	4.8	32.3	30.0	27.7	30.0	1.26	1.23	1.17	1.22
29-30.09.2020	73	176	141	120	146	5.9	5.0	4.6	5.2	30.4	27.5	29.6	29.2	1.16	1.20	1.14	1.17
02-03.10.2020	47	86	93	57	79	4.6	4.4	4.2	4.4	33.9	30.8	28.5	31.1	1.28	1.18	1.15	1.20
06-07.10.2020	115	123	188	201	171	5.5	6.1	6.3	6.0	52.1	50.6	57.5	53.4	1.34	1.37	1.29	1.33
09-10.10.2020	77	155	119	145	140	6.1	5.5	4.6	5.4	32.2	33.7	37.6	34.5	1.32	1.30	1.00	1.21
Norms NAAQM	60				100				80				80				5.0

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HISTOGRAM OF RESULTS OF AMBIENT AIR QUALITY MONITORING of Gate No. 4, Near 4 & 5 No. Jaty (15.09.2020 to 09.10.2020)

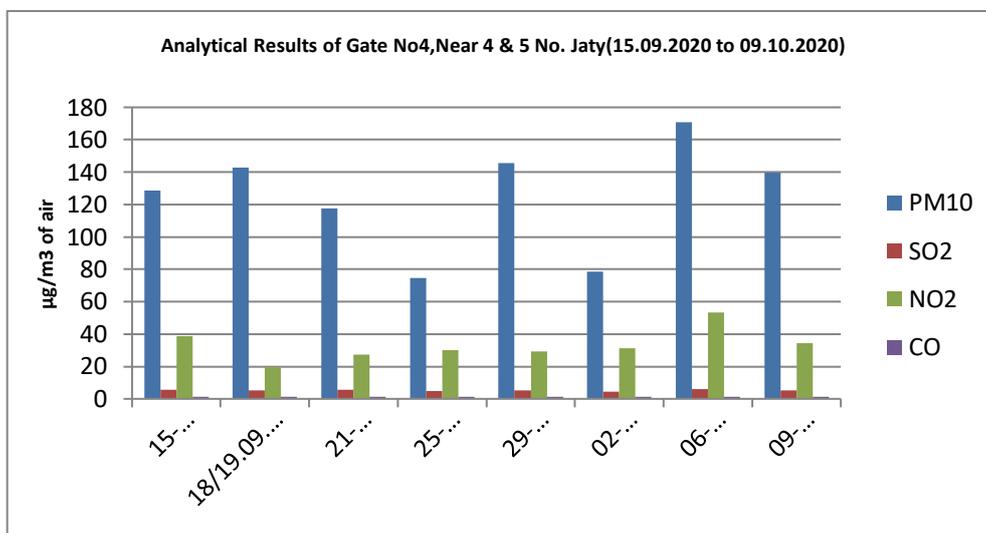


Table – 2.2
[SCHEDULE VII]
[See rule 3 (3B)]
National Ambient Air Quality Standards

Pollutants	Time Weighted Average	Concentration in Ambient Air ($\mu\text{g} / \text{m}^3$ of air)	
		Industrial, Residential, Rural & Other Areas	Ecologically Sensitive Areas
Sulphur Dioxide (SO ₂)	Annual Average *	50	20
	24 hours**	80	80
Nitrogen Dioxide (NO ₂)	Annual Average *	40	30
	24 hours**	80	80
RPM Particulate Matter (size less than 10 μm) or PM ₁₀	Annual Average *	60	60
	24 hours**	100	100

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform interval
** 24 hourly / 8 hourly values should be met 98 % of the time in a year. However, 2 % of the time, it may exceed but not on two consecutive days.

[Norms as per Ministry of Environment and Forests Notification, New Delhi, the 16th November, 2009]
[Environment (Protection) Seventh Amendment Rules, 2009]

3.0 AMBIENT NOISE QUALITY STUDY

3.1.0 Objective: Anevaluation of ambient noise levels were carried out in and around the working areasduring September –December2017, according to the following land use (Table 3.3) categories:

- Ambient Noise level in the Residential areas.
- Ambient Noise levels in the Commercial areas
- Ambient Noise Level in the Industrial areas

3.2.0 Selection of Noise level Monitoring Stations:

The noise level measurement stations selected according to each land use category, the locationdetails of which have been depicted in Table 3.0.

3.3.0 Sampling equipment and methodology:

3.3.1:Equipment:

Noise level measurements were carried out with the help of portable Sound level Meter (SL-4001 and SL 4033SD) respectively. M / S Lutron manufactured both the instruments.

3.3.2: Methodology:

(a) For determination of ambient noise at a particular point, the noise meter probe was pointed to the four cardinal directions of north, south, east and west. Corresponding to each direction a set of reading in “slow” setting was recorded.

(b) During the study time a gap of 30 seconds was allowed between two consecutive data observation. Sound level was collected to monitor the values of L 10, L 50, L 90, Lmax, Lmin& L day and L night during the period of 24 hrs.monitoring period.

(c) The noise levels were recorded continuously at 1 – hourly interval through SL – 4001. Thus in total 1440 readings were recorded after 12 hours study. While through SL 4033 SD, the ambient noise levels were measured for 24 hours continuously. So, here a total number of 2880 readings were recorded after 24 hours study.

The measurements recorded are detailed below:

(c) Equivalent Continuous Sound Pressure Level (Leq):

Equivalent Continuous Sound Pressure Level, or Leq, is the constant noise level that would result in the same total sound energy being produced over a given period. It can be measured in either A, C or Z (Linear) modes. Leq is not an ‘average sound level’, as it sometimes referred to. The equations used to calculate Leq are not calculating a specific average level.

Leq can be described mathematically by the following equation:

$$Leq = 10 \log_{10} \left(\frac{1}{T_M} \int_Q^{T_M} \left(\frac{P(t)}{P_0} \right)^2 dt \right)$$

Where:

- **Leq** is the equivalent continuous linear weighted sound pressure level re 20µPa, determined over a measured time interval T_M (secs)
- **P(t)** is the instantaneous sound pressure of the sound signal
- **P₀** is the reference sound pressure of 20µPa

When the instantaneous A-weighted sound pressure (P_A) of the sound signal is introduced the equivalent continuous A-weighted sound pressure level determined over time interval T_M is as follows:

$$L_{eq} = 10 \log_{10} \frac{1}{T_M} \int_0^{T_M} \left(\frac{P_A(t)}{P_0} \right)^2 dt$$

In practice when measuring noise it is possible to take Leq readings, with your instrument, of short duration, i.e <5 minutes, providing all variations of noise emissions are covered. If the measured environment changes greatly then the longer the Leq measurement is taken the more accurate the measurement.

Adding Leq values requires taking an anti-log of each value. The addition can be performed as shown:

A weighting: the A-weighting

$$\text{Total } L_{eq} = 10 \log \left(\frac{10^{\frac{L_{eq1}}{10}} + 10^{\frac{L_{eq2}}{10}} + 10^{\frac{L_{eq3}}{10}} + \dots + 10^{\frac{L_{eqn}}{10}}}{n} \right)$$

filter covers the full audio range - 20 Hz to 20 kHz and the shape is similar to the response of the human ear at the lower levels.

A-weighted noise measurements are the most widely used and confirm the accuracy of the meter including the filters.

The preferred convention is to write LA = x dB, however dB A and dB (A) are often used, etc.,

C-weighting: a standard frequency weighting for sound level meters, commonly used for higher level measurements, it also written as dB(C) or dBC.

The A-weighting curve is used extensively for general purpose noise measurements but the C-weighting correlates better with the human response to high noise levels.

L50: If we consider any fluctuating noise levels and store the results once a second, then at the end of an hour we would have 3600 samples. We can then use these samples to determine some helpful statistics. For example if add up all the samples and divide by 3600 then we will get the average or L50% value of the noise over the hour.

L10: By definition the L10 value is the level just exceeded for 10% of the time and takes account of any annoying peaks of noise.

L90: By definition the L90 value is the level just exceeded for 90% of the time and takes account of any annoying peaks of noise.

L max is the highest RMS (root mean squared) sound pressure level within the measuring period.

L min is the lowest RMS sound pressure level within the measuring period.

L day is the total results during day time monitoring

L night is the total results during night time.

PERIODIC ENVIRONMENTAL MONITORING REPORT
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Table: 3.1

RESULTS OF AMBIENT NOISE LEVEL MONITORING

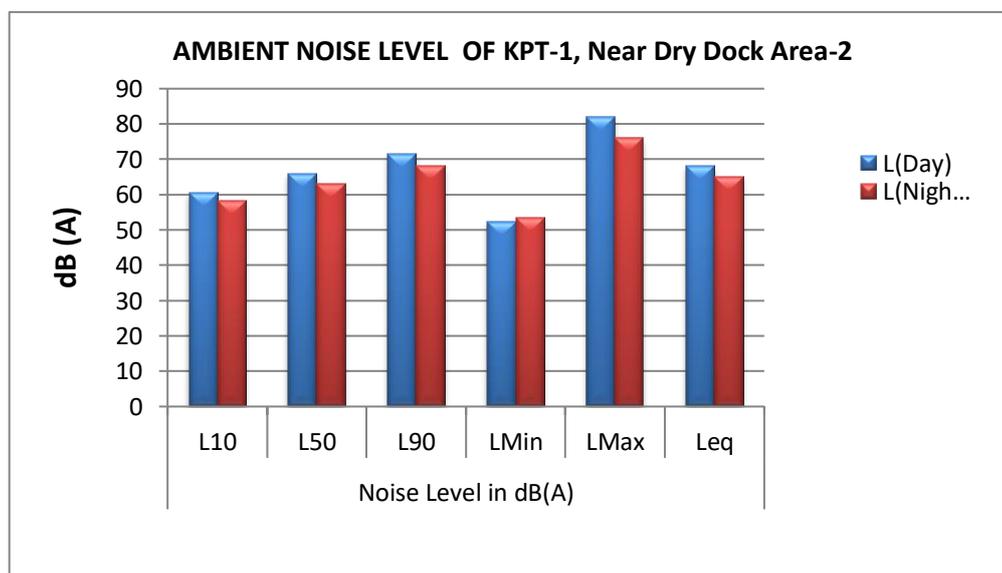
Location:KPT-1, Near Dry Dock Area-2

Date of Monitoring: 09.10.2020

Day Time (06:00 A.M. to 10:00 P.M.)

Sl. No.	Date of Monitoring	Time	Noise Level in dB(A)						Norms as per 'The Noise Pollution (Regulation and Control) Rules, 2000 (Vide S.O. 50 (E) dtd. 11.01.2010 under the Environment (Protection) Act, 1986)' for Industrial area	
			L10	L50	L90	LMin	LMax	Leq		
1.	09-10-2020	09:01 A.M. - 10:00 A.M.	60.7	64.9	70.2	54.9	79.2	67.6	75 dB(A)	
2.		10:01 A.M. - 11:00 A.M.	61.6	65.3	70.2	58.9	77.4	67.6		
3.		11:01 A.M. - 12:00 P.M.	59.8	64.1	68.9	55.5	72.6	65.9		
4.		12:01 P.M. - 01:00 P.M.	60.4	64.9	69.6	58.5	71.6	65.9		
5.		01:01 P.M. - 02:00 P.M.	60.2	63.5	67.8	56.6	73.3	65.3		
6.		02:01 P.M. - 03:00 P.M.	60.3	64.4	69.9	57.8	72.6	66.5		
7.		03:01 P.M. - 04:00 P.M.	63.0	67.1	71.5	57.6	74.1	68.2		
8.		04:01 P.M. - 05:00 P.M.	59.3	64.9	70.2	56.2	75.4	66.4		
9.		05:01 P.M. - 06:00 P.M.	59.4	65.1	70.1	55.3	76.3	67.2		
10.		06:01 P.M. - 07:00 P.M.	58.9	64.2	69.2	54.4	73.5	66.1		
11.		07:01 P.M. - 08:00 P.M.	56.4	63.4	69.7	52.2	73.4	65.7		
12.		08:01 P.M. - 09:00 P.M.	55.4	62.1	70.4	50.7	76.9	66.4		
13.		09:01 P.M. - 10:00 P.M.	57.2	63.4	68.1	52.4	74.1	65.9		
14.	10-10-2020	06:01 A.M. - 07:00 A.M.	60.0	63.3	69.3	57.8	79.6	66.6		
15.		07:01 A.M. - 08:00 A.M.	59.8	63.7	67.7	55.7	70.5	64.8		
16.		08:01 A.M. - 09:00 A.M.	62.2	66.5	71.2	59.7	74.7	68.5		
L(Day)			61.3	66.8	72.1	53	82.7	68.9		
Night Time (10:00 P.M. to 06:00 A.M.)										
17.	09-10-2020	10:01 P.M. - 11:00 P.M.	53.5	61.1	66.1	51.7	71.3	63.3	70 dB(A)	
18.		11:01 P.M. - 00:00 A.M.	54.1	60.6	64.9	51.8	68.5	61.9		
19.	10-10-2020	00:01 A.M. - 01:00 A.M.	56.5	62.6	67.8	53.4	75.2	64.9		
20.		01:01 A.M. - 02:00 A.M.	59.1	63.5	67.8	55.5	72.0	64.9		
21.		02:01 A.M. - 03:00 A.M.	57.2	62.3	66.2	53.5	69.7	63.5		
22.		03:01 A.M. - 04:00 A.M.	56.7	61.1	65.3	54.9	68.3	62.3		
23.		04:01 A.M. - 05:00 A.M.	58.0	60.9	66.3	56.6	71.3	63.0		
24.		05:01 A.M. - 06:00 A.M.	57.5	61.5	67.6	55.1	74.4	64.9		
L(Night) :			59.0	62.1	67.2	52.4	75.1	64.1		

AMBIENT NOISE LEVEL OF KPT-1, NEAR DRY DOCK AREA-2 PRESENTED THROUGH HISTOGRAM



PERIODIC ENVIRONMENTAL MONITORING REPORT
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Table - 3.2

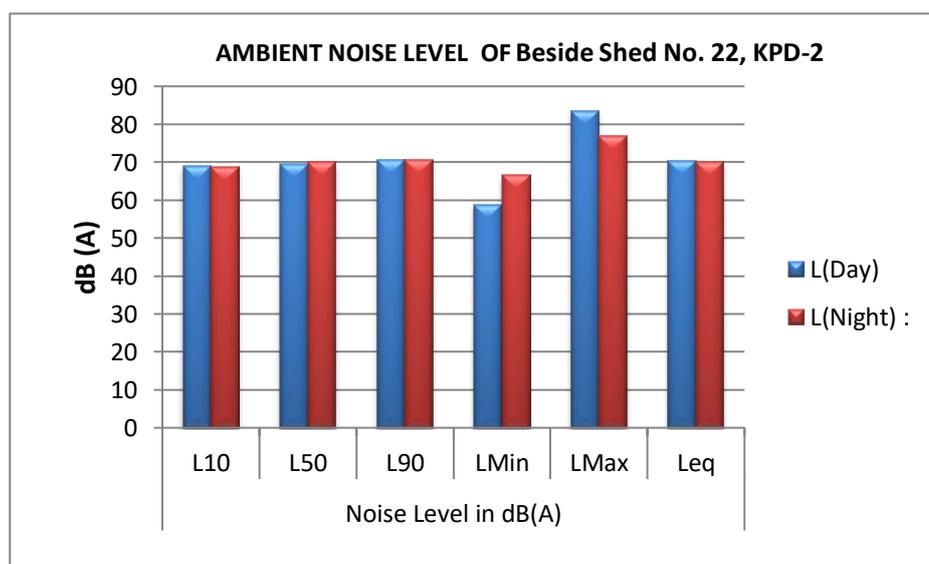
RESULTS OF AMBIENT NOISE LEVEL MONITORING

Location: : Beside Shed No. 22, KPD-2

Date of Monitoring: 09.10.2020

Day Time (06:00 A.M. to 10:00 P.M.)										
Sl. No.	Date of Monitoring	Time	Noise Level in dB(A)						Norms as per 'The Noise Pollution (Regulation and Control) Rules, 2000 (Vide S.O. 50 (E) dtd. 11.01.2010 under the Environment (Protection) Act, 1986' for Industrial area	
			L ₁₀	L ₅₀	L ₉₀	L _{Min}	L _{Max}	L _{eq}		
1.	09-10-2020	09:01 A.M. - 10:00 A.M.	67.6	69.6	75.2	57.8	82.4	72.2	75 dB(A)	
2.		10:01 A.M. - 11:00 A.M.	68.0	68.3	69.3	67.8	71.9	68.6		
3.		11:01 A.M. - 12:00 P.M.	67.7	68.1	69.1	67.4	76.2	68.9		
4.		12:01 P.M. - 01:00 P.M.	68.3	68.6	68.9	68.2	71.4	68.7		
5.		01:01 P.M. - 02:00 P.M.	67.5	67.7	68.0	67.4	69.7	67.8		
6.		02:01 P.M. - 03:00 P.M.	66.9	67.1	67.2	66.8	68.2	67.1		
7.		03:01 P.M. - 04:00 P.M.	68.8	68.9	69.1	68.6	69.8	68.9		
8.		04:01 P.M. - 05:00 P.M.	68.3	68.5	68.9	68.1	70.6	68.6		
9.		05:01 P.M. - 06:00 P.M.	69.8	70.0	70.8	69.6	76.7	70.4		
10.		06:01 P.M. - 07:00 P.M.	70.6	70.8	71.1	70.5	75.5	71.0		
11.		07:01 P.M. - 08:00 P.M.	70.3	70.4	70.6	70.2	71.1	70.5		
12.		08:01 P.M. - 09:00 P.M.	65.7	66.0	66.5	65.5	67.8	66.1		
13.		09:01 P.M. - 10:00 P.M.	68.9	71.6	72.0	68.6	73.3	71.4		
14.	10-10-2020	06:01 A.M. - 07:00 A.M.	66.2	66.6	68.7	65.7	73.9	67.6		
15.		07:01 A.M. - 08:00 A.M.	70.4	70.9	73.8	70.2	89.3	74.5		
16.		08:01 A.M. - 09:00 A.M.	69.2	69.4	69.9	68.9	75.2	69.8		
L(Day)			70.9	71.3	72.1	60.6	85.2	72.0		
Night Time (10:00 P.M. to 06:00 A.M.)										
17.	09-10-2020	10:01 P.M. - 11:00 P.M.	70.8	70.9	71.1	70.6	74.0	71.0	70 dB(A)	
18.		11:01 P.M. - 00:00 A.M.	70.4	70.5	70.9	70.3	72.2	70.7		
19.	10-10-2020	00:01 A.M. - 01:00 A.M.	68.5	68.8	69.1	68.3	73.0	69.0		
20.		01:01 A.M. - 02:00 A.M.	67.6	67.9	68.9	67.4	70.2	68.1		
21.		02:01 A.M. - 03:00 A.M.	71.1	71.5	72.4	70.9	78.8	72.2		
22.		03:01 A.M. - 04:00 A.M.	72.4	72.8	73.2	72.3	74.0	72.9		
23.		04:01 A.M. - 05:00 A.M.	67.5	68.1	68.4	66.9	69.4	68.1		
24.		05:01 A.M. - 06:00 A.M.	68.2	68.8	70.8	57.9	78.0	69.9		
L(Night) :			69.6	70.7	71.3	67.5	77.7	70.7		

AMBIENT NOISE LEVEL OF BESIDE SHED NO. 22, KPD- 2 PRESENTED THROUGH HISTOGRAM



PERIODIC ENVIRONMENTAL MONITORING REPORT
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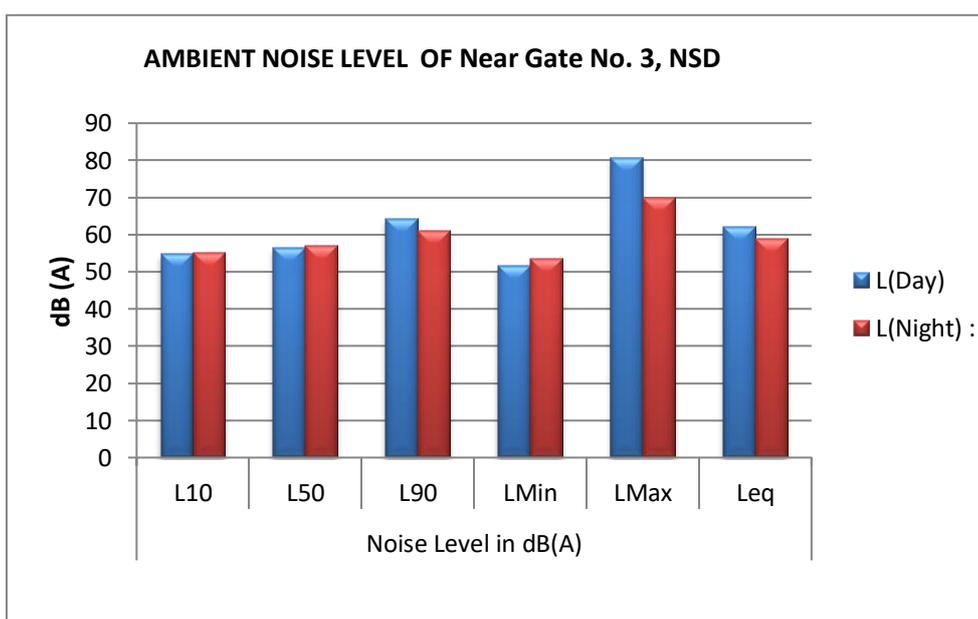
Table: 3.3
RESULTS OF AMBIENT NOISE LEVEL MONITORING

Location: : Near Gate No. 3, NSD

Date of Monitoring: 09.10.2020

Day Time (06:00 A.M. to 10:00 P.M.)									
Sl. No.	Date of Monitoring	Time	Noise Level in dB(A)						Norms as per 'The Noise Pollution (Regulation and Control) Rules, 2000 (Vide S.O. 50 (E) dtd. 11.01.2010 under the Environment (Protection) Act, 1986' for Industrial area
			L10	L50	L90	LMin	LMax	Leq	
1.	09-10-2020	09:01 A.M. - 10:00 A.M.	57.1	62.4	70.2	55.8	75.9	66.5	75 dB(A)
2.		10:01 A.M. - 11:00 A.M.	55.6	59.7	66.7	54.9	69.0	62.2	
3.		11:01 A.M. - 12:00 P.M.	52.5	55.3	60.0	51.2	72.7	59.6	
4.		12:01 P.M. - 01:00 P.M.	57.2	62.6	71.9	56.1	81.7	69.0	
5.		01:01 P.M. - 02:00 P.M.	57.5	59.4	69.4	56.8	72.5	63.8	
6.		02:01 P.M. - 03:00 P.M.	56.2	57.6	60.5	55.6	73.7	60.1	
7.		03:01 P.M. - 04:00 P.M.	52.7	53.8	58.1	52.3	64.8	56.2	
8.		04:01 P.M. - 05:00 P.M.	53.6	54.4	58.4	53.2	69.9	58.8	
9.		05:01 P.M. - 06:00 P.M.	57.1	58.2	61.3	56.7	67.7	59.5	
10.		06:01 P.M. - 07:00 P.M.	53.7	54.4	56.8	53.3	60.6	55.4	
11.		07:01 P.M. - 08:00 P.M.	57.7	58.3	65.0	57.3	70.5	61.3	
12.		08:01 P.M. - 09:00 P.M.	52.0	52.6	56.5	51.7	70.7	56.3	
13.		09:01 P.M. - 10:00 P.M.	56.2	56.8	61.6	55.5	77.0	63.0	
14.	10-10-2020	06:01 A.M. - 07:00 A.M.	51.6	56.3	61.4	51.0	68.3	58.8	
15.		07:01 A.M. - 08:00 A.M.	53.7	56.4	63.3	52.5	76.0	63.2	
16.		08:01 A.M. - 09:00 A.M.	52.8	60.3	69.3	51.5	71.7	62.9	
L(Day)			56.1	57.6	65.3	52.9	81.8	63.3	
Night Time (10:00 P.M. to 06:00 A.M.)									
17.	09-10-2020	10:01 P.M. - 11:00 P.M.	56.9	57.7	60.9	56.5	64.9	59.0	70 dB(A)
18.		11:01 P.M. - 00:00 A.M.	58.7	59.3	62.3	58.3	65.8	60.4	
19.	10-10-2020	00:01 A.M. - 01:00 A.M.	55.0	55.8	61.1	54.3	64.4	57.8	
20.		01:01 A.M. - 02:00 A.M.	58.1	58.9	62.8	56.9	67.5	60.5	
21.		02:01 A.M. - 03:00 A.M.	57.7	59.2	62.6	56.5	70.2	61.0	
22.		03:01 A.M. - 04:00 A.M.	58.4	59.4	65.2	57.8	72.1	62.8	
23.		04:01 A.M. - 05:00 A.M.	53.0	54.4	60.6	52.7	66.7	57.9	
24.		05:01 A.M. - 06:00 A.M.	54.6	55.7	59.7	54.0	61.1	57.0	
L(Night) :			56.4	58.2	62.4	54.8	71.1	60.1	

AMBIENT NOISE LEVEL OF NEAR GATE NO. 3, NSD PRESENTED THROUGH HISTOGRAM



PERIODIC ENVIRONMENTAL MONITORING REPORT
KOLKATA PORT TRUST, KHIDDERPORE

Table - 3.4

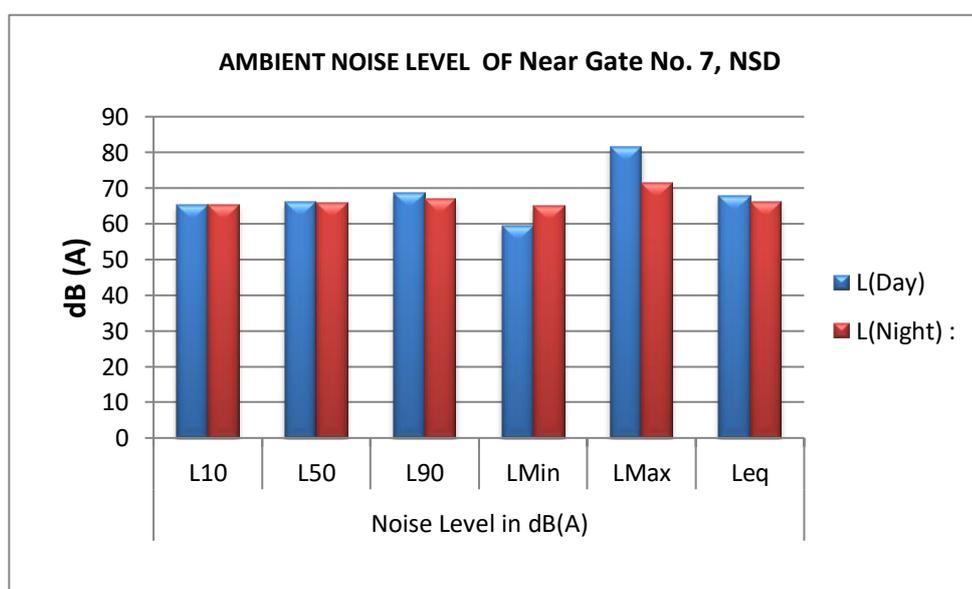
RESULTS OF AMBIENT NOISE LEVEL MONITORING

Location: : Near Gate No. 7, NSD

Date of Monitoring: 09.10.2020

Day Time (06:00 A.M. to 10:00 P.M.)									
Sl. No.	Date of Monitoring	Time	Noise Level in dB(A)						Norms as per 'The Noise Pollution (Regulation and Control) Rules, 2000 (Vide S.O. 50 (E) dtd. 11.01.2010 under the Environment (Protection) Act, 1986)' for Industrial area
			L ₁₀	L ₅₀	L ₉₀	L _{Min}	L _{Max}	L _{eq}	
1.	09-10-2020	09:01 A.M. - 10:00 A.M.	68.1	68.7	70.6	60.5	82.5	71.3	75 dB(A)
2.		10:01 A.M. - 11:00 A.M.	65.4	66.3	71.1	65.0	74.1	68.0	
3.		11:01 A.M. - 12:00 P.M.	66.0	67.0	69.5	65.5	75.0	67.9	
4.		12:01 P.M. - 01:00 P.M.	68.0	68.7	71.0	67.5	78.5	70.1	
5.		01:01 P.M. - 02:00 P.M.	67.8	68.2	69.0	67.6	71.4	68.4	
6.		02:01 P.M. - 03:00 P.M.	65.9	66.5	67.8	65.6	70.4	67.0	
7.		03:01 P.M. - 04:00 P.M.	64.4	64.7	65.4	64.1	69.4	65.0	
8.		04:01 P.M. - 05:00 P.M.	65.9	66.2	67.5	65.7	78.1	67.3	
9.		05:01 P.M. - 06:00 P.M.	67.3	67.8	68.2	67.0	74.1	68.0	
10.		06:01 P.M. - 07:00 P.M.	64.2	64.7	65.4	64.0	66.2	64.8	
11.		07:01 P.M. - 08:00 P.M.	66.4	67.1	67.8	66.3	70.6	67.3	
12.		08:01 P.M. - 09:00 P.M.	66.4	67.0	67.8	66.2	71.5	67.2	
13.		09:01 P.M. - 10:00 P.M.	65.8	66.4	67.2	65.6	68.0	66.6	
14.	10-10-2020	06:01 A.M. - 07:00 A.M.	63.8	64.4	69.0	63.3	74.0	66.5	
15.		07:01 A.M. - 08:00 A.M.	67.4	69.0	73.8	67.1	83.6	72.6	
16.		08:01 A.M. - 09:00 A.M.	63.4	64.7	66.6	63.0	74.9	66.4	
L(Day)			66.8	67.8	70.2	61.0	83.0	69.5	
Night Time (10:00 P.M. to 06:00 A.M.)									
17.	09-10-2020	10:01 P.M. - 11:00 P.M.	66.1	66.6	67.3	65.8	68.7	66.8	70 dB(A)
18.		11:01 P.M. - 00:00 A.M.	64.3	64.7	65.3	64.1	67.3	64.8	
19.	10-10-2020	00:01 A.M. - 01:00 A.M.	63.4	63.8	64.2	63.2	66.7	63.9	
20.		01:01 A.M. - 02:00 A.M.	67.0	67.3	67.8	66.7	69.9	67.4	
21.		02:01 A.M. - 03:00 A.M.	66.9	67.3	68.2	66.6	73.0	67.7	
22.		03:01 A.M. - 04:00 A.M.	66.5	66.9	67.7	66.2	68.4	67.0	
23.		04:01 A.M. - 05:00 A.M.	64.1	64.7	65.6	63.6	66.8	64.9	
24.		05:01 A.M. - 06:00 A.M.	67.9	68.5	69.2	58.6	71.1	68.6	
L(Night) :			65.7	66.3	67.3	65.3	71.7	66.5	

AMBIENT NOISE LEVEL OF NEAR GATE NO. 7, NSD PRESENTED THROUGH HISTOGRAM



PERIODIC ENVIRONMENTAL MONITORING REPORT
KOLKATA PORT TRUST, KHIDDERPORE

TABLE 3.6
NATIONAL AMBIENT NOISE LEVEL STANDARD

LIMITS IN d (B) A Leq			
AREA CODE	CATEGORY OF AREA	DAY TIME	NIGHT TIME
A	INDUSTRIAL AREA	75	70
B	COMMERCIAL AREA	65	55
C	RESIDENTIAL AREA	55	45
D	SILENCE ZONE	50	40

Note:

1. Day time is reckoned in between 6 a.m and 10 p.m
2. Night time is reckoned in between 10 p.m and 6 a.m
3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.
4. Mixed categories areas may be declared "as one of the four" above mentioned categories, by the Competent Authority.
5. dB (A) Leq denotes the time weighted average of the level of sound in decibels in scale A, which is relatable to human hearing. A "decibel" is a unit in which the noise is measured.

"A", in dB (A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq : It is energy mean of the noise level over a specified period.

Source:

The Principal Rules were published in the Gazette of India, vide no. S.O 123 (E), dated 14th February 2000 and subsequently amended vise S.O 1046 (E), dated 22nd November, 2000, S.O 1088 (E), dated 11th October, 2002, S.O (1569 (E), dated the 19th September, 2006 and S.O 50 (E) dated 11th January, 2010.

4.0 CHARACTERIZATIONS OF DRINKING WATER SAMPLES

4.1.0 Objective:

Most important aim was to get an idea about the quality of the collected water samples, which were mainly used, for drinking purposes. The sampling of two surface water sample, 3 ground water samples and also collection of 3 supply water samples were carried out on July 10, 2020. The collected samples were analysed at the laboratory of R.V. Briggs at Kolkata.

4.2.0 Drinking Water Characterization:

Parameters assessed:

The drinking water quality was assessed for the following parameters:

- Total Coliform Organisms
- Faecal Coliform Organism
- pH
- Colour
- Turbidity
- Chloride
- Residual Chlorine
- Total Dissolved Solid

4.3.0 Plan of Sampling:

The details of the water sampling sites are as follows.

- (i) Head Office Canteen
- (ii) 51 CGR Road, Civil Engg. Dock Office, 2nd Floor Tap
- (iii) Remount Road Quarter, 9 No. Civil Site Office
- (iv) Port Land Park Quarter, Civil Site Office
- (v) KOPT Hospital, Canteen # 09
- (vi) Container Terminal Office, (NSD)
- (vii) NS Dock Office, (WTP)
- (viii) KP Dock Office

4.5.0 Laboratory Determinations:

Bacteriological Count: The determination of Total coliform & Faecal Coliform count carried out according to the method prescribed by APHA 22nd Edn. 9222 B & APHA 22nd Edn. 9222 D respectively.

pH value : The pH value was calculated in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (22nd edition – 1550 H + B).

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Colour: The colour value was calculated in the laboratory according to the method prescribed IS: 3025-(part-4): 1983 Reaffirmed 2012.

Turbidity: The turbidity value was calculated in the laboratory according to the method prescribed IS: 3025 (Part-10): 1984 Reaffirmed 2012.

Chloride: The chloride value was calculated in the laboratory according to the method prescribed IS: 3025 (Part-32): 1988 Reaffirmed 2009.

Residual Chlorine: The residual chlorine value was calculated in the laboratory according to the method prescribed IS: 3025 (Part-26): 1986 Reaffirmed 2009.

Total Dissolved Solid: The TDS value was calculated in the laboratory according to the method prescribed IS: 3025 (Part-16): 1984 Reaffirmed 2012.

Table 4.1

Analytical Results of Drinking Water Sample collected from the above-mentioned locations

Date of Collection: 20.10.2020

Sl No.	Test parameters	Locations								Unit
		Head Office Canteen	51 CGR Road, Civil Engg. Dock Office, 2nd Floor Tap	Remount Road Quarter, 9 No. Civil Site Office	Port Land Park Quarter, Civil Site Office	KOPT Hospital, Canteen # 09	Container Terminal Office, (NSD)	NS Dock Office, (WTP)	KP Dock Office	
1	Colour	1	1	1	1	1	1	1	1	Hazen
2	Turbidity	1.3	1.1	1.1	1.4	1.5	1.9	1.4	1.0	NTU
3	pH value	7.4	7.4	7.4	7.4	7.4	7.4	7.2	6.9	---
4	Total Dissolved Solids	168	176	188	166	174	474	468	176	mg/l
5	Chloride as Cl	14	16	16	16	17	175	161	16	mg/l
6	Residual Free Chlorine	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/l
7	Coliform Organism	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	CFU/100ml
8	Faecal Coliform	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	CFU/100ml

4.9.1. Assessment of analytical Results against Standards:

As the above mentioned supply water samples were used mostly for drinking water and also for cooking purposes, So, the assessment was carried out as per the stipulated Standards of IS: 1622 (1981) for Bacteriological parameters and IS: 10,500 (2012) 2nd revision (Table 4.3 d-4.3f) for other parameters respectively as specified by MoEF, Government of India :

(a) Bacteriological Parameters:

The count of bacteriological parameters in terms of Total coliform count and Faecal (E.coli) Coliform Organisms were absent and are safe to consume in the collected samples.

(b) Organoleptic and Physical Parameters:

pH, Turbidity and Total Dissolved Solids were within their respective acceptable limits.

(c) General Parameters Concerning Substances Undesirable in Excessive Amounts:

The values for Aluminium, Anionic Detergents, Barium, Boron, Calcium, Chloride, Copper, Fluoride, Iron, Magnesium, Manganese, NO₃, Phenolic Compounds, Se, Ag, SO₄, Sulphide, Total Hardness, Total Alkalinity and Zinc were below their respective permissible limits in all the analysed samples.

(d) Parameters Concerning Toxic Substances:

The concentrations of toxic substances like Cd, CN, Pb, Hg, Mo, Ni, Total As and Total Cr were within their respective tolerance limits.

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Table 5.1
5.0 SUMMARY REPORT OF AMBIENT AIR QUALITY

PROJECT :		KOLKATA PORT TRUST KHIDDERPORE							
PERIOD :		Sept' 2020 TO Oct' 2020						Unit : $\mu\text{g}/\text{m}^3$	
Stn. No.	Pollutants	No. of Readings	Min. value	Max. value	Arithmetic Mean	Standard deviation	Percentile Value P50th	P98th	
Near Dry Dock Area-2	PM _{2.5}	8	47	86	75	12	80	84	
Beside Shed No. 22	"	8	45	87	65	13	64	85	
Administrative Building	"	8	49	73	60	10	59	72	
Gate No. 4, Near 4 & 5 No. Jaty	"	8	41	115	69	23	73	113	
Near Dry Dock Area-2	PM ₁₀	24	72	198	137	41	136	194	
Beside Shed No. 22	"	24	53	168	114	30	113	165	
Administrative Building	"	24	64	147	110	30	131	144	
Gate No. 4, Near 4 & 5 No. Jaty	"	24	57	184	125	42	149	180	
Near Dry Dock Area-2	SO ₂	24	4.2	7.1	5.4	0.7	6.2	7.0	
Beside Shed No. 22	"	24	4.2	6.9	5.4	0.6	5.8	6.8	
Administrative Building	"	24	4.2	6.3	5.2	0.5	5.4	6.2	
Gate No. 4, Near 4 & 5 No. Jaty	"	24	4.2	6.1	5.3	0.5	5.9	6.0	
Near Dry Dock Area-2	NO ₂	24	21.6	49.1	35.5	6.4	39.2	48.1	
Beside Shed No. 22	"	24	21.0	44.7	35.2	7.4	37.4	43.8	
Administrative Building	"	24	26.0	43.1	35.6	5.3	37.4	42.2	
Gate No. 4, Near 4 & 5 No. Jaty	"	24	18.3	52.1	33.0	9.2	32.3	51.1	
Near Dry Dock Area-2	CO	24	1.16	1.34	1.29	0.01	1.32	1.31	
Beside Shed No. 22	"	24	1.17	1.33	1.26	0.02	1.30	1.30	
Administrative Building	"	24	1.15	1.36	1.26	0.04	1.29	1.33	
Gate No. 4, Near 4 & 5 No. Jaty	"	24	1.00	1.34	1.24	0.05	1.28	1.31	

6.0 CHARACTERISATION OF EFFLUENTS

6.1 Dock Basin & River Water Characterization:

6.1.1 Objective: The main purpose of the study was to get an idea about the quality of Dock Basin & River water within the area of study. All together 4 Dock Basin water samples and 2 River water samples were collected and were analysed within our present area of study.

Four (04) *Dock Basin* samples collected from: (i) 7/8 N.S. Dock, (ii) N.S. D. Lock Entrance (iii) KPD 2 (26-28 KPD) and from (iv) KPD 1 (11 KPD) respectively.

Two (02) *River water* samples were collected from (i) NSD Lock Entrance, (ii) KPD Lock Entrance from River, respectively.

6.1.2 Dock Basin & River water character of the present study areas were assessed in terms of the following structure:

(a) *Bacteriological Count:* (i) Total coliform count (ii) Faecal (E.coli) coliform Count

(b) *Organoleptic and Physical Parameters:*

i) Colour, (ii) pH value, (iii) Turbidity, (iv) Total Dissolved Solids (iv) Total Suspended Solids

(c) *General Parameters Concerning Substances undesirable in Excessive Amounts:*

(i) Dissolved Oxygen, (ii) Salinity, (iii) Ammoniacal Nitrogen, (iv) Sulphate, (v) oil & Grease, (vi) BOD, (vii) COD.

6.1.3: Plan of Sampling:

Altogether Dock Basin water samples and 2 River water samples were collected from the locations mentioned above (4.8.1). Major groundwater sources, the details of the water sampling sites were given in the Table 4.3 a to 4.3 c.

6.1.4 Sampling Procedure:

For each location three water samples were collected (Plate – 5) for the following analysis: (i) *Bacteriological analysis:* The sample was collected in a pre-sterilised 250 ml. water bottle, wearing throwaway gloves. The sample bottles were previously sterilized by autoclaving. Two layers of papers covered the stopper and the neck of bottle, prior to sterilization. The opening and closing of the bottles in the process of sample collection was carried out with meticulous care to avoid any bacterial contamination from outside source. When water was collected from tube well, the mouth of the tube well was flamed for 10 minutes, and the water was allowed to run for 5 minutes before filling the bottle. The bottle was filled up to neck leaving 3 inches air space vertically below the glass stopper. Immediately after collection, the samples

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were transported to the R.V.Briggs laboratory in an ice – box, which was kept in temperatures within 4^oC. While for determination of other parameters like: *non-metals*:Colour, pH value,Turbidity, Total Dissolved Solids, Total Suspended Solids, Dissolved Oxygen, Salinity, Ammoniacal Nitrogen, Sulphate, oil & Grease, BOD, COD a total quantity of 2.0 Liters of effluent was collected from the locations in separated bottles. Before collection, the containers were washed with the sample water with vigorous shake. Then the samplings were carried out from 60 cm deep inside .(i) In a dusky glass bottle of 1 litre capacity the sample was collected for determination of Oil & Grease. (ii) Second sample was collected in a plastic container of 1 litre capacity for testing of its pH, Total Suspended Solids, Chemical Oxygen Demand & Bio Chemical Oxygen Demand. The D.O for the sample was measured at the sampling site. After collection, the samples were immediately transported to the R.V.Brigg's laboratory at Kolkata. The whole collection procedure was carried out in presence of KPT official.

6.1.5: Laboratory determination:

The laboratory determination of above mentioned parameters carried out as per following procedure:

- Faecal (E.coli) coliform count : The method was followed as per IS : 1622, 1981
- pH value : The pH value was calculated in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 4550 H + B)
- Taste : The method was followed according to the procedure of IS : 3025 (Part -8) 1985
- Turbidity : The Turbidity value was calculated in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 2130 B)
- Total Dissolved Solids (TDS) : The TDS value was calculated in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 2540 C)
- Total Suspended Solids (TSS): The TSS was measured in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 2540 D).
- Oil & Grease: The Oil &Grease was measured in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 5520 B).
- COD: The COD was measured in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 5220 B).
- BOD: The BOD was measured in the laboratory according to the method prescribed by the IS 3025 (Part 44) 1966.
- Ammoniacal Nitrogen: The Ammoniacal Nitrogen was measured in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 4500 NH₃F).
- Salinity: The Salinity was measured in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23nd edition – 2520 B).

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- DO: The DO was measured in the laboratory according to the method prescribed by the American Public Health Association (APHA) in their Publication (23rd edition – 4500 OC).
- Sulphate: The Sulphate was measured in the laboratory according to the method prescribed by I.S. 3025 (Part – 24) – 1986 .

6.1.6 Assessment of Analytical Results against Standards of Dock Basin & River water:(Table 5.0):

The assessment was made against the stipulated standard prescribed by the West Bengal Pollution Control Board:

- ✓ pH value : It was marginally above the stipulated tolerance limit..
- ✓ Colour:
- ✓ Turbidity
- ✓ Total Dissolved Solids
- ✓ Total Suspended Solids: The value was within the specific norms.
- ✓ Oil & Grease: The value was within the fixed norms.
- ✓ BOD: The value was within the given norms.
- ✓ COD: The value was within the set norms.
- ✓ Ammoniacal Nitrogen
- ✓ Sulphate
- ✓ Salinity
- ✓ DO:
- ✓ Total Coliform
- ✓ Faecal Coliform

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Table 6.1

ANALYTICAL RESULTS OF THE EFFLUENTSAMPLES COLLECTED

Date of Sampling:30.09.2020& 20.10.2020

Dock Basin water:						
Sl. No.	Test Parameters	Unit	Locations			
			7/8 N.S. Dock Dt:30.09.2020.	N.S. D. Lock Entrance Dt:30.09.2020.	KPD 2 (26-28 KPD) Dt:20.10.2020	KPD 1 (11 KPD) Dt:20.10.2020.
1	pH Value	...	7.50	8.30	7.63	7.26
2	Turbidity	NTU	3.6	4.7	7.1	7.2
3	Total Suspended Solids (TSS)	mg/l	< 10.0	<10	< 10.0	< 10.0
4	Ammoniacal Nitrogen as N	mg/l	<0.2	< 0.2	8.40	7.09
5	Oil and Grease(O & G)	mg/l	< 6.0	< 6.0	< 6.0	< 6.0
6	Biochemical Oxygen Demand for 3 days at 27°C (BOD)	mg/l	< 5.0	6.8	5.3	< 5.0
7	Chemical Oxygen Demand (COD)	mg/l	12.0	20.0	20.0	12.0
8	Sulphate as SO ₄	mg/l	38.0	37.5	12.8	7.38
9	Colour	Hazen	Colourless	Colourless	Colourless	Colourless
10	Salinity	PSU	0.4106	.4050	0.2675	0.2565
11	Total Dissolved Solids (TDS)	mg/l	462	468.0	312	272
12	Dissolved Oxygen (DO)	mg/l	5.90	5.8	5.50	7.60
13	Total Coliform/100 ml.	CFU	1,380	920	900	760
14	Faecal Coliform/100 ml.	CFU	1,040	730	710	520

River water:				
Sl. No.	Test Parameters	Unit	Locations	
			KPD Lock Entrance Dt:20.10.2020.	N.S. D. Lock Entrance Dt:30.09.2020.
1	Colour	Hazen	Colourless	Colourless
2	pH Value	...	7.42	7.60
3	Total Dissolved Solids (TDS)	mg/l	220	302.0
4	Dissolved Oxygen (DO)	mg/l	7.40	6.50
5	Oil and Grease (O & G)	mg/l	< 6.0	<6.0
6	Biochemical Oxygen Demand for 3 days at 27°C (BOD)	mg/l	< 5.0	9.4
7	Sulphate as SO ₄	mg/l	9.1	39.4
8	Turbidity	mg/l	50.7	33.0
9	Ammoniacal Nitrogen as N	mg/l	< 0.2	<0.2
10	Salinity	mg/l	0.1796	0.2510
11	Total Suspended Solids (TSS)	mg/l	58.0	144
12	Chemical Oxygen Demand (COD)	mg/l	16.0	33.0
13	Total Coliform/100 ml.	CFU	1,380	770
14	Faecal Coliform/100 ml.	CFU	1,020	480