**FERRO ALLOYS CORPORATION LIMITED**

**OSTAPAL CHROMITE MINES**
P.O. : KALIAPANI - 755047
DIST. : JAJPUR, ODISHA, INDIA
PHONE : 06784 - 251312, 250598
E-mail : facor.ostapal@gmail.com
ostapalmines@facor.in

**CHROME ORE MINING DIVISION**

OCMENV/ 518 /2020

Date: 20.11.2020

To

The Joint Director (s)
Ministry of Environment, Forest & Climate change
Govt. of India
Eastern Regional Office
BHUBANESWAR

Sub:- Submission of Six monthly report on the status of compliance to the conditions stipulated in the grant of Environmental Clearance Letter No. J-11015/38/2006-IA-II(M), dtd. 06.12.2006 for Ostapal Chromite Mines of M/s. FACOR Ltd.

Dear Sir,

This has reference to the captioned subject, it is to inform you that we are herewith submitting Six monthly compliance reports pertaining to Ostapal Chromite Mines of M/s. FACOR Ltd. for the period from **April, 2020 to September, 2020** along with the Environmental Monitoring data (Ambient Air, Noise, Water & Soil) for your kind perusal. The soft copy of the same is being sent by mail to your good office.

This is for your kind information and necessary action.

Thanking You,

Yours Faithfully,
for FERRO ALLOYS CORPORATION LTD.

MINES MANAGER

Encl: A/a.

CC – The Director (IA), MoEF, 3rd Floor, Indira Paryavaran Bhawan, Jorbagh Road, New Delhi – 110032.

**Name of the Project: OSTAPAL CHROMITEMINES, M/S.FACORLTD.**

**Project Code: Mining(Non-Coal)**

**Clearance Letter No.Withdate:No.J-11015/38/2006-IA-II(M)dt.06-12- 2006 Period of**

**Compliance Report: APRIL , 2020 to September 2020.**

**Specific Condition:**

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 1. | All the conditions stipulated by the State Pollution control Board, in their Consent to establish should be effectively implemented. | All the stipulated conditions are being effectively implemented ted. |
| 2. | Necessary forestry clearance under the Forest (Conservation) Act, 1980 for an area of 4.07 Ha forest land shall be obtained before starting mining operation in that area. Till such time mining activities shall be restricted to an area of 64.354 Ha for which in principle forestry clearance has been obtained from the Ministry on03.10.2005 | This area is left as Safety Zone area for greenbelt around periphery of forest land of M.L. area and mining operations in this area will not be done. |
| 3. | Top soil should be stacked properly with proper slope at earmarked site(s) with adequate measures and should be used for reclamation and rehabilitation of mined out area. | No top soil has been generated during the period April 2020 to September'2020 |
| 4. | Over burden shall be stacked at earmarked dump site(s) only and should not be kept active for long period. The total height of the dump(s) should not exceed 45m in three stages of 15 m each, keeping overall slope of the dumps below 28 $^{0}$. The proponent shall carry out slope stability study and submit report to the Ministry.<br><br>The OB dumps should be scientifically vegetated with suitable native species to prevent erosion and surface run off. In critical areas, use of geo textiles shall be taken for stabilization of the dump. Monitoring and management of rehabilitated areas should continue until the vegetation becomes self - sustaining. Compliance status should be submitted to the Ministry of Environment & Forests on six monthly basis. | The OB is being dumped at earmarked sites only. The OB dump is not kept active for long period. The present height of the dump is 41m with over all slope $25^{0}$. In future also the overall slope will be maintained below $28^{0}$.<br><br>The inactive benches are being vegetated by Suitable native species and massive grass plantation to prevent erosion & surface runoff. The management of the rehabilitated areas of the dumps has been continuing until the vegetation becomes self-sustaining. |
| 5. | Trace Metals such as Ni, Co, As, and Hg should be analyzed in dust fall and soil samples for at least one year during summer, monsoon and winter seasons. If concentrations of these metals are found below the standards then with prior approval of MOEF this specific monitoring could be discontinued. | Collection and analysis of dust & soil samples are done and the test reports are enclosed for the period from JULY 20 to SEPTEMBER 2020 in **Annexure No.-5 & Annexure No.-6**.<br><br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid - 19 |

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 6. | Catch drains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from soil, OB and mineral dumps. The water so collected should be utilized for watering the mine area, roads, plantation etc. The drains should be regularly de -silted and maintained properly.<br>Garland drain (size, gradient and length) shall be constructed for both mine pit & waste dump and sump capacity should be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years data) and maximum discharge in the area adjoining the mine site. Sump capacity should also provide adequate retention period to allow proper settling of silt material.<br>Storm water return system should be provided. Storm water should not be allowed to go to the effluent treatment plant during high rainfall / super cyclone period. A separate storm water sump for this purpose should be created. | Catch drains around OB dumps and mineral stockyard have already been constructed with siltation ponds at regular intervals to arrest silt and sediments. Whenever required the silts and sediments are being cleaned from catch drains and siltation ponds and maintained regularly. Mine pumped out water is sufficient for dust suppression and plantation purposes. Hence catch drain water is dis-charging outside ML area through upgraded ETP. Hence there is no need for collection of water from catch drains from mine area, roads, plantation etc.<br><br>Garland drains of width 2m, depth 1.5m and length 4325 m with gradient have been constructed for maximum discharge of rainfall in the adjoining areas.<br><br>There is no chance of flow of storm water into the effluent treatment plant during high rain fall/super cyclone period became the plant is at high reduced level (RL). Hence storm water return system is not required. |
| 7. | Dimensions of retaining wall at the toe of OB dumps & benches within the mine to check run -off and siltation should be based on the rain fall data. | Retaining wall of width 1.5m and height 1.2m has already been constructed all around the toe of dumps up to a length of 3125 m to check the run -off and siltation. |
| 8. | Effluents containing of $Cr^{+6}$ shall be treated to meet the prescribed standards before reuse/discharge. Effluent Treatment plant should be provided for treatment of mine water discharge and wastewater generated from the workshop and mineral separation plant.<br>Run off from OB dumps and other surface run off should be analyzed for $Cr^{+6}$ and in case its concentration is found higher than the permissible limit the water should be treated before reuse/discharge. | An Effluent Treatment Plant is operating for treatment of Mines discharge water. The conc. of $Cr^{+6}$ in treated discharge water is <0.005mg/l.<br>The tailing water (waste water of mineral separation plant) also is being treatedby adding $FeSO_4$ before discharge into tailingpond. The treated tailing pond water is being collected in an intake pond and being re -used in beneficiation plant. Thus zero discharge from Beneficiation Plant is being maintained.<br>Almost all mining machineries and transporting vehicles are being engaged on contract basis for transportation of OB and chrome ore. The company has few nos. of vehicles. The major repairing of these vehicles is being done at outside workshop and minor repairing is being done in our garage. Hence, discharge of workshop effluent Is nil.<br>The total surface runoff water is being collected in two settling pits which are Pumped to the ETP for treatment before final discharge. |
| 9. | Separate impervious concrete pits for disposal of sludge shall be provided for the safe disposal of sludge generated from the mining operations. | The sludge generated from mining operations contains chrome ore. It is being fed in Beneficiation Plant to separate the Chrome. |

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 10. | The Project proponent shall ensure that the quality of decanted effluents from the tailing pond confirm to the pre scribed standards before discharge. | The effluents from tailing pond are not discharged outside. The supernatant water of the tailing pond is being collected in a sump adjacent to the tailing pond and re-circulated in Beneficiation Plant. |
| 11. | The Project proponent shall explore the possibility to reduce concentration of Cr $^{+6}$ in the tailing pond in consultation with an Expert Scientific Institution like NEERI. | The Conc. of Cr $^{+6}$ in tailings is being reduced by adding $FeSO_4$ solution and disposed in the tailing pond. |
| 12. | Plantation shall be raised in an area of 33.02 Ha including green belt in an area of 6.56 Ha by planting native species around ML area, OB dumps, and roads around worked out area etc. in consultation with local DFO/Agriculture Department . The density of the trees should be around 2000 plant species per hectare. | Plantation has been done over inactive/dead benches of OB dumps, Road side, around C.O.B Plant and other places in an area of 32.83 Ha. Plantation is being carried out in consultation with local Forest Department. |
| 13. | Regular monitoring of ground water level & quality should be carried out by establishing a network of existing wells and constructing new Piezometers during the mining operation. The monitoring should be carried out four times in a year – pre-monsoon (April -May), monsoon (August), post - monsoon (November ) and winter (January) and the data thus collected may be sent regularly to MOEF, Central Ground Water Authority and Regional Director Central Ground Water Board. | Monitoring of ground water level & quality is being carried out in 9 Nos. of wells.<br><br>The Monitoring reports has been sent & the monitoring report for the period from JULY 20 to SEPTEMBER 2020 is enclosed as:<br>Ground water level :**Annexure No.-8**<br>Ground water quality: **Annexure No.-3**<br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid -19 |
| 14. | The project proponent shall carry out regular monitoring of ground water quality in all the 14 wells. The frequency of monitoring in 8 wells where concentration of $Cr^{+6}$ is within permissible limits, will be quarterly while in the remaining 6 wells it will be on monthly basis. | The monitoring test reports of ground water quality in 6 Bore wells & 3 Nos. of piezometer holes for concentration of Cr $^{+6}$ are enclosed for the period from JULY 20 to SEPTEMBER 2020 as<br>**Annexure No.- 3**<br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid -19 |
| 15. | Project Authorities should meet water requirement of the peripheral village(s), especially, if the village wells go dry due to mine de -watering. | As a part of peripheral development, the Project Authority has constructed Bore wells at nearby villages and also potable water is being provided to nearby villages by water tankers.<br>Reading of the abstraction structures, used for water supply to local community are enclosed for reference as **Annexure No.8:** for the period from JULY 20 to SEPTEMBER 2020<br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid -19 |

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 16. | Permission from the competent authority should be obtained for drawl of ground water for domestic use. | NOC has been obtained from Central Ground Water Authority , Ministry of Water Resources, New Delhi vide letter no.21 - 4/1456/OR/MIN/2017 -1735 dated 28.08.2018 for ground water withdrawal. The approved NOC is enclosed as **Annexure No.-10**. |
| 17. | Suitable rain water harvesting measures on long-term basis shall be planned and implemented in consultation with Regional Director, CGWB. | Rain water has been collected in different pits for suitable rain water harvesting measures. |
| 18. | Drills should be wet operated or operated with dust extractors. | Wet Drilling is being practiced. |
| 19. | Blasting operation should be carried out only during the day time. Controlled blasting should be practiced. The mitigative measures for control of ground vibrations and to arrest fly rocks and boulders should be implemented. | Blasting operation is being carried out in day time only. Controlled blasting is being practiced by following Nonel&muffle blasting. Delay detonators are used for providing delay timings between rows and within rows of holes. Numbers of rows in a blast are restricted to less than three to get good fragmentation and to reduce fly rocks and ground vibration. |
| 20. | The voids created at the end of mining shall be converted into water Body with shallow depths not exceeding 30m. The higher benches of the excavated void/mine pit shall be terraced and plantation done to stabilize the slopes. Peripheral fencing shall be done along the excavated area. | The same will be implemented at the end of mining operation. It has already been prepared in Mining Plan & submitted to IBM, Bhubaneswar |
| 21. | Vehicular emissions should be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral. The vehicles should be covered with a tarpaulin and shall not be overloaded. | Vehicular emission of all machinery used in mining operations are being monitored regularly and kept under control of rigorous maintenance of all engines and changing of lubricants as per the recommendation of the manufacturer. HEMMs have valid PUC Certificate which is only allowed for operation inside the Mines. All the transporting vehicles are being covered with tarpaulin and over loading are strictly avoided. |
| 22. | Consent to operate should be obtained from SPCB before enhancing Production capacity of the mine. | Consent to operate has been obtained from SPCB, Bhubaneswar. There is no proposal of enhancing the production capacity of the mine. |

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 23. | Sewage treatment Plant should be installed for the colony. ETP should also be provided for workshop and waste water generated from Mining operations. | There is no colony inside the ML area. Almost all mining machineries and transporting vehicles are being engaged on contract basis for transportation of OB and chrome ore. The company has few Nos. of vehicles. However, major repairing of the vehicles is being done at outside workshop and minor repairing is being done in ourgarage.Hence, discharge of workshop effluent is nil. An ETP has already been established for treatment of mines water. |
| 24. | A final mines closure plan along with details of corpus fund should be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval. | The same will be submitted in due time to MOEF for approval. |

**GENERAL CONDITIONS:**

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 1 | No change in mining technology & scope of working should be made without prior. | The Mining technology & scope of working has not been changed. |
| 2 | No change in the calendar plan including excavation, quantum of mineral Chromite and waste should be made. | The calendar plan including excavation, quantum of mineral Chromite and waste over burden has not been changed. The calendar plan including excavation, quantum of mineral chromite and waste over burden has been generated during the period ( April, 2020 to September, 2020) is given in **Annexure No. -11**. |
| 3 | Conservation measures for protection of flora & fauna in the Core & Buffer Zone should be drawn up in consultation with local forest & wild life department. | As per the advice of Forest Department, we are maintaining vehicles, watchman and infrastructural facility as measures to protect Flora & Fauna in core & buffer zone. |
| 4 | Four ambient air quality -monitoring stations should be established in the Core zone as well as in the Buffer zone for RPM, SPM, $SO_2$& $NO_x$ monitoring. Location of the stations should be decided based on the meteorological data, topographical features, and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. | Ambient Air quality monitoring stations has already been established in consultation with SPCB. |

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 5 | Data on ambient Air Quality (RPM, SPM, $SO_2$ & $NO_x$) should be regularly submitted to the Ministry including its Regional Office at Bhubaneswar and the State Pollution Control Board / Central Pollution Control Board once in six months. | Test reports on Ambient Air Quality monitoring viz., PM $_{10,}$ PM $_{2.5}$, $SO_2$, $NO_x$ & CO is being monitored & submitted regularly. Monitoring report for the period from JULY 20 to SEPTEMBER 2020 are enclosed as follows:<br>**Annexure No.-1 : Core Zone**<br>**Annexure No.-2 : Buffer Zone**<br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid -19 |
| 6 | Fugitive dust emissions from all the sources should be controlled regularly. Water spraying arrangement on haul roads, loading & unloading and at transfer points shouldbeprovided and properly maintained. | Control of fugitive dust emissions is being carried out by water spraying on haul roads, Ore handlingyard, loading and unloading points regularly. Thetestreport of the same is enclosed as **Annexure No.-7**. for the period from JULY 20 to SEPTEMBER 2020<br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid -19 |
| 7 | Measures should be taken for control of noise levels below 85 dB(A) in work environment.<br>Workers engaged in operations of HEMM, etc. should be provided with ear plugs / muffs. | Control measures such as maintenance of all machines including checking of silencers regularly, controlled blasting using delay detonators, installing immovable machinery on foundations with suitable rubber pad and closed rooms is being followed -up. The workers engaged at noise generating areas are allowed to work on rotation basis with providing earplugs/muffs.<br>Location wise noise level at work environment is enclosed as **Annexure No. -09** for the period from JULY 20 to SEPTEMBER 2020<br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid -19 |
| 8 | Industrial waste water (workshop & waste water from the Mine) should be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19$^{th}$May, 1993 and 31$^{st}$December, 1993 or as amended from time to time. Oil & grease trap should be installed before discharge of workshop effluents. | The Mines waste water is being pumped out directly in to the intake tank of the ETP for treatment of $Cr^{+6}$and part of the treated water is used in our COB Plant, plantation, dust suppression and surplus treated water is finally discharged to outside ML area.<br>The analysis of this water shows that all parameters are well within the prescribed limit. The analysis report of Mines final discharge water after treatment in E.T.P., for the period july 2020 to September, 2020 is enclosed as **Annexure No.-4** Almost all mining machineries and transporting vehicles are being engaged on contract basis for transportation of OB and chrome ore. The company has few Nos. of vehicles. The major repairing of these vehicles is being done outside mines and minor repairing is being done in our garage. Hence, discharge of workshop effluent is not envisaged.<br>N.B-The analysis report of mines for the period from April 20 to June 20 could not be done due to covid -19 |

| Sl. No. | Condition | Compliance Status |
|---|---|---|
| 9 | Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.<br><br>Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed. | In addition to water spraying to suppress dust generation, workers engaged in dusty areas such as drillers, dumper drivers, HEMM Operators are being provided with nose masks as precautionary measure. Training &information on safety, health hazards are being given to all categories of deserved workers.<br>Occupational health surveillance programmed all categories of workers and employees is being conducted periodically by lung function test, audiometry test, vision tests and other tests. Workers/employees with defects are advised for suitable treatment or engaged on suitable rotation duty. |
| 10 | A separate Environment Management Cell with suitable qualified personnel should be set -up under the control of a Senior Executive, who will report directly to the Head of the Organization. | A separate Environment Management Cell with qualified personnel and well equipped Environment Engineering Laboratory is functioning under the control of a Senior Executive.<br>Besides we are carrying out all Environmental monitoring & analysis through a MoEF & NABL accredited laboratory M/s. **Visiontek Consultancy Services Pvt. Ltd**, Bhubaneswar &the monitoring reports are enclosed asAnnexures. |
| 11 | The Project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the Project by the concerned authorities and the date of start of land development work. | The final approval of the Project is 06.12.2006. It is a mining industry. Hence, land development work is a continuous process. |
| 12 | The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhubaneswar. | Separate funds provision is made to carryout environmental protection measures. Details of expenses during the year 2020-21 will be submitted after completion of financial year and proposed budgeted amount for the year 2020-21.is given in **Annexure No. - 12** |

# QUATERLY ANALYSIS REPORT

## (JULY 2020 TO SEPTEMBER 2020)

ON

## ENVIRONMENTAL MONITORING

AT

# OSTAPAL CHROMITE MINES

CHROME ORE MINING DIVISION
POST-KALIAPANI, PIN– 755028
DISTRICT –JAJPUR, ODISHA

**M/s FERRO ALLOYS CORPORATION LIMITED**

*Prepared by:-*


VISIONTEK CONSULTANCY SERVICES PVT. LTD.
*(An Enviro Engineering Consulting Cell)*

Plot No.-M22&M23, Chandaka Industrial Estate, Patia,
Bhubaneswar-751024, Odisha
Tel. : 0674-3511721
E-mail : visiontekin@gmail.com, visiontek@vcspl.org,
Visit us at: www.vcspl.org


ISO 9001:2015
ISO 14001:2015
ISO 45001:2018 (OH&S)
ISO/IEC 17025:2005

# CONTENTS



# ANNEXURE

# ANNEXURE

# METHODOLOGY OF ENVIRONMENTAL MONITORING STUDY

## 1.0 INTRODUCTION :

**M/s Visiontek Consultancy Services Pvt. Ltd.** carried out the environmental monitoring for the **Ferro Alloys Corporation Limited (OSTAPAL CHROMITE MINES, KALIAPANI, JAJPUR)**

Environmental monitoring was carried out at various locations inside the plant site. The Monitoring was carried out with respect to the qualities of Ambient Air Quality (Core & Buffer Zone), Ground Water Quality, Effluent Water Quality, Fugitive Dust, Dust Fall, Ground Water Level, Noise Monitoring & Soil Testing.

## 2.0 STUDY PERIOD:

The Study Was Conducted During Month Of **July 2020 to September 2020.**

## 3.0 METHODOLOGY:

The environmental monitoring was carried out as per the standard methodology of Bureau of Indian Standard (IS: 11255), American Public Health Association (APHA), & Central Pollution Control Board (CPCB).

## 4.0 SELECTION OF MONITORING LOCATIONS:

The location for Ambient Air Quality (Core & Buffer Zone), Ground Water Quality, Effluent Water Quality, Fugitive Dust, Dust Fall, Ground Water Level, Noise Monitoring & Soil Testing has been selected by FACOR'S representative.

## 4.1 AMBIENT AIR QUALITY :

The ambient air quality (AAQ) of the study region was monitored at three locations selected within the premises. Ambient air quality (AAQ) in respect of Particulate Matter (size less than 10 µm or $PM_{10}$), Particulate matter (size less than 2.5 µm or $PM_{2.5}$), Sulphur di-oxide ($SO_2$), Oxides of Nitrogen (NOx),

Carbon Monoxide (CO), Ozone (O3), Ammonia (NH3), Nickel (Ni), Lead (Pb), Arsenic (As), Benzene (C6H6) and Benzo(a)Pyrene (BaP). Respirable Dust Sampler (APM 460BL) of ENVIROTECH make, FPS (APM ) of ENVIROTECH make, Organic Vapour Sampler, ENVIROTECH make, model APM 850 were used for monitoring of ambient air quality at all the identified locations. The sampling method was carried out as per the guidelines for planning IS: 5182 (part 14): 2000. And the analysis methods are outlined in the table as shown below:

**AMBIENT AIR QUALITY ANALYSIS METHOD**

| SL. NO. | PARAMETER | ANALYSIS METHOD |
|---|---|---|
| 1. | Particulate Matter (size less than 10 µm or $PM_{10}$), µg/$m^3$ | Gravimetric method |
| 2. | Particulate matter (size less than 2.5 µm or $PM_{2.5}$), µg/$m^3$ | Gravimetric method |
| 3. | Sulphur di-oxide ($SO_2$), µg/$m^3$ | Improved west & Geake method |
| 4. | Oxides of Nitrogen ($NO_x$), µg/$m^3$ | Jacob and Hochheiser Modified method |
| 5. | Carbon Monoxide (CO), mg/$m^3$ | NDIR Spectroscopy method |
| 6. | Ozone ($O_3$), µg/$m^3$ | Chemical Method |
| 7. | Ammonia ($NH_3$), µg/$m^3$ | Indophenols Blue Method |
| 8. | Benzene ($C_6H_6$), µg/$m^3$ | Absorption & Desorption followed by GC analysis |
| 9. | Benzo(a) Pyrene (BaP), ng/$m^3$ | Solvent extraction followed by GC analysis. |
| 10. | Nickel (Ni) , ng/$m^3$ | AAS method after sampling |
| 11. | Lead (Pb), µg/$m^3$ | AAS method after sampling |
| 12. | Arsenic( As), ng/$m^3$ | AAS method after sampling |

### 4.1.1 AMBIENT AIR QUALITY SAMPLING STATIONS (CORE ZONE) :

Details of the sampling locations are given below.

| Field ID | Station |
|---|---|
| AAQMS-1 | Near Dispensary |
| AAQMS-2 | Near Weighbridge |
| AAQMS-3 | At Middle of the Opencast Quarry |
| AAQMS-4 | At Middle of the COB Plant |

The Detail of Ambient Air Quality (Core Zone) Report is given in the **Annexure-1.**

### 4.1.2 AMBIENT AIR QUALITY SAMPLING STATIONS (BUFFER ZONE) :

Details of the sampling locations are given below.

| Field ID | Station |
|---|---|
| AAQMS-1 | Near Village Ostia |
| AAQMS-2 | Near Village Koiposi |
| AAQMS-3 | Near Kaliapani Township |
| AAQMS-4 | Near Village Ostapal |

The Detail of Ambient Air Quality (Buffer Zone) Report is given in the **Annexure-2.**

## 4.2 WATER QUALITY:

Water quality monitoring was carried out at fourteen waste water locations. Samples were collected manually during study period. Considering several possibilities of interference the poly tetrafluoroethylene (PTFE) sample bottles were used. These bottles were sterilized properly before being used for water sample collection.

The methodology for sample collection, preservation and analysis was as per Standard methods for the Examination of Water and Wastewater, 23$^{RD}$ Edition 2017, APHA.

## WATER QUALITY ANALYSIS METHOD

| SL.NO. | PARAMETER | ANALYSIS METHOD |
|---|---|---|
| 1 | Colour | **Visual Comparison Method** APHA 23$^{RD}$ Ed,2017 : 2120 B, C |
| 2 | Odour | **Threshold Odour Test** APHA 23$^{RD}$ Ed,2017 :2150 B |
| 3 | Taste | **Flavor Threshold Test** APHA 23$^{RD}$ Ed,2017 : 2160 C |
| 4 | Turbidity | **Nephelometric Method** APHA 23$^{RD}$ Ed,2017 :2130 B |
| 5 | pH Value | **pH Meter** |

| | | |
|---|---|---|
| | | APHA 23RD Ed,2017 : 4500$H^+$ B |
| 6 | Total Hardness (as $CaCO_3$) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C |
| 7 | Iron (as Fe) | **By AAS Method** APHA 23RD Ed,2017 : 3111, B |
| 8 | Chloride (as Cl ) | **Argentometric Method** APHA 23RD Ed,2017 : 4500$Cl^-$ B |
| 9 | Residual, free Chlorine | **Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B |
| 10 | Dissolved Solids | **Gravimetric Method** APHA 23RD Ed,2017 : 2540 C |
| 11 | Calcium (as Ca ) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B |
| 12 | Magnesium (as Mg) | **Calculation Method** APHA 23RD Ed,2017 : 3500Mg B |
| 13 | Copper (as Cu) | **By AAS Method** APHA 23RD Ed,2017: 3111 B |
| 14 | Manganese (as Mn) | **Persulfate Method** APHA 23RD Ed,2017: 3500Mn B |
| 15 | Sulphate (as $SO_4$) | **Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E |
| 16 | Nitrate (as $NO_3$) | **By UV-Screen Method** APHA 23RD Ed,2017: 4500 $NO_3^-$ E |
| 17 | Fluoride (as F) | **Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500$F^-$ C |
| 18 | Phenolic Compounds (as $C_6H_5OH$) | **Chloroform Extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D |
| 19 | Mercury (as Hg) | **AAS Method** APHA 23RD Ed,2017: 3112 B |
| 20 | Cadmium (as Cd) | **AAS Method** APHA 23RD Ed,2017: 3111 B |
| 21 | Selenium (as Se) | **By AAS Method** APHA 23RD Ed,2017: 3500 Se C |
| 22 | Arsenic (as As) | **By AAS Method** APHA 23RD Ed,2017: 3114 B |
| 23 | Cyanide (as CN) | **Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 $CN^-$ C,D |
| 24 | Lead (as Pb) | **By AAS Method** APHA 23RD Ed,2017 3111 B |
| 25 | Zinc (as Zn) | **By AAS Method** APHA 23RD Ed,2017: 3111 B |
| 26 | Anionic Detergents (as MBAS) | **Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C |
| 27 | Chromium (as $Cr^{+6)}$ | **Diphenyl Carbazide Method** APHA 23RD Ed,2017: 3500Cr B |
| 28 | Mineral Oil | **Partition-Gravimetric Method** APHA 23RD Ed,2017: 5520 B |
| 29 | Alkalinity | **Titration Method** APHA 23RD Ed,2017:2320 B |
| 30 | Aluminium as( Al) | **AAS Method** APHA 23RD Ed,2017: 3111 D |
| 31 | Boron (as B) | **Curcumin Method** APHA 23RD Ed,2017: 4500B, B |
| 32 | Temperature | **By Thermometer** |

| | | |
|---|---|---|
| | | APHA 2550 B; 23rd Edition, 2017 |
| 33 | Dissolved Oxygen | **Modified Winkler Method**<br>APHA 4500 O. C; 23rd Edition, 2017 |
| 34 | Biochemical Oxygen Demand as BOD | **Oxygen Depletion Method**<br>IS 3025 ( Part 44 ):2003 |
| 35 | Chemical Oxygen Demand as COD | **Open Reflux Method**<br>APHA 5220 B; 23rd Edition, 2017 |
| 36 | Oil & Grease | **Gravimetric Method (Solvent Extraction)**<br>APHA 5520 B; 23rd Edition, 2017 |
| 37 | Ammonical Nitrogen as N | **By TKN Method**<br>APHA 4500-$NH_3$ C; 23rd Edition, 2017 |
| 38 | Total Kjeldahl Nitrogen as N | **By TKN Method**<br>APHA 4500-Norg C; 23rd Edition, 2017 |
| 39 | Sulphide as S | **By Methylene Blue Method**<br>APHA 4500-S D; 23rd Edition, 2017 |
| 40 | Free Ammonia as NH3 | By Calculation |
| 41 | Particulate Size of Suspended Solids | **Gravimetric Method**<br>APHA 2540 D; 23rd Edition, 2017 |
| 42 | Bio-assay Test | **Evaluating Acute Toxicity**<br>IS 6582 (P-2) 2008 |
| 43 | Total Suspended Solids | **Gravimetric Method**<br>APHA 2540 D; 23rd Edition, 2017 |
| 44 | Total Coli form as TC | **MPN Method**<br>APHA 23rd Ed,2017 : 9221 B |

### 4.2.1 GROUND WATER SAMPLING LOCATIONS :

Detail of the sampling location is given below:

| Field ID | Location |
|---|---|
| **GW-1** | Bore well Near Work Shop of the Mines |
| **GW-2** | Bore Well Near Main Gate |
| **GW-3** | Open Well Near Ostia Village |
| **GW-4** | Open Well Near Ostapal Village |
| **GW-5** | Tube Well inside Shiva Temple of Gurujanga Village |
| **GW-6** | Tube Well outside Shiva Temple Gurujanga Village |
| **GW-7** | Eastern side of the Quarry (PZ-1) |
| **GW-8** | Southern side of the Quarry (PZ-2) |
| **GW-9** | Wastern side of the Quarry (PZ-3) |

The Detailed Ground Water Quality Analysis Report is mentioned in **Annexure-3.**

### 4.2.2 EFFLUENT WATER SAMPLING LOCATIONS :

Detail of the sampling location is given below:

| Field ID | Location |
|---|---|
| **EW-1** | ETP Outside Discharge Point |

The Detailed Effluent Water Quality Analysis Report is mentioned in **Annexure-4.**

### 4.3 DUST FALL :

Dust Fall monitoring is one aspect of air quality that industrial hygienist use to determine the amount of dust particles present in the workplace, cities or communities over a given period of time. Dust Fall Monitoring carried out by Respirable Dust Sampler at One Location

#### 4.3.1 DUST FALL SAMPLING LOCATIONS :

Details of the sampling locations are given below.

| Field ID | Station |
|---|---|
| DF-1 | Near Roof Top of Office Building |

The Detail of Dust Fall Report is given in the **Annexure-5.**

### 4.4 SOIL ANALYSIS:

The soil analysis of the study region was monitored at Four selected outside the plant premises. Soil Sampling is based on agriculture field available in the study area. Composite sampling is done following SPCB method. Coning and Quartering method is done & the samples were collected in air locked polythenes following with proper PPE (Personal Protective equipments). Locations of Soil Analysis Stations are as follows:

#### 4.4.1 SOIL ANALYSIS SAMPLING LOCATIONS:

| Field ID | Location ID |
|---|---|
| **S-1** | East Side Quarry |
| **S-2** | West Side Quarry |
| **S-3** | North Side Quarry |
| **S-4** | South Side Quarry |

The Detail of Soil Quality Analysis Report is given in the **Annexure-6.**

### 4.5 FUGITIVE EMISSION:

The fugitive emission of the study region was monitored at two locations selected within the plant premises. The parameter monitored was Suspended Particulate Matter Using Sampler of ENVIROTECH make: model APM 460 BL of the identified location.

### 4.5.1 FUGITIVE EMISSION SAMPLING STATIONS:

Detail of the sampling location is given below.

| Field ID | Station |
|---|---|
| F1 | Near Mines Ore Plot Area |
| F2 | Near COB Plant Area |
| F3 | Near Mines Loading & Unloading |

The Detailed **Fugitive Emission Report** is given in the **Annexure-7**

## 4.6 GROUND WATER LEVEL MEASUREMENT:

The Ground Water Level Measurement of the study region was monitored at Nine locations selected within the plant premises & Buffer Area . The parameter monitored was Ground water Level Using Peizeometer Sampler of the identified location.

### 4.6.1 GROUND WATER LEVEL SAMPLING STATIONS:

Detail of the sampling location is given below.

| Field ID | Station |
|---|---|
| **GW-1** | Bore well Near Work Shop of the Mines |
| **GW-2** | Bore Well Near Main Gate |
| **GW-3** | Open Well Near Ostia Village |
| **GW-4** | Open Well Near Ostapal Village |
| **GW-5** | Tube Well inside Shiva Temple of Gurujanga Village |
| **GW-6** | Tube Well outside Shiva Temple Gurujanga Village |
| **GW-7** | Eastern side of the Quarry (PZ-1) |
| **GW-8** | Southern side of the Quarry (PZ-2) |
| **GW-9** | Western side of the Quarry (PZ-3) |

The Detailed **Ground Water Level** is given in the **Annexure-8.**

## 4.7 NOISE LEVEL MONITORING:

Noise Levels were recorded by Digital Sound Level Meter of LUTRON make at two locations within the plant premises. Monitoring was carried out once in a month at each location during the study period for day time and night time. According to CPCB (Noise Pollution (Regulation & Control) rules, 2000 day time is considered from 6.00 am to 10.00 pm and night time is considered from 10.00 pm to 6.00 am.

Locations of Noise level monitoring stations are as follows:

### 4.7.1 NOISE LEVEL SAMPLING STATIONS:

| Field ID | Location ID |
|---|---|
| N-1 | Open Cast Quarry |
| N-2 | COB Plant |
| N-3 | Mines Loading & Unloading |

The Detailed Noise Measurement Report is given in **Annexure-9**

**Annexure-1**

# AMBIENT AIR QUALITY ANALYSIS REPORT (CORE ZONE)

Ref : Envlab/20/R-3725 Date : 07.09.2020

## AMBIENT AIR QUALITY(CORE ZONE) MONITORING REPORT- JULY 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **AAQ (Cz)-1:** Near Dispensary
   **AAQ (Cz)-2:** Near Weighbridge
   **AAQ (Cz)-3:** At Middle of the Opencast Quarry
   **AAQ (Cz)-4:** At Middle of the COB Plant
4. Method of Sampling **: IS 5182(P-5) 1975 RA 2014**
5. Date of Sampling **: 06.07.2020**
6. Date of Analysis **: 08.07.2020 to 09.07.2020**
7. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
8. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Parameters Analyzed | Unit | Testing Methods | NAAQ Standard | Analysis Result | | | |
|---|---|---|---|---|---|---|---|
| | | | | AAQ(Cz)-1 | AAQ(Cz)-2 | AAQ(Cz)-3 | AAQ(Cz)-4 |
| Particulate matter(size less than10µm) or $PM_{10}$ | µg / $m^3$ | IS 5182 (P-22) 2006 RA 2017 **Gravimetric Method** | **100** | 78.2 | 70.2 | 56 | 74.2 |
| Particulate matter(size less than10µm) or $PM_{2.5}$ | µg / $m^3$ | VCSPL/AAQ-SOP/001 Date: 01.12.2019 **Gravimetric Method** | **60** | 46.9 | 42.1 | 33.6 | 44.5 |
| Sulphur dioxide as $SO_2$ | µg / $m^3$ | IS 5182 (P-2) 2001 RA 2017 **Improved West and Geake Method** | **80** | 9.1 | 7.8 | 6.92 | 9.6 |
| Oxides of Nitrogen as $NO_x$ | µg / $m^3$ | IS 5182 (P-6) 2006 RA 2017 **Modified Jacob & Hochheiser Method (Na-Arsenite)** | **80** | 14.1 | 10.6 | 9.8 | 13.2 |
| Carbon Monoxide as CO | mg / $m^3$ | IS 5182 (P-10) 2006 RA 2017 **NDIR Spectroscopy** | **4** | 1.28 | 1.16 | 1.32 | 1.26 |

*Prepared By*

*Reviewed By*



Plot No.-M-22&23, Chandaka Industrial Estate, Patia, Bhubaneswar-751024, Dist-Khurda, Odisha Tel.: 7752017905
E-mail : visiontek@vcspl.org, visiontekin@gmail.com, visiontekin@yahoo.co.in, Visit us at: www.vcspl.org

Ref : Envlab/20/R-3725 Date : 07.09.2020

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ammonia as $NH_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 401, 3rd ed 1999 **Indo Phenol Blue Method** | **400** | 21.2 | 20.8 | 22.6 | 21.4 |
| Ozone as $O_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 411, 3rd ed 1999 **Chemical Method** | **100** | 4.1 | 4.2 | 4.8 | 4.2 |
| Arsenic as As | ng/ $m^3$ | IS 5182 (Part-22), RA2019 **AAS Method After Sampling** | **06** | BDL | BDL | BDL | BDL |
| Lead as Pb | µg / $m^3$ | IS 5182(Part 22) RA2019 **AAS Method After Sampling** | **01** | BDL | BDL | BDL | BDL |
| Nickel as Ni | ng/ $m^3$ | IS 5182 (Part-22), RA2019 **AAS Method After Sampling** | **20** | BDL | BDL | BDL | BDL |
| Benzene as $C_6H_6$ | µg / $m^3$ | IS 5182 (Part 11):2017 **Absorption & Desorption followed by GC analysis** | **05** | BDL | BDL | BDL | BDL |
| Benzo-Pyrene as Bap | ng/ $m^3$ | IS 5182 (Part 12):2017 **Solvent extraction followed by Gas Chromatography analysis** | **01** | BDL | BDL | BDL | BDL |

***BDL Values:*** $SO_2$< 4 µg/$m^3$, $NO_X$< 9 µg/$m^3$, $O_3$<4 µg/$m^3$, Ni<0.01 ng/$m^3$, As < 0.001 ng/$m^3$, $C_6H_6$<0.001 µg/$m^3$, BaP<0.002 ng/$m^3$, Pb<0.001 µg/$m^3$, CO-<0.1 mg/$m^3$

**Prepared By**

**Reviewed By**




Plot No.-M-22&23, Chandaka Industrial Estate, Patia, Bhubaneswar-751024, Dist-Khurda, Odisha Tel.: 7752017905
E-mail : visiontek@vcspl.org, visiontekin@gmail.com, visiontekin@yahoo.co.in, Visit us at: www.vcspl.org

**Figure-01: Graph Showing Avg. AAQ Concentration (AAQMS-1:Near Dispensary) within study area for the month of July 2020**

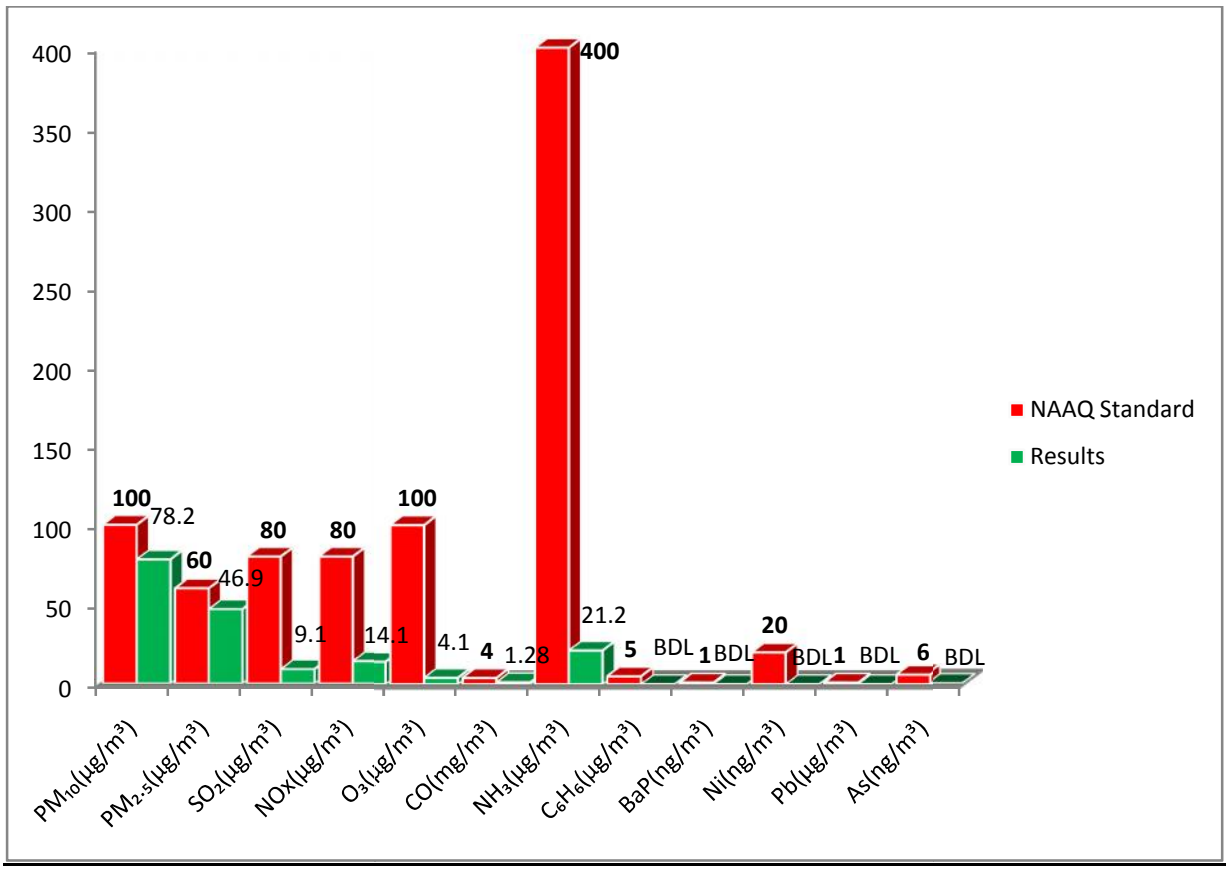


**Figure-02: Graph Showing Avg. AAQ Concentration (AAQMS-2:Near Weighbridge) within study area for the month of July-2020**

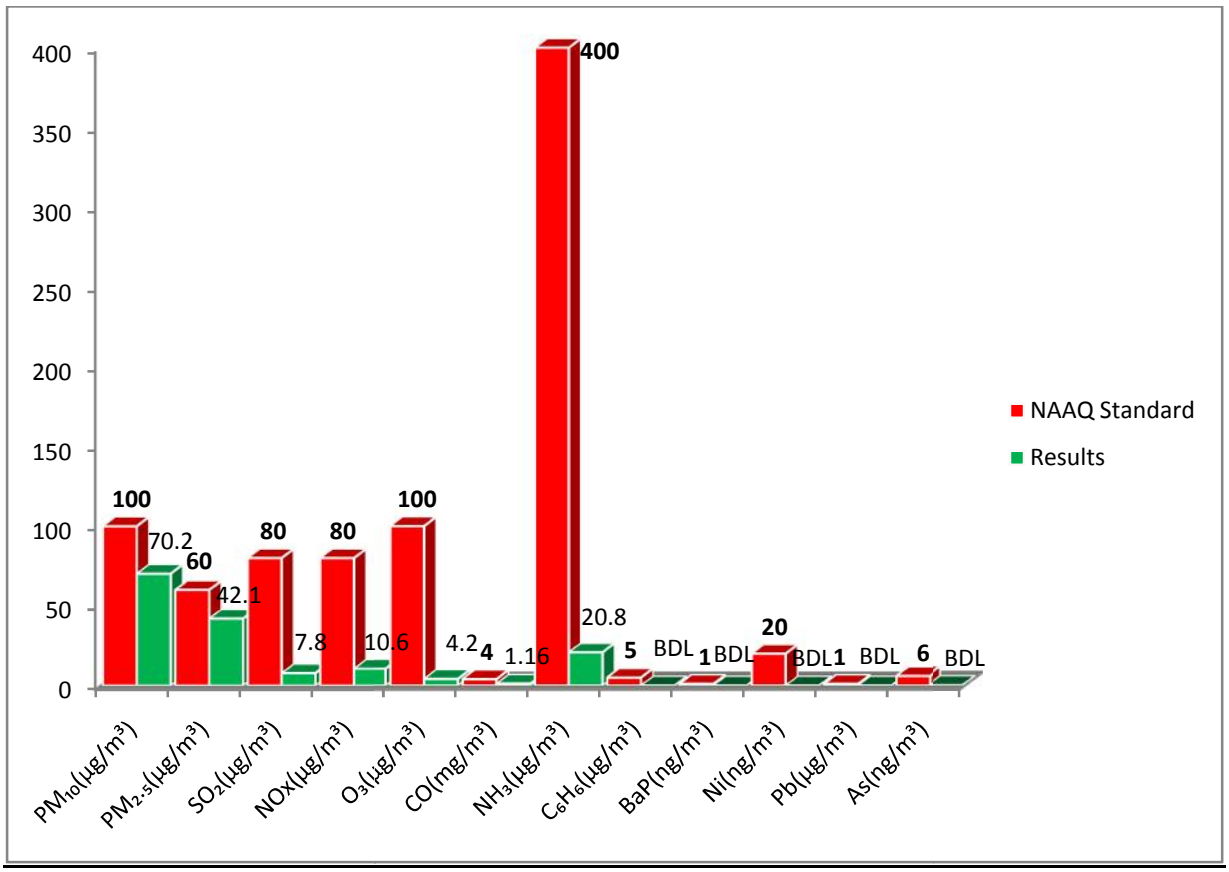


**Figure-03: Graph Showing Avg. AAQ Concentration (AAQMS-3: At Middle of the Open Cast Quarry) within study area for the month of July-2020**

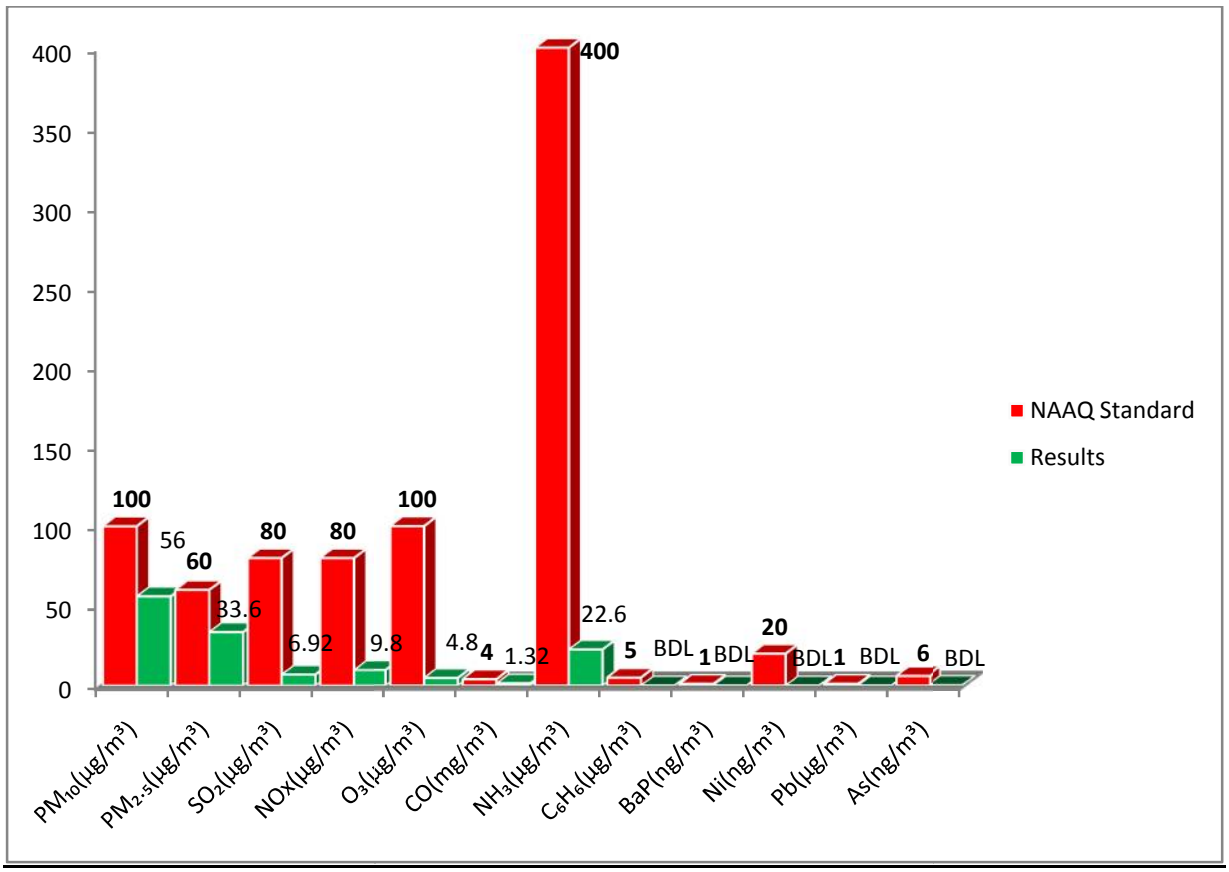
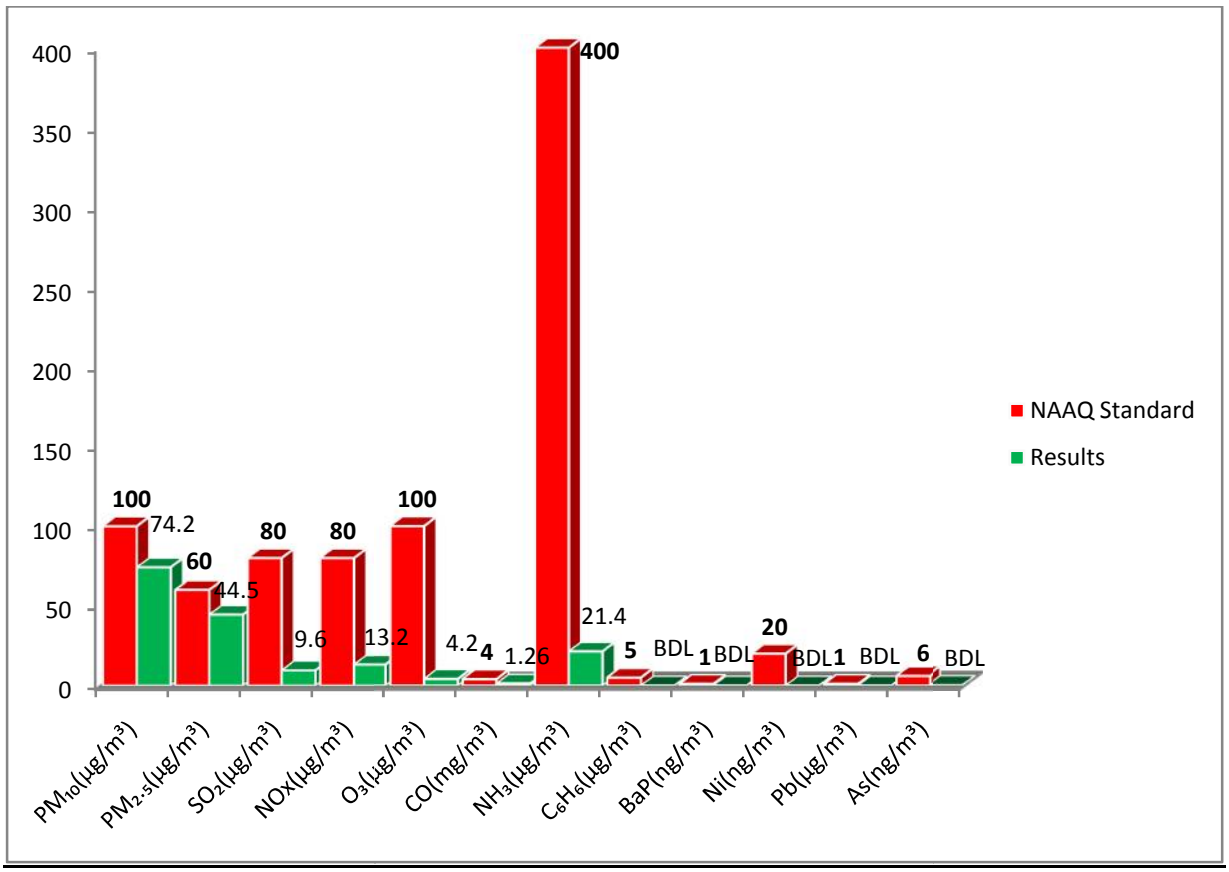


**Figure-04: Graph Showing Avg. AAQ Concentration (AAQMS-4:At Middle of the COB Plant) within study area for the month of July-2020**



Ref : Envlab/20/R-3727 Date : 07.09.2020

## AMBIENT AIR QUALITY(CORE ZONE) MONITORING REPORT- AUGUST 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **AAQ (Cz)-1:** Near Dispensary
   **AAQ (Cz)-2:** Near Weighbridge
   **AAQ (Cz)-3:** At Middle of the Opencast Quarry
   **AAQ (Cz)-4:** At Middle of the COB Plant
4. Method of Sampling **: IS 5182(P-5) 1975 RA 2014**
5. Date of Sampling **: 10.08.2020**
6. Date of Analysis **: 12.08.2020 TO 13.08.2020**
7. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
8. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Parameters Analyzed | Unit | Testing Methods | NAAQ Standard | Analysis Result | | | |
|---|---|---|---|---|---|---|---|
| | | | | AAQ(Cz)-1 | AAQ(Cz)-2 | AAQ(Cz)-3 | AAQ(Cz)-4 |
| Particulate matter(size less than10µm) or $PM_{10}$ | µg / $m^3$ | IS 5182 (P-22) 2006 RA 2017 **Gravimetric Method** | **100** | 80.2 | 44.5 | 54.8 | 76.6 |
| Particulate matter(size less than10µm) or $PM_{2.5}$ | µg / $m^3$ | VCSPL/AAQ-SOP/001 Date: 01.12.2019 **Gravimetric Method** | **60** | 48.1 | 8.1 | 32.9 | 46 |
| Sulphur dioxide as $SO_2$ | µg / $m^3$ | IS 5182 (P-2) 2001 RA 2017 **Improved West and Geake Method** | **80** | 9.4 | 10.8 | 7.1 | 10.1 |
| Oxides of Nitrogen as $NO_x$ | µg / $m^3$ | IS 5182 (P-6) 2006 RA 2017 **Modified Jacob & Hochheiser Method(Na-Arsenite)** | **80** | 13.6 | 4.1 | 10.2 | 13.8 |
| Carbon Monoxide as CO | mg / $m^3$ | IS 5182 (P-10) 2006 RA 2017 **NDIR Spectroscopy** | **4** | 1.21 | 1.21 | 1.28 | 1.24 |

*Prepared By*

*Reviewed By*

Ref : Envlab/20/R-3727 Date : 07.09.2020

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ammonia as $NH_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 401, 3rd ed 1999 **Indo Phenol Blue Method** | **400** | 20.6 | 20.2 | 21.4 | 22.1 |
| Ozone as $O_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 411, 3rd ed 1999 **Chemical Method** | **100** | 4.4 | 4.1 | 5.1 | 4.8 |
| Arsenic as As | ng/ $m^3$ | IS 5182 (Part-22), RA2019 **AAS Method After Sampling** | **06** | BDL | BDL | BDL | BDL |
| Lead as Pb | µg / $m^3$ | IS 5182(Part 22) RA2019 **AAS Method After Sampling** | **01** | BDL | BDL | BDL | BDL |
| Nickel as Ni | ng/ $m^3$ | IS 5182 (Part-22), RA2019 **AAS Method After Sampling** | **20** | BDL | BDL | BDL | BDL |
| Benzene as $C_6H_6$ | µg / $m^3$ | IS 5182 (Part 11):2017 **Absorption & Desorption followed by GC analysis** | **05** | BDL | BDL | BDL | BDL |
| Benzo-Pyrene as Bap | ng/ $m^3$ | IS 5182 (Part 12):2017 **Solvent extraction followed by Gas Chromatography analysis** | **01** | BDL | BDL | BDL | BDL |

***BDL Values:*** $SO_2$< 4 µg/$m^3$, $NO_X$< 9 µg/$m^3$, $O_3$<4 µg/$m^3$, Ni<0.01 ng/$m^3$, As < 0.001 ng/$m^3$, $C_6H_6$<0.001 µg/$m^3$, BaP<0.002 ng/$m^3$, Pb<0.001 µg/$m^3$, CO-<0.1 mg/$m^3$

**Prepared By**

**Reviewed By**

**Figure-01: Graph Showing Avg. AAQ Concentration (AAQMS-1:Near Dispensary) within study area for the month of August-2020**

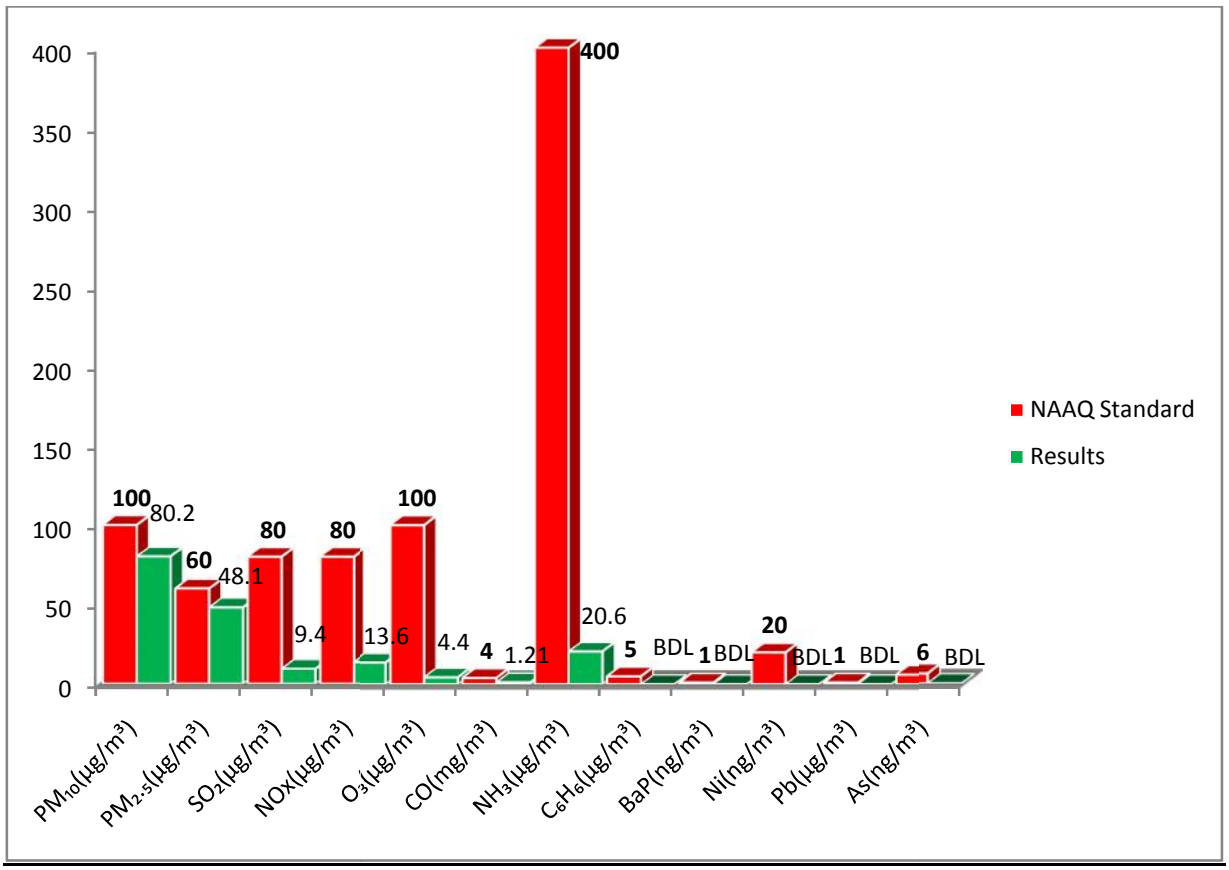


**Figure-02: Graph Showing Avg. AAQ Concentration (AAQMS-2:Near Weighbridge) within study area for the month of August-2020**

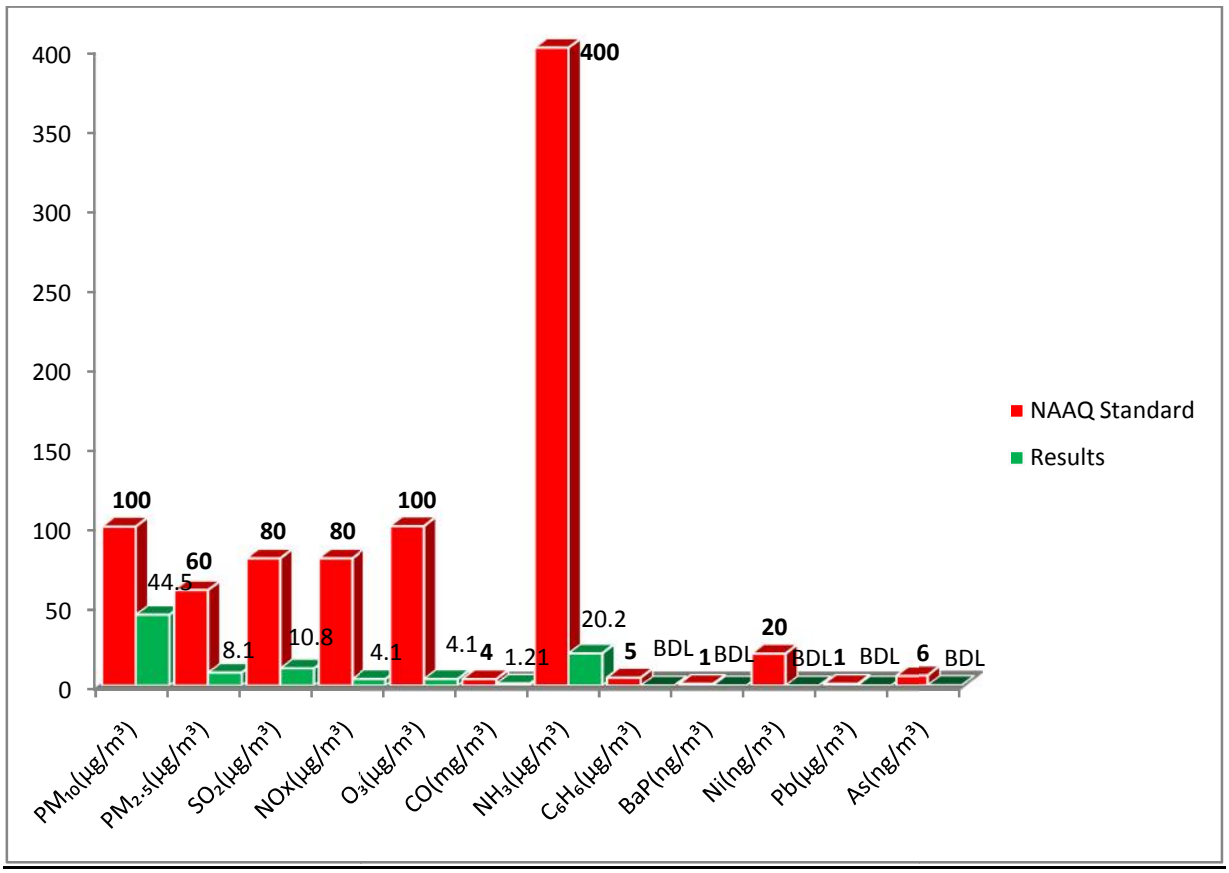


**Figure-03: Graph Showing Avg. AAQ Concentration (AAQMS-3: At Middle of the Open Cast Quarry) within study area for the month of August 2020**

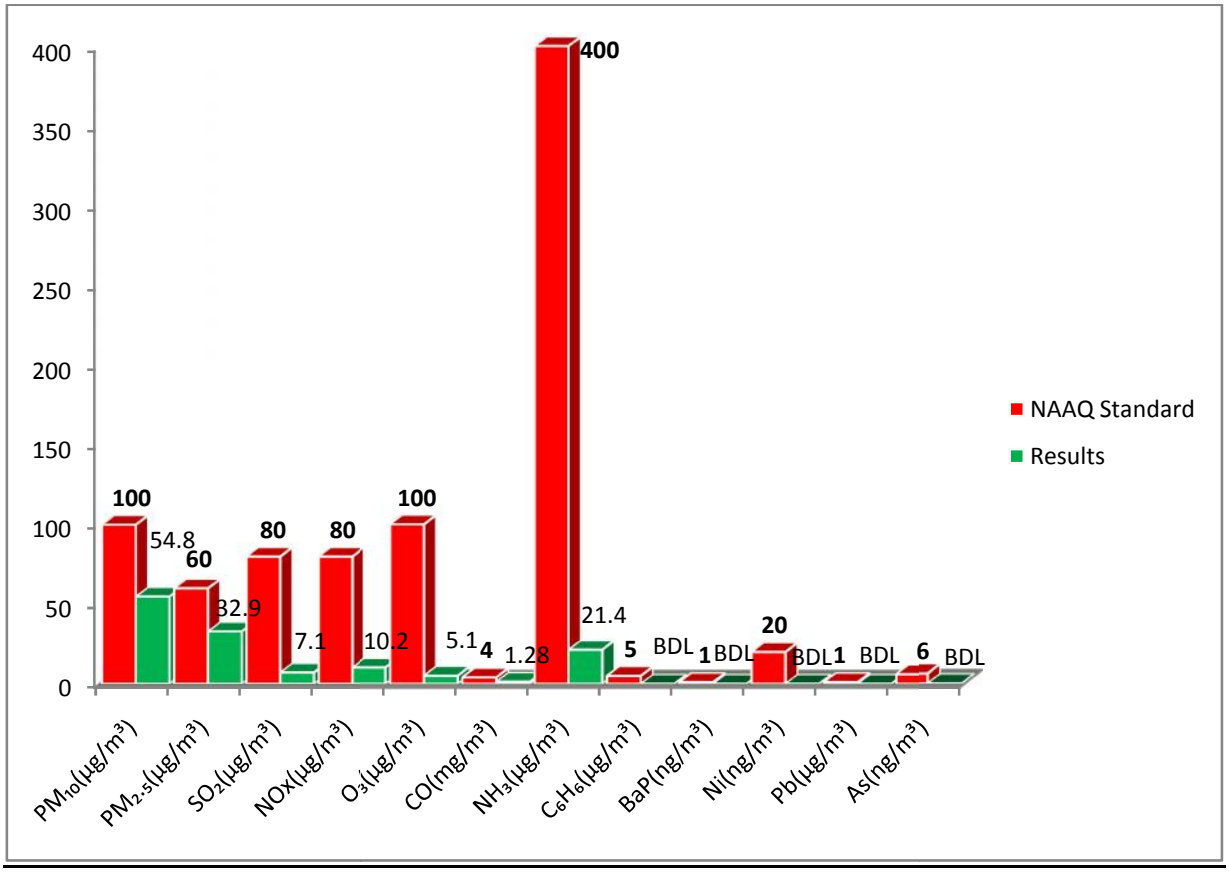
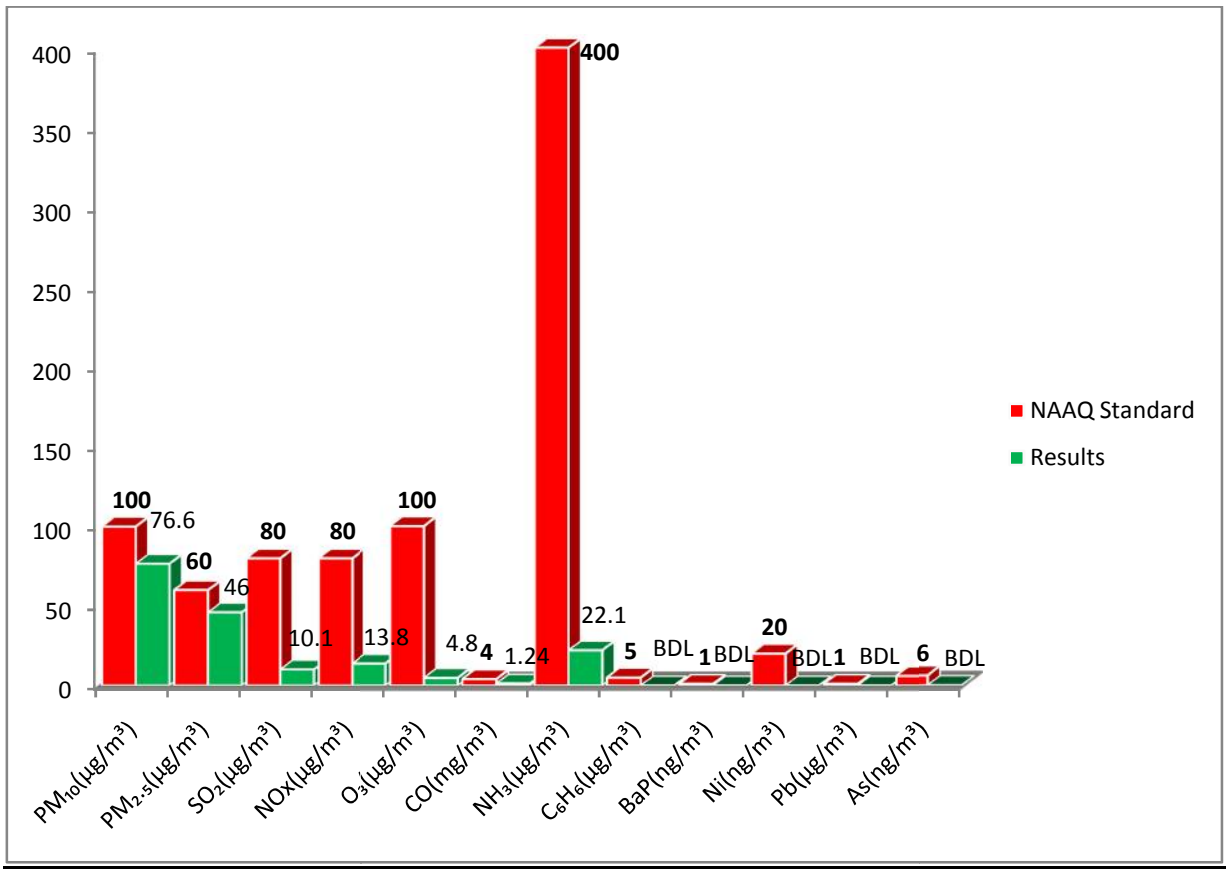


**Figure-04: Graph Showing Avg. AAQ Concentration (AAQMS-4:At Middle of the COB Plant) within study area for the month of August-2020**



**Ref : Envlab/20/R-4624** **Date : 10.10.2020**

## AMBIENT AIR QUALITY (CORE ZONE) MONITORING REPORT-SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **AAQ (Cz)-1:** Near Dispensary
   **AAQ (Cz)-2:** Near Weighbridge
   **AAQ (Cz)-3:** At Middle of the Opencast Quarry
   **AAQ (Cz)-4:** At Middle of the COB Plant
4. Method of Sampling **: IS 5182(P-5) 1975 RA 2014**
5. Date of Sampling **: 21.09.2020 & 23.09.2020**
6. Date of Analysis **: 23.9.2020 to 25.09.2020 & 26.09.2020 to 28.09.2020**
7. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
8. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Parameters Analyzed | Unit | Testing Methods | NAAQ Standard | Analysis Result | | | |
|---|---|---|---|---|---|---|---|
| | | | | AAQ(Cz)-1 | AAQ(Cz)-2 | AAQ(Cz)-3 | AAQ(Cz)-4 |
| Particulate matter(size less than10µm) or $PM_{10}$ | µg / $m^3$ | IS 5182 (P-22) 2006 RA 2017 **Gravimetric Method** | **100** | 84.6 | 48.0 | 60.2 | 78.0 |
| Particulate matter(size less than10µm) or $PM_{2.5}$ | µg / $m^3$ | VCSPL/AAQ-SOP/001 Date: 01.12.2019 **Gravimetric Method** | **60** | 48.1 | 18.1 | 32.9 | 46.0 |
| Sulphur dioxide as $SO_2$ | µg / $m^3$ | IS 5182 (P-2) 2001 RA 2017 **Improved West and Geake Method** | **80** | 10.2 | 11.6 | 8.0 | 10.6 |
| Oxides of Nitrogen as $NO_x$ | µg / $m^3$ | IS 5182 (P-6) 2006 RA 2017 **Modified Jacob & Hochheiser Method(Na-Arsenite)** | **80** | 14.2 | 5.2 | 11.4 | 14.4 |
| Carbon Monoxide as CO | mg / $m^3$ | IS 5182 (P-10) 2006 RA 2017 **NDIR Spectroscopy** | **4** | 1.34 | 1.28 | 1.36 | 1.31 |

*Reviewed By*

*Approved By*

**Ref : Envlab/20/R-4624** **Date : 10.10.2020**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ammonia as $NH_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 401, 3rd ed 1999 **Indo Phenol Blue Method** | **400** | 21.8 | 20.6 | 22.6 | 23.4 |
| Ozone as $O_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 411, 3rd ed 1999 **Chemical Method** | **100** | 4.4 | 4.1 | 5.1 | 4.8 |
| Arsenic as As | ng/ $m^3$ | IS 5182 (Part-22), RA2019 **AAS Method After Sampling** | **06** | BDL | BDL | BDL | BDL |
| Lead as Pb | µg / $m^3$ | IS 5182(Part 22) RA2019 **AAS Method After Sampling** | **01** | BDL | BDL | BDL | BDL |
| Nickel as Ni | ng/ $m^3$ | IS 5182 (Part-22), RA2019 **AAS Method After Sampling** | **20** | BDL | BDL | BDL | BDL |
| Benzene as $C_6H_6$ | µg / $m^3$ | IS 5182 (Part 11):2017 **Absorption & Desorption followed by GC analysis** | **05** | BDL | BDL | BDL | BDL |
| Benzo-Pyrene as Bap | ng/ $m^3$ | IS 5182 (Part 12):2017 **Solvent extraction followed by Gas Chromatography analysis** | **01** | BDL | BDL | BDL | BDL |

***BDL Values:*** $SO_2$< 4 µg/$m^3$, $NO_X$< 9 µg/$m^3$, $O_3$<4 µg/$m^3$, Ni<0.01 ng/$m^3$, As < 0.001 ng/$m^3$, $C_6H_6$<0.001 µg/$m^3$, BaP<0.002 ng/$m^3$, Pb<0.001 µg/$m^3$, CO-<0.1 mg/$m^3$

*Reviewed By*

*Approved By*

**Figure-01: Graph Showing Avg. AAQ Concentration (AAQMS-1:Near Dispensary) within study area for the month of September-2020**

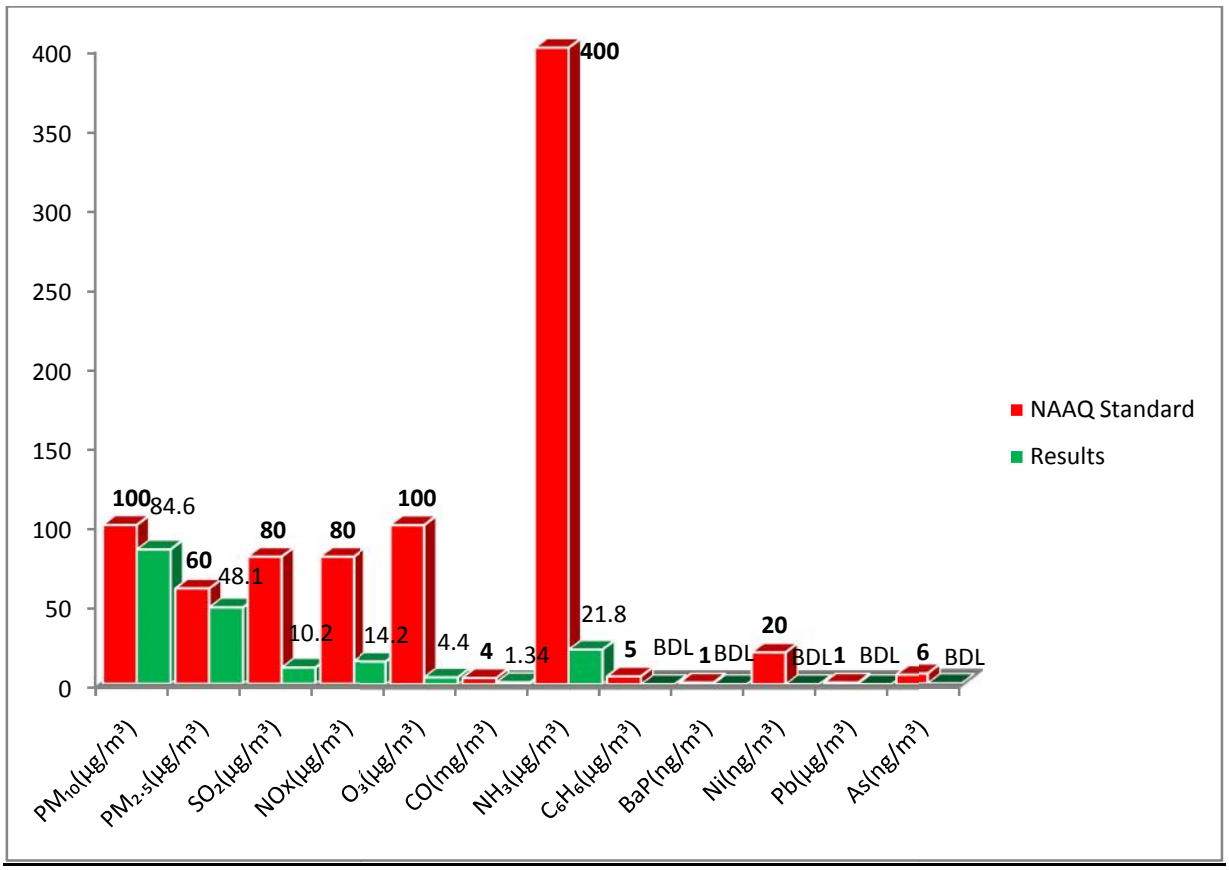


**Figure-02: Graph Showing Avg. AAQ Concentration (AAQMS-2:Near Weighbridge) within study area for the month of September-2020**

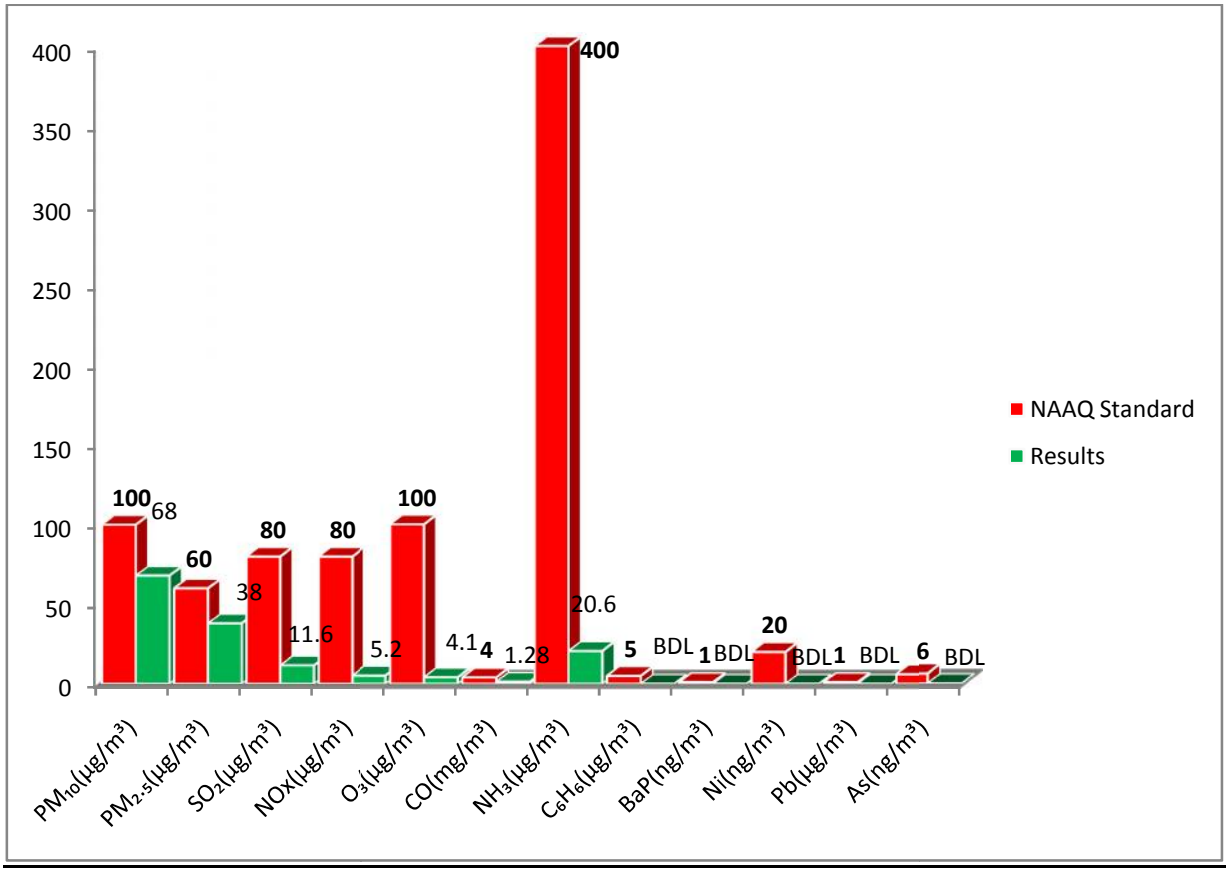


**Figure-03: Graph Showing Avg. AAQ Concentration (AAQMS-3: At Middle of the Open Cast Quarry) within study area for the month of September -2020**

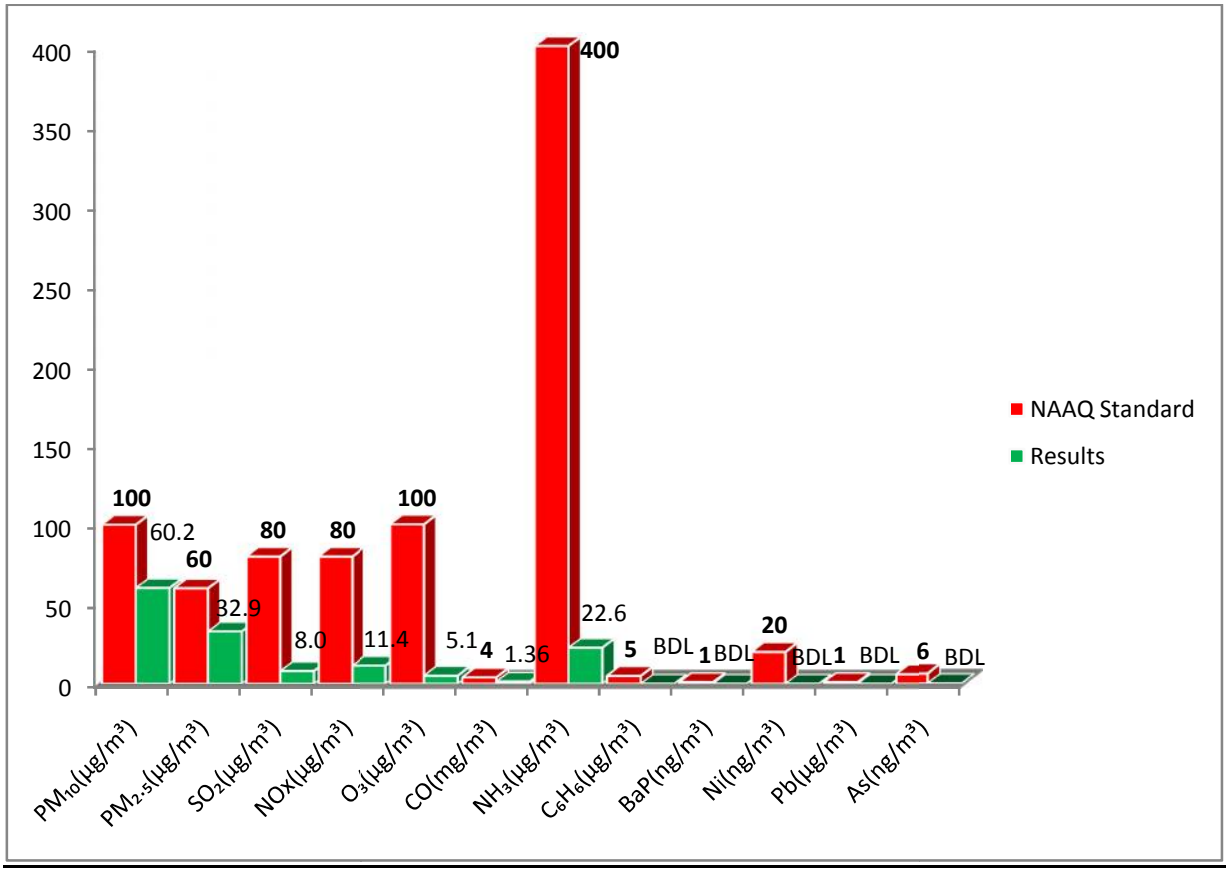
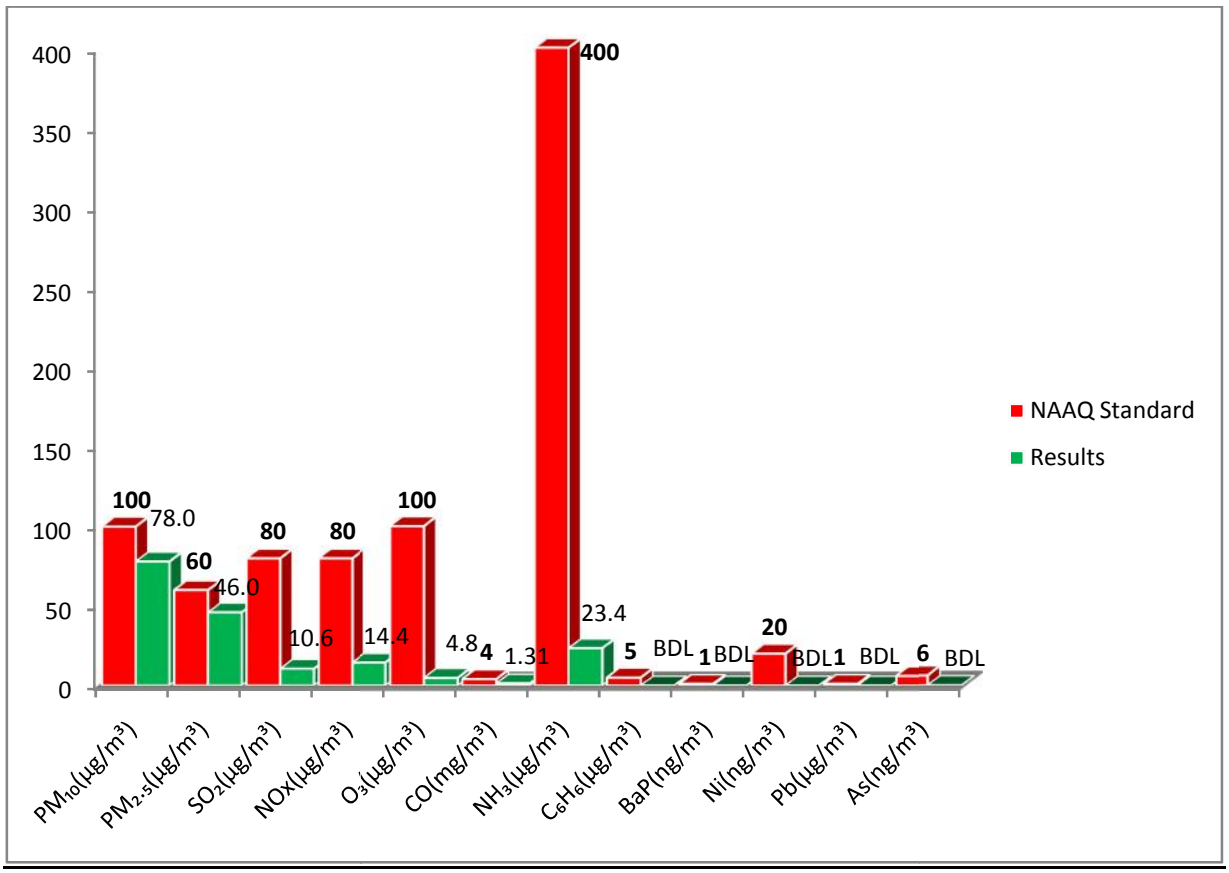


**Figure-04: Graph Showing Avg. AAQ Concentration (AAQMS-4:At Middle of the COB Plant) within study area for the month of September-2020**



**Annexure-2**

# AMBIENT AIR QUALITY ANALYSIS REPORT (BUFFER ZONE)

Ref : Envlab/20/R-3726 Date : 07.09.2020

## AMBIENT AIR QUALITY(BUFFER ZONE) MONITORING REPORT- JULY 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **AAQ (Bz)-1:** Near Village Ostia
   **AAQ (Bz)-2:** Near Village Koiposi
   **AAQ (Bz)-3:** Near Kaliapani Township
   **AAQ (Bz)-4:** Near Village Ostapal
4. Method of Sampling **: IS 5182(P-5) 1975 RA 2014**
5. **Date of Sampling : 08.07.2020**
6. Date of Analysis **: 10.07.2020 to 11.07.2020**
7. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
8. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Parameters Analyzed | Unit | Testing Methods | NAAQ Standard | Analysis Result | | | |
|---|---|---|---|---|---|---|---|
| | | | | AAQ(Bz)-1 | AAQ(Bz)-2 | AAQ(Bz)-3 | AAQ(Bz)-4 |
| Particulate matter(size less than10µm) or $PM_{10}$ | µg / $m^3$ | IS 5182 (P-22) 2006 RA 2017 **Gravimetric Method** | **100** | 72.8 | 59.6 | 88.2 | 64.6 |
| Particulate matter(size less than10µm) or $PM_{2.5}$ | µg / $m^3$ | VCSPL/AAQ-SOP/001 Date: 01.12.2019 **Gravimetric Method** | **60** | 38.8 | 35.8 | 52.9 | 38.8 |
| Sulphur dioxide as $SO_2$ | µg / $m^3$ | IS 5182 (P-2) 2001 RA 2017 **Improved West and Geake Method** | **80** | 8.1 | 7.2 | 10.8 | 8.0 |
| Oxides of Nitrogen as $NO_x$ | µg / $m^3$ | IS 5182 (P-6) 2006 RA 2017 **Modified Jacob & Hochheiser Method(Na-Arsenite)** | **80** | 15.72 | 11.2 | 18.2 | 10.8 |
| Carbon Monoxide as CO | mg / $m^3$ | IS 5182 (P-10) 2006 RA 2017 **NDIR Spectroscopy** | **4** | 0.56 | 0.38 | 1.42 | 0.44 |

*Prepared By*

*Reviewed By*




Plot No.-M-22&23, Chandaka Industrial Estate, Patia, Bhubaneswar-751024, Dist-Khurda, Odisha Tel.: 7752017905
E-mail : visiontek@vcspl.org, visiontekin@gmail.com, visiontekin@yahoo.co.in, Visit us at: www.vcspl.org

Ref : Envlab/20/R-3726 Date : 07.09.2020

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ammonia as $NH_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 401, 3rd ed 1999 Indo Phenol Blue Method | **400** | BDL | BDL | 21.8 | BDL |
| Ozone as $O_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 411, 3rd ed 1999 Chemical Method | **100** | 4.1 | BDL | 5.2 | 4.1 |
| Arsenic as As | ng/ $m^3$ | IS 5182 (Part-22), RA2019 AAS Method After Sampling | **06** | BDL | BDL | BDL | BDL |
| Lead as Pb | µg / $m^3$ | IS 5182(Part 22) RA2019 AAS Method After Sampling | **01** | BDL | BDL | BDL | BDL |
| Nickel as Ni | ng/ $m^3$ | IS 5182 (Part-22), RA2019 AAS Method After Sampling | **20** | BDL | BDL | BDL | BDL |
| Benzene as C6H6 | µg / $m^3$ | IS 5182 (Part 11):2017 Absorption & Desorption followed by GC analysis | **05** | BDL | BDL | BDL | BDL |
| Benzo-Pyrene as Bap | ng/ $m^3$ | IS 5182 (Part 12):2017 Solvent extraction followed by Gas Chromatography analysis | **01** | BDL | BDL | BDL | BDL |

***BDL Values:*** $SO_2$< 4 µg/$m^3$, $NO_X$< 9 µg/$m^3$, $O_3$<4 µg/$m^3$, Ni<0.01 ng/$m^3$, As < 0.001 ng/$m^3$, $C_6H_6$<0.001 µg/$m^3$, BaP<0.002 ng/$m^3$, Pb<0.001 µg/$m^3$, CO-<0.1 mg/$m^3$

**Prepared By**

**Reviewed By**




Plot No.-M-22&23, Chandaka Industrial Estate, Patia, Bhubaneswar-751024, Dist-Khurda, Odisha Tel.: 7752017905
E-mail : visiontek@vcspl.org, visiontekin@gmail.com, visiontekin@yahoo.co.in, Visit us at: www.vcspl.org

**Figure-01: Graph Showing Avg. AAQ Concentration (AAQMS (Bz)-1: Near Village Ostia) within study area for the month of July-2020**

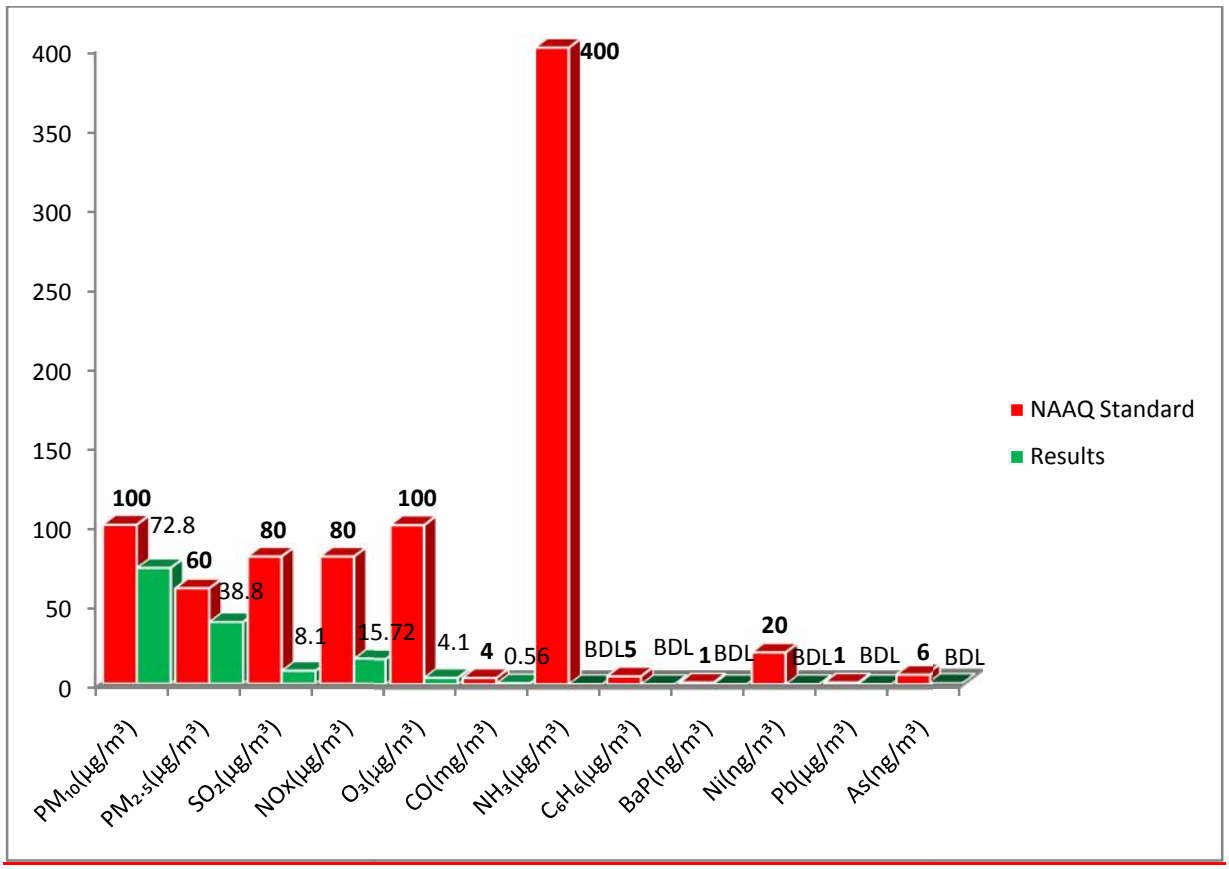


**Figure-02: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-2:Near Village Koiposi) within study area for the month of July-2020**

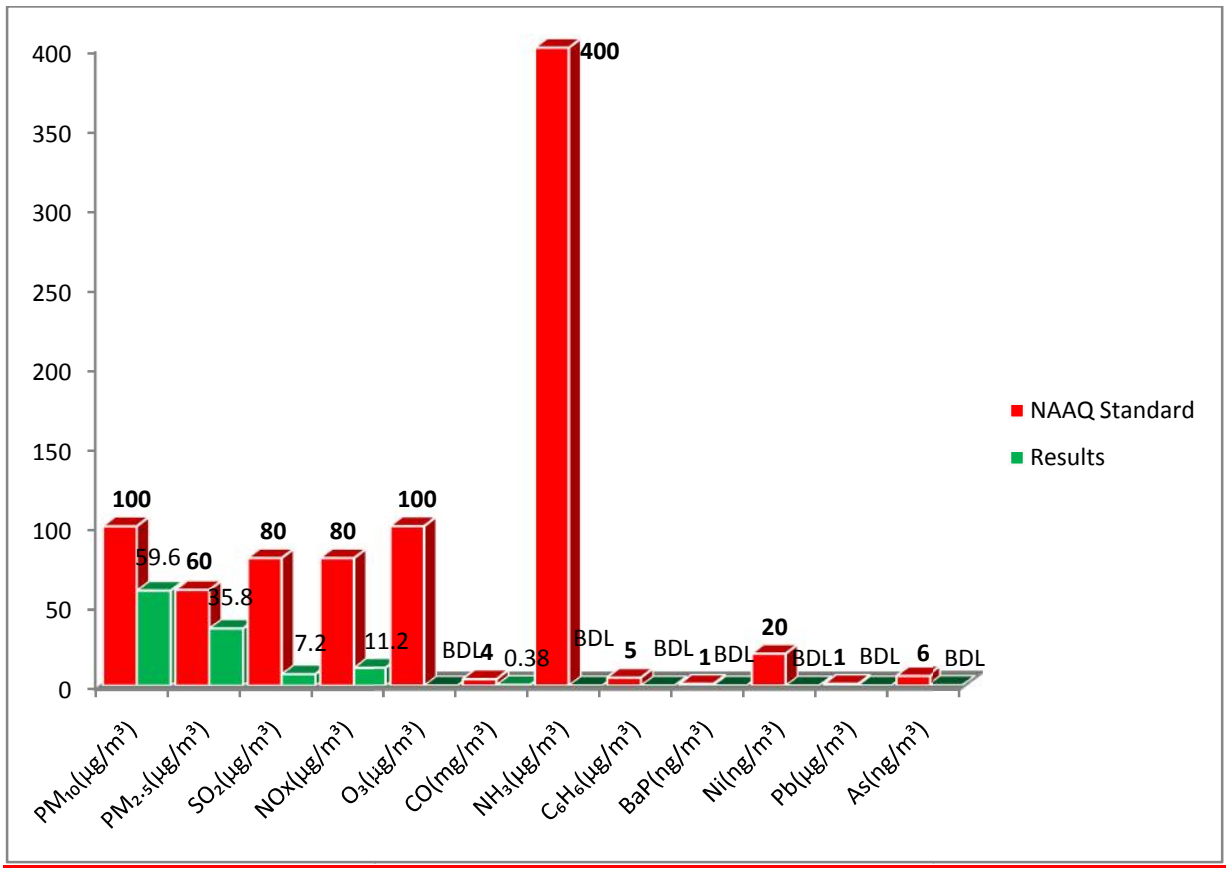


**Figure-03: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-3:Near Kaliapani Township) within study area for the month of July-2020**

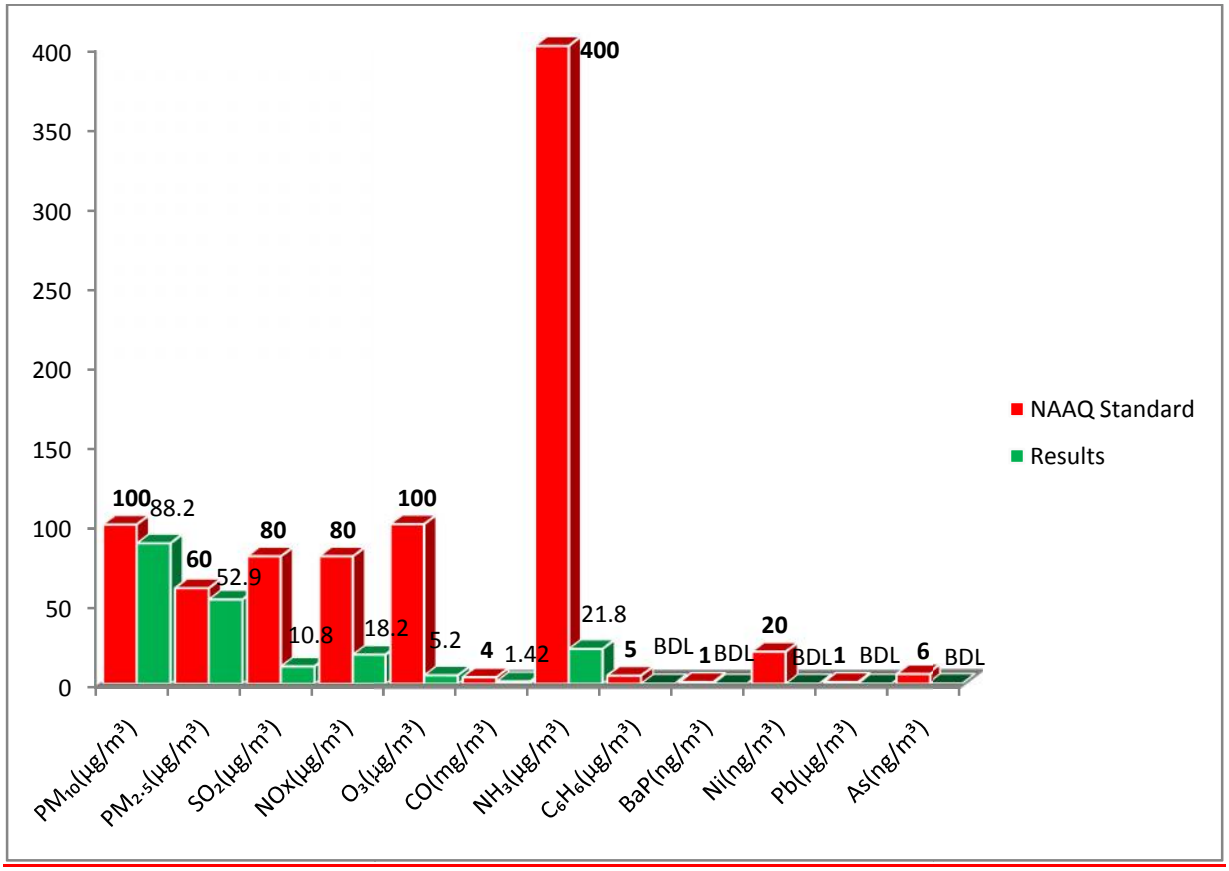
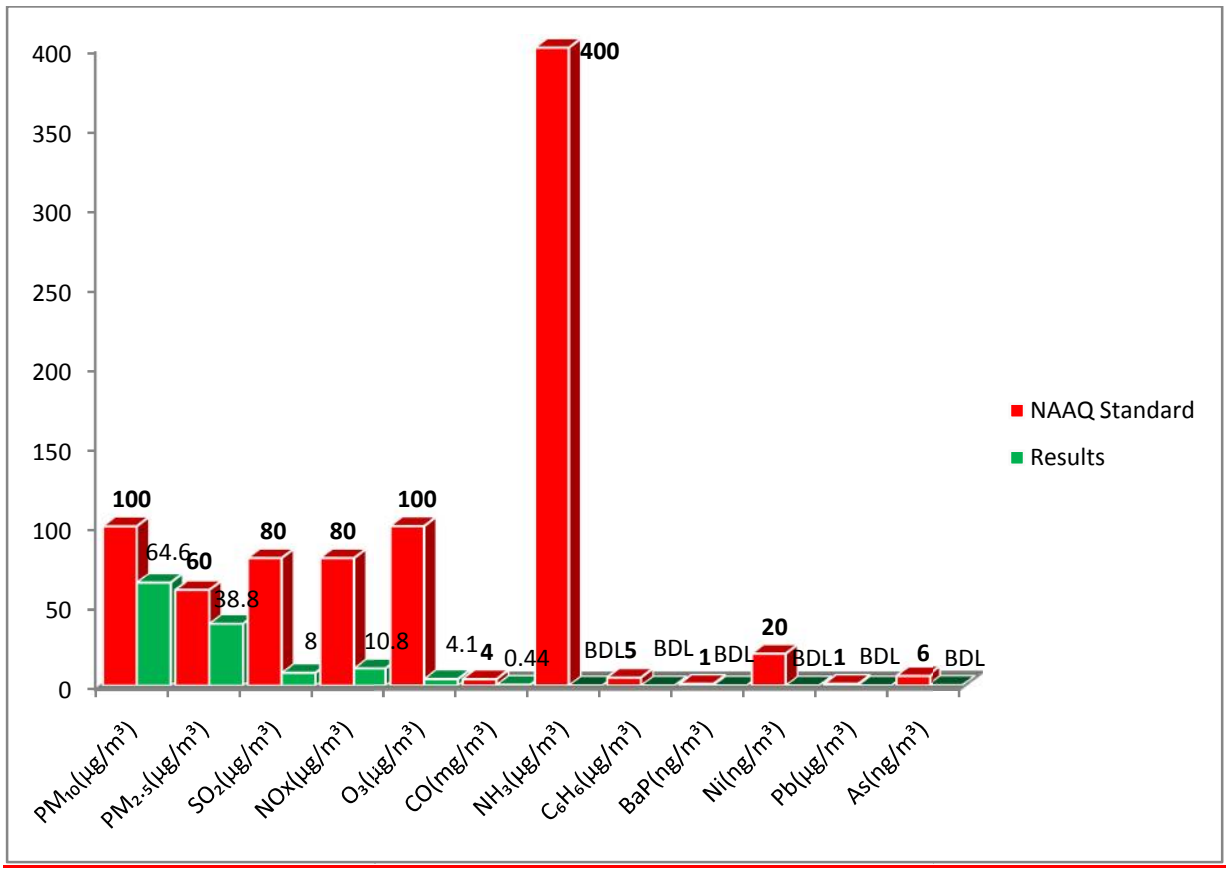


**Figure-04: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-4:Near Village Ostapal) within study area for the month of July-2020**



Ref : Envlab/20/R-3728 Date : 07.09.2020

## AMBIENT AIR QUALITY (BUFFER ZONE) MONITORING REPORT- AUGUST 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **AAQ (Bz)-1:** Near Village Ostia
   **AAQ (Bz)-2:** Near Village Koiposi
   **AAQ (Bz)-3:** Near Kaliapani Township
   **AAQ (Bz)-4:** Near Village Ostapal
4. Method of Sampling **: IS 5182(P-5) 1975 RA 2014**
5. **Date of Sampling : 12.08.2020**
6. Date of Analysis **: 14.08.2020 TO 15.08.2020**
7. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
8. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Parameters Analyzed | Unit | Testing Methods | NAAQ Standard | Analysis Result | | | |
|---|---|---|---|---|---|---|---|
| | | | | AAQ(Bz)-1 | AAQ(Bz)-2 | AAQ(Bz)-3 | AAQ(Bz)-4 |
| Particulate matter(size less than10µm) or $PM_{10}$ | µg / $m^3$ | IS 5182 (P-22) 2006 RA 2017 **Gravimetric Method** | **100** | 75.2 | 60.8 | 89 | 63.8 |
| Particulate matter(size less than10µm) or $PM_{2.5}$ | µg / $m^3$ | VCSPL/AAQ-SOP/001 Date: 01.12.2019 **Gravimetric Method** | **60** | 40.2 | 36.5 | 53.4 | 38.3 |
| Sulphur dioxide as $SO_2$ | µg / $m^3$ | IS 5182 (P-2) 2001 RA 2017 **Improved West and Geake Method** | **80** | 8.4 | 7.8 | 11.2 | 8.2 |
| Oxides of Nitrogen as $NO_x$ | µg / $m^3$ | IS 5182 (P-6) 2006 RA 2017 **Modified Jacob & Hochheiser Method(Na-Arsenite)** | **80** | 16.1 | 11.4 | 19.1 | 11.6 |
| Carbon Monoxide as CO | mg / $m^3$ | IS 5182 (P-10) 2006 RA 2017 **NDIR Spectroscopy** | **4** | 0.61 | 0.42 | 1.48 | 0.48 |

*Prepared By*

*Reviewed By*

Ref : Envlab/20/R-3728 Date : 07.09.2020

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ammonia as $NH_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 401, 3rd ed 1999 Indo Phenol Blue Method | **400** | BDL | BDL | 21.8 | BDL |
| Ozone as $O_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 411, 3rd ed 1999 Chemical Method | **100** | 4.6 | BDL | 5.6 | 4.2 |
| Arsenic as As | ng/ $m^3$ | IS 5182 (Part-22), RA2019 AAS Method After Sampling | **06** | BDL | BDL | BDL | BDL |
| Lead as Pb | µg / $m^3$ | IS 5182(Part 22) RA2019 AAS Method After Sampling | **01** | BDL | BDL | BDL | BDL |
| Nickel as Ni | ng/ $m^3$ | IS 5182 (Part-22), RA2019 AAS Method After Sampling | **20** | BDL | BDL | BDL | BDL |
| Benzene as C6H6 | µg / $m^3$ | IS 5182 (Part 11):2017 Absorption & Desorption followed by GC analysis | **05** | BDL | BDL | BDL | BDL |
| Benzo-Pyrene as Bap | ng/ $m^3$ | IS 5182 (Part 12):2017 Solvent extraction followed by Gas Chromatography analysis | **01** | BDL | BDL | BDL | BDL |

***BDL Values:*** $SO_2$< 4 µg/$m^3$, $NO_X$< 9 µg/$m^3$, $O_3$<4 µg/$m^3$, Ni<0.01 ng/$m^3$, As < 0.001 ng/$m^3$, $C_6H_6$<0.001 µg/$m^3$, BaP<0.002 ng/$m^3$, Pb<0.001 µg/$m^3$, CO-<0.1 mg/$m^3$

**Prepared By**

**Reviewed By**

**Figure-01: Graph Showing Avg. AAQ Concentration (AAQMS (Bz)-1: Near Village Ostia) within study area for the month of August -2020**

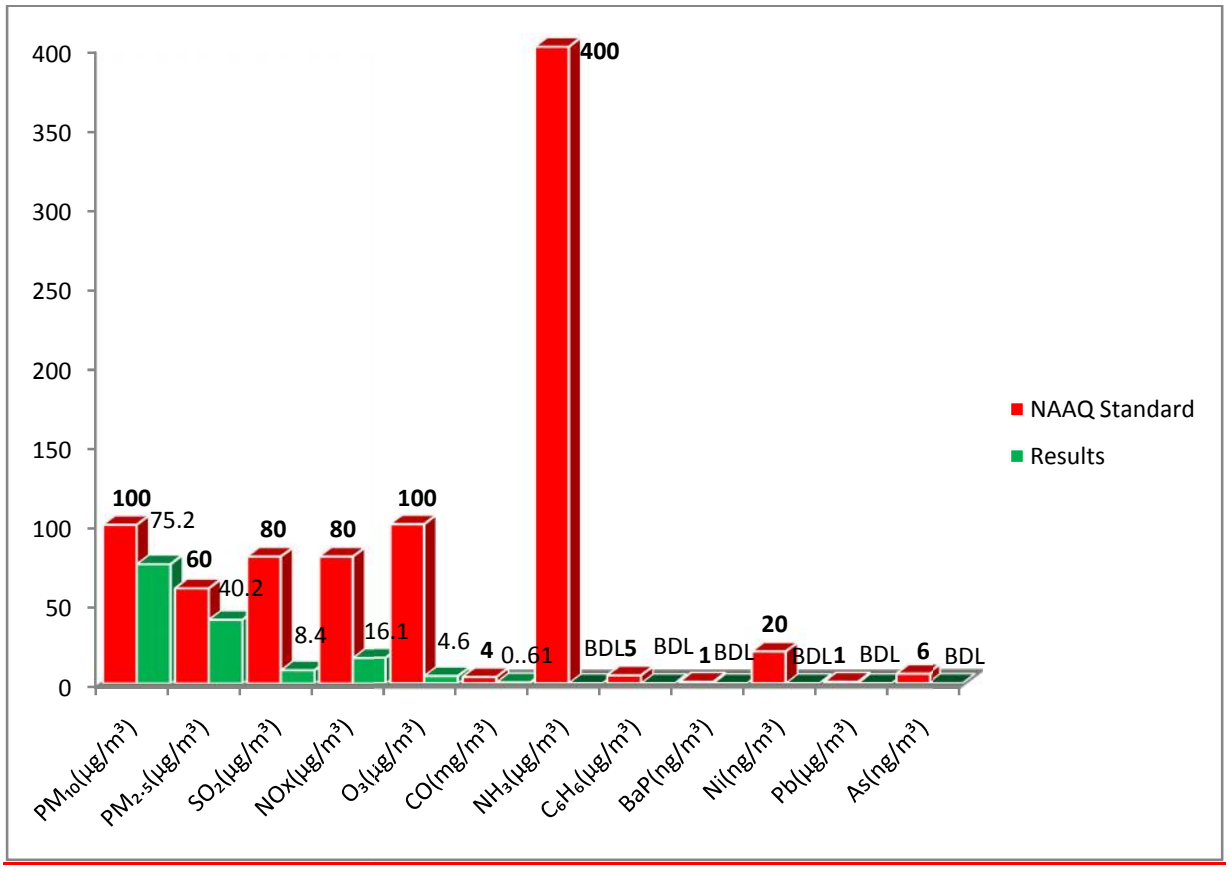


**Figure-02: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-2:Near Village Koiposi) within study area for the month of August-2020**

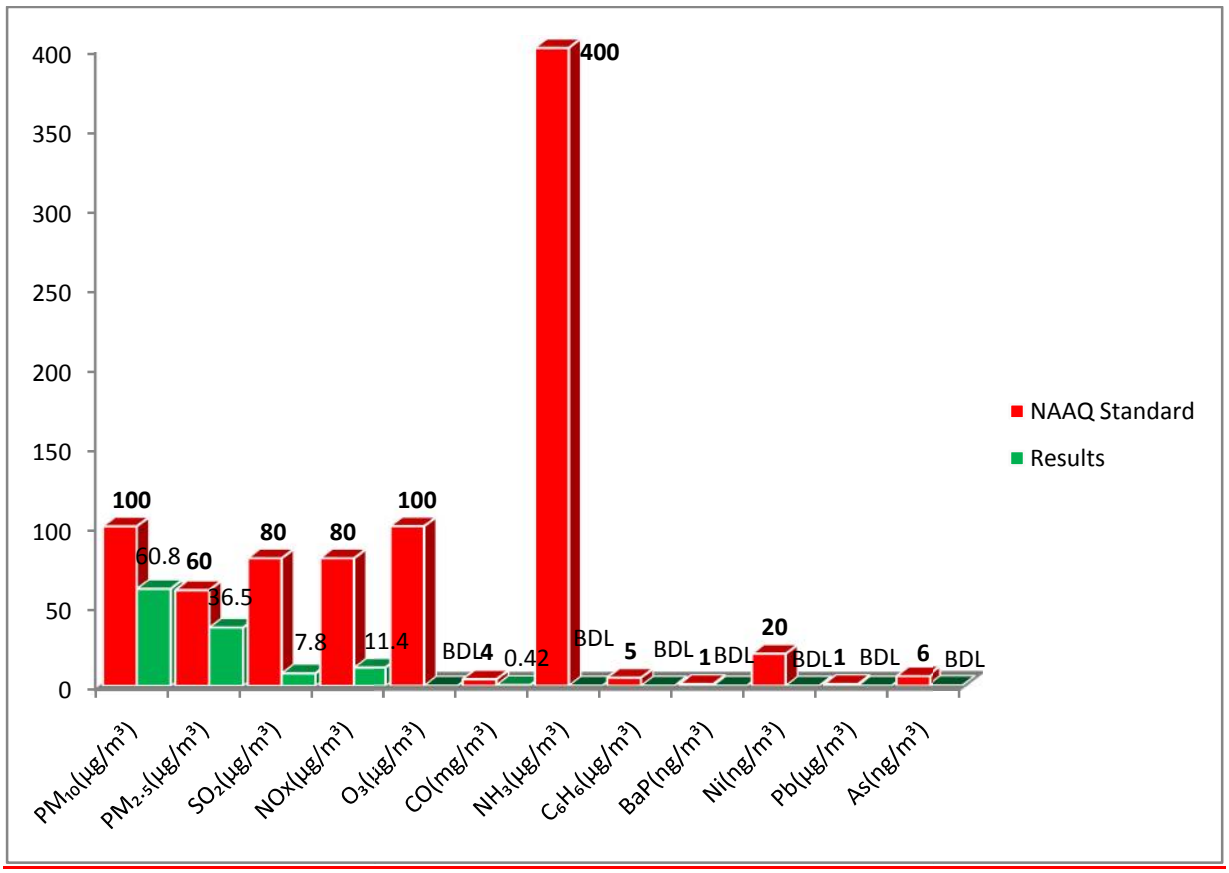


**Figure-03: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-3:Near Kaliapani Township) within study area for the month of August -2020**

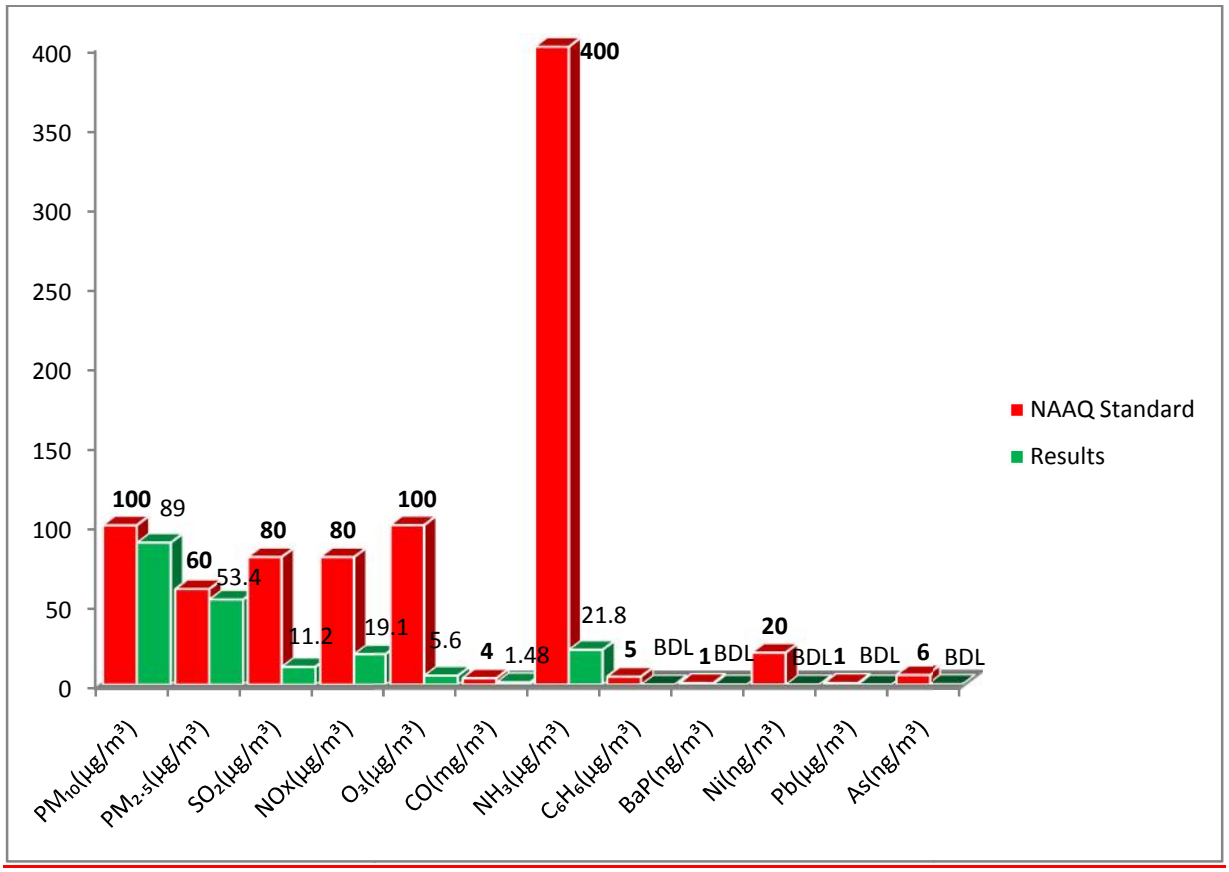
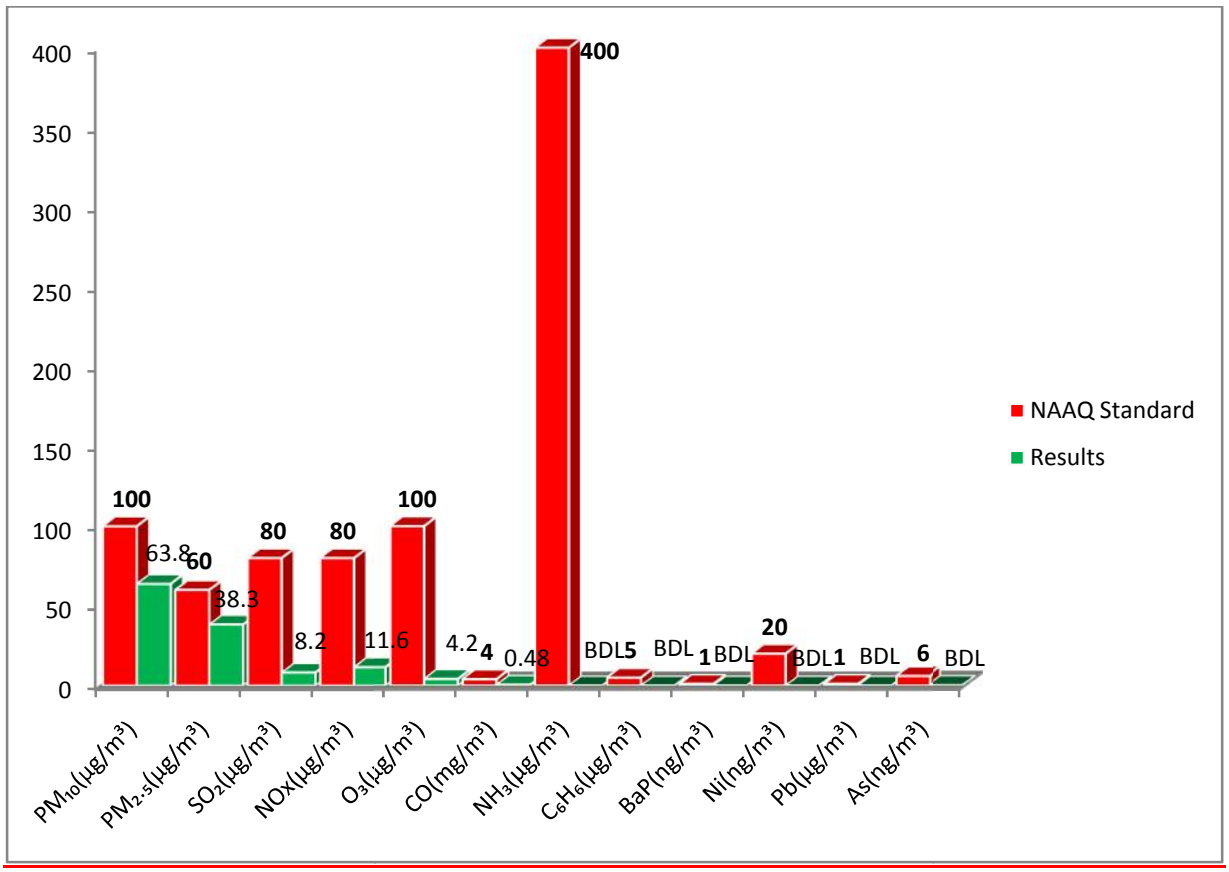


**Figure-04: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-4:Near Village Ostapal) within study area for the month of August-2020**



**Ref : Envlab/20/R-4625** **Date : 10.10.2020**

## AMBIENT AIR QUALITY (BUFFER ZONE) MONITORING REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **AAQ (Bz)-1:** Near Village Ostia
   **AAQ (Bz)-2:** Near Village Koiposi
   **AAQ (Bz)-3:** Near Kaliapani Township
   **AAQ (Bz)-4:** Near Village Ostapal
4. Method of Sampling **: IS 5182(P-5) 1975 RA 2014**
5. **Date of Sampling : 22.09.2020**
6. Date of Analysis **: 25.09.2020 TO 29.09.2020**
7. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Monitor, VOC Sampler
8. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Parameters Analyzed | Unit | Testing Methods | NAAQ Standard | Analysis Result | | | |
|---|---|---|---|---|---|---|---|
| | | | | AAQ(Bz)-1 | AAQ(Bz)-2 | AAQ(Bz)-3 | AAQ(Bz)-4 |
| Particulate matter(size less than10µm) or $PM_{10}$ | µg / $m^3$ | IS 5182 (P-22) 2006 RA 2017 **Gravimetric Method** | **100** | 70.08 | 52.6 | 84.0 | 60.2 |
| Particulate matter(size less than10µm) or $PM_{2.5}$ | µg / $m^3$ | VCSPL/AAQ-SOP/001 Date: 01.12.2019 **Gravimetric Method** | **60** | 38.0 | 34.0 | 50.8 | 34.0 |
| Sulphur dioxide as $SO_2$ | µg / $m^3$ | IS 5182 (P-2) 2001 RA 2017 **Improved West and Geake Method** | **80** | 8.1 | 7.6 | 11.6 | 7.8 |
| Oxides of Nitrogen as $NO_x$ | µg / $m^3$ | IS 5182 (P-6) 2006 RA 2017 **Modified Jacob & Hochheiser Method(Na-Arsenite)** | **80** | 15.9 | 11.2 | 18.4 | 11.2 |
| Carbon Monoxide as CO | mg / $m^3$ | IS 5182 (P-10) 2006 RA 2017 **NDIR Spectroscopy** | **4** | 0.55 | 0.40 | 1.36 | 0.42 |

*Reviewed By*

*Approved By*

**Ref : Envlab/20/R-4625** **Date : 10.10.2020**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ammonia as $NH_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 401, 3rd ed 1999 Indo Phenol Blue Method | **400** | BDL | BDL | 20.8 | BDL |
| Ozone as $O_3$ | µg / $m^3$ | VCSPL/SOP-AAQ/001, Dated 01.12.2019 ISC 411, 3rd ed 1999 Chemical Method | **100** | 5.2 | BDL | 5.8 | 4.4 |
| Arsenic as As | ng/ $m^3$ | IS 5182 (Part-22), RA2019 AAS Method After Sampling | **06** | BDL | BDL | BDL | BDL |
| Lead as Pb | µg / $m^3$ | IS 5182(Part 22) RA2019 AAS Method After Sampling | **01** | BDL | BDL | BDL | BDL |
| Nickel as Ni | ng/ $m^3$ | IS 5182 (Part-22), RA2019 AAS Method After Sampling | **20** | BDL | BDL | BDL | BDL |
| Benzene as C6H6 | µg / $m^3$ | IS 5182 (Part 11):2017 Absorption & Desorption followed by GC analysis | **05** | BDL | BDL | BDL | BDL |
| Benzo-Pyrene as Bap | ng/ $m^3$ | IS 5182 (Part 12):2017 Solvent extraction followed by Gas Chromatography analysis | **01** | BDL | BDL | BDL | BDL |

***BDL Values:*** $SO_2$< 4 µg/$m^3$, $NO_X$< 9 µg/$m^3$, $O_3$<4 µg/$m^3$, Ni<0.01 ng/$m^3$, As < 0.001 ng/$m^3$, $C_6H_6$<0.001 µg/$m^3$, BaP<0.002 ng/$m^3$, Pb<0.001 µg/$m^3$, CO-<0.1 mg/$m^3$

*Reviewed By*

*Approved By*

**Figure-01: Graph Showing Avg. AAQ Concentration (AAQMS (Bz)-1: Near Village Ostia) within study area for the month of September-2020**

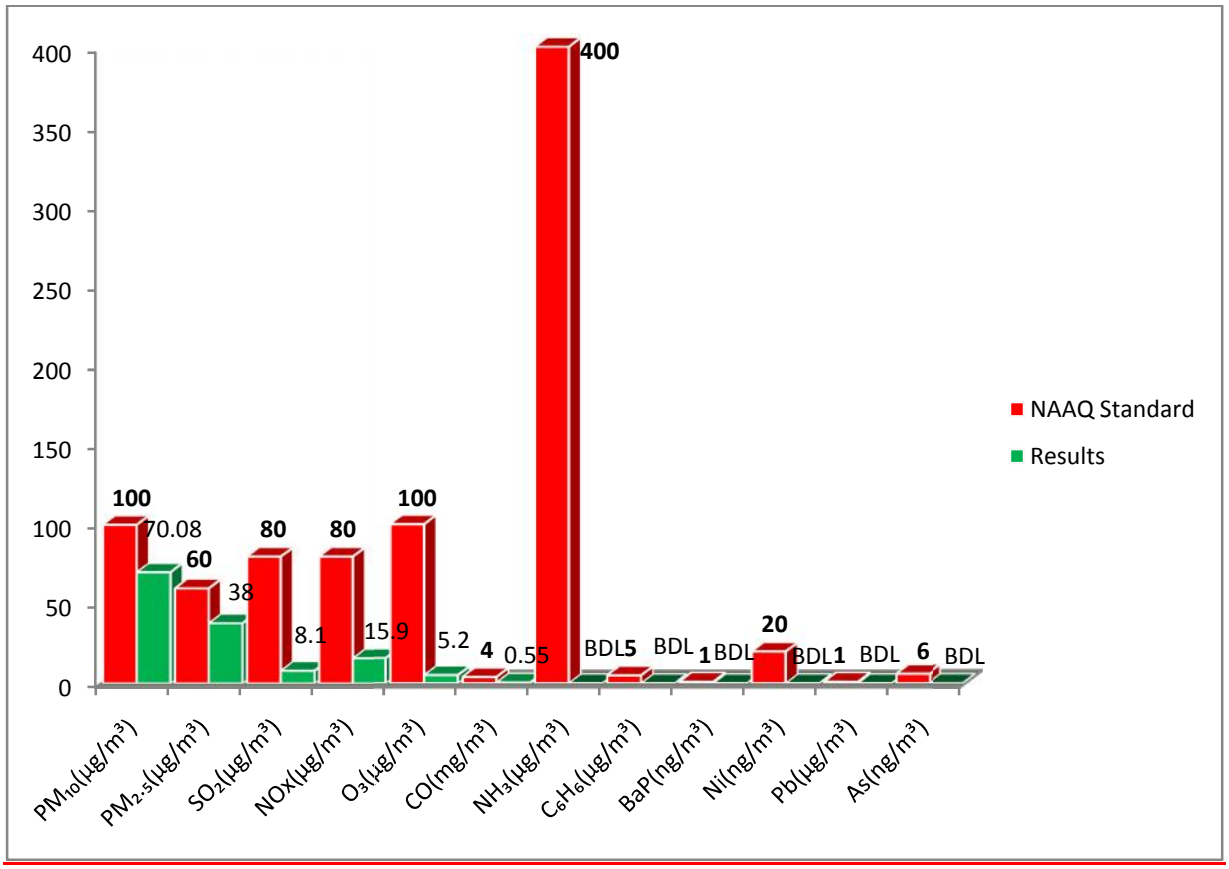


**Figure-02: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-2:Near Village Koiposi) within study area for the month of September-2020**

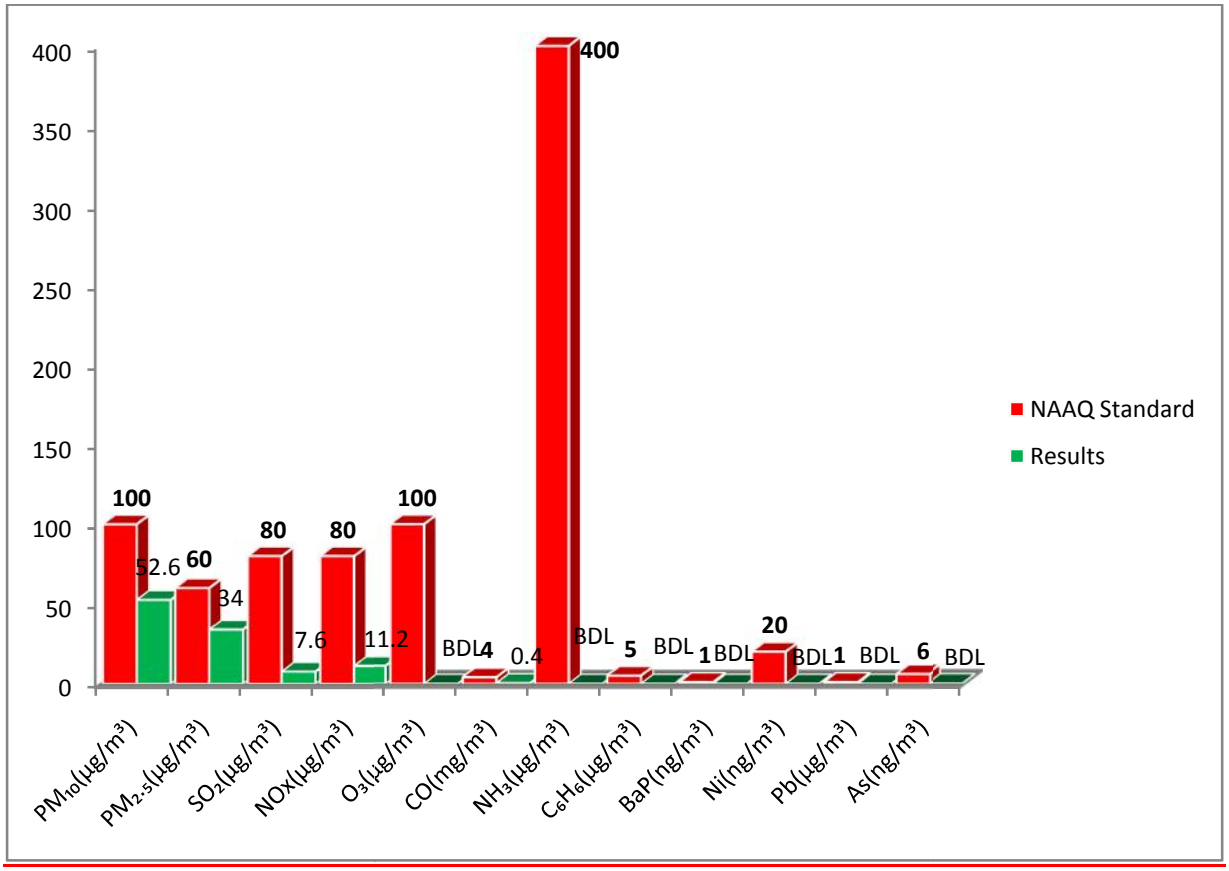


**Figure-03: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-3:Near Kaliapani Township) within study area for the month of September-2020**

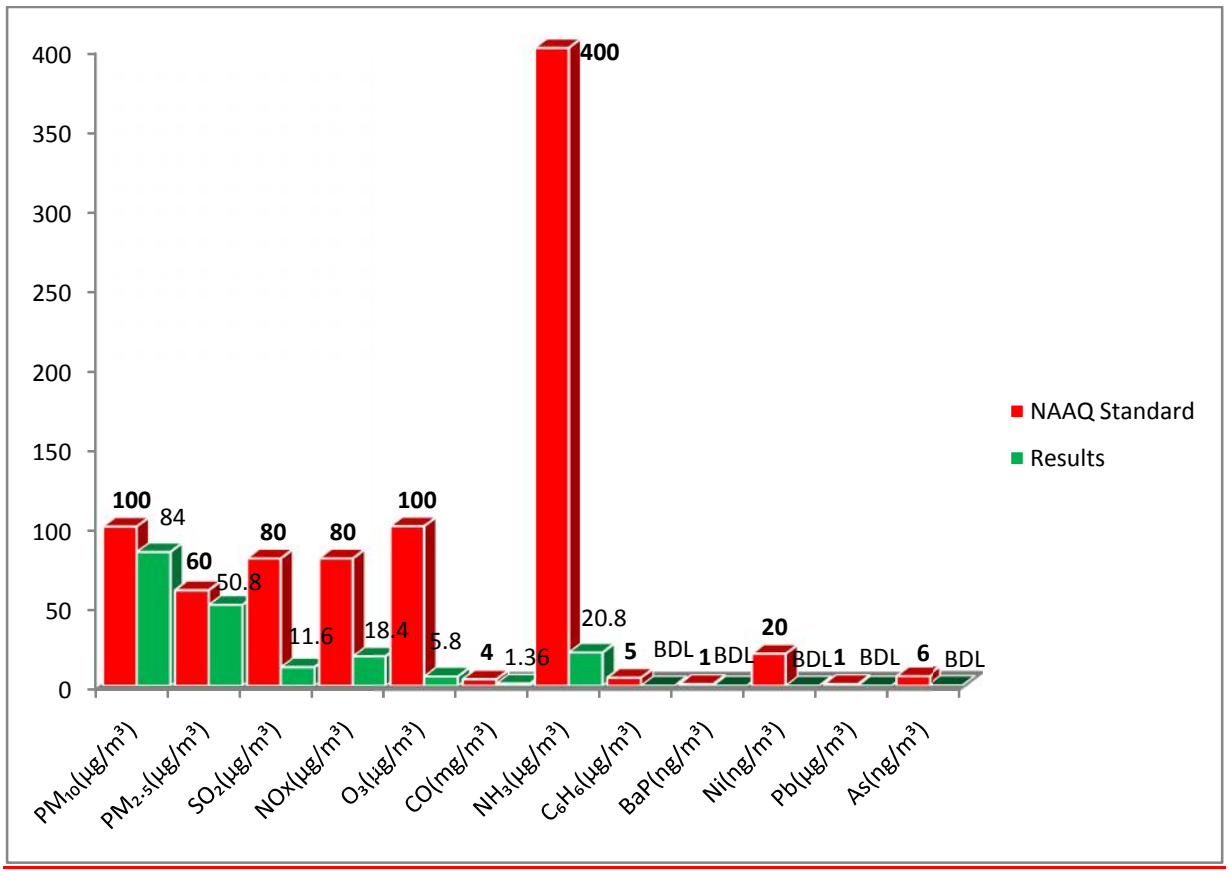
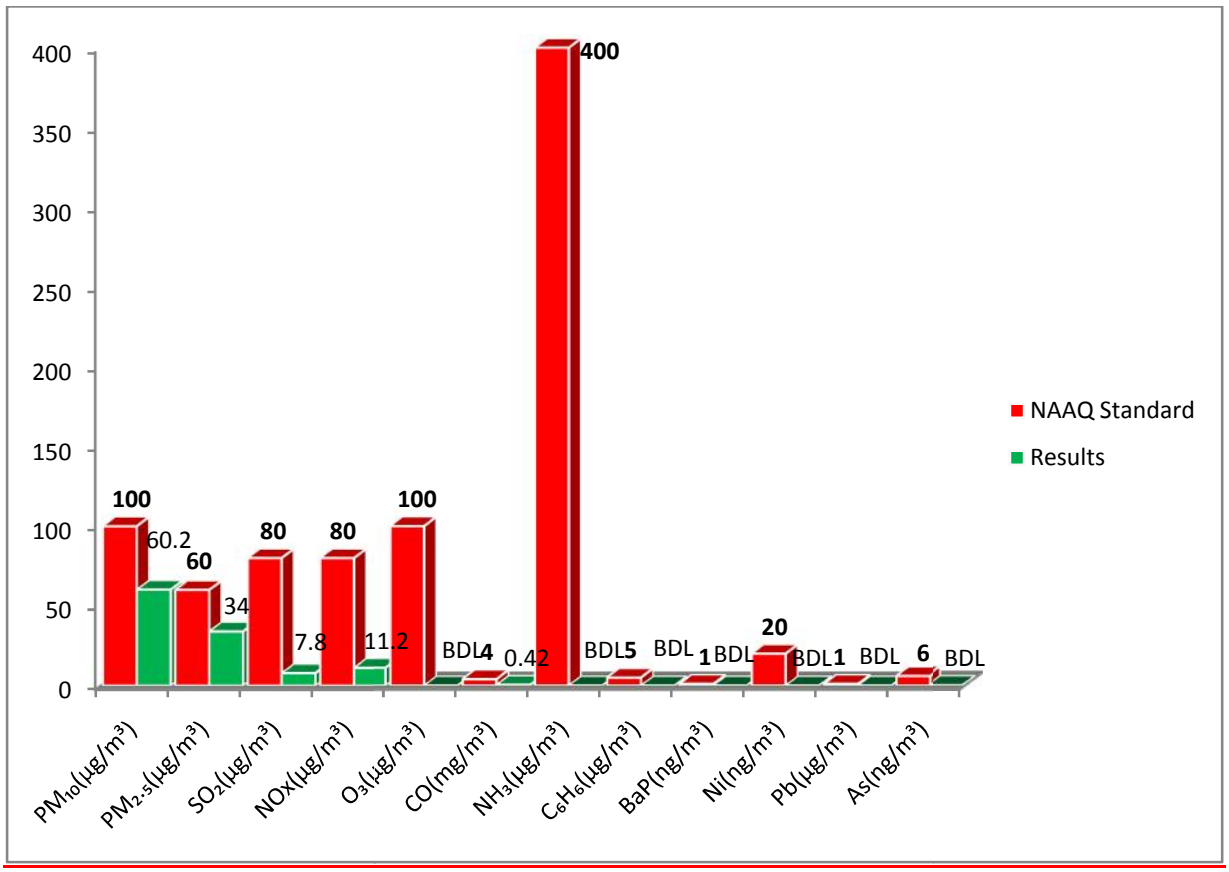


**Figure-04: Graph Showing Avg. AAQ Concentration (AAQMS(Bz)-4:Near Village Ostapal) within study area for the month of September-2020**



**Annexure-3**

# GROUND WATER QUALITY ANALYSIS REPORT

# Visiontek Consultancy Services Pvt. Ltd.

*(An Enviro Engineering Consulting Cell)*

ISO 9001: 2015
ISO 14001:2015
ISO 45001:2018 (OH&S)
ISO/IEC 17025:2005


**Ref : Envlab/20/R-4626** **Date : 10.10.2020**

## GROUND WATER QUALITY ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **GW1:** Bore well Near Work Shop of the Mines
   **GW2:** Bore Well Near Main Gate of OCM
   **GW3:** Open Well Near Ostia Village
4. Method of Sampling : **APHA 1060 B**
5. **Date of Sampling** : **22.09.2020**
6. Date of Analysis : **23.09.2020 TO 29.09.2020**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No. | Parameter | Testing Method | Unit | Standard as per IS -10500:2012 Amended on 2015 & 2018 | | Analysis Result | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Acceptable Limit | Permissible Limit | GW1 | GW2 | GW3 |
| ***Essential Characteristics*** | | | | | | | | |
| 1 | Colour | **Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C | Hazen | **5** | **15** | <5 | <5 | <5 |
| 2 | Odour | **Threshold Odour Test** APHA 23RD Ed,2017 :2150 B | -- | **Agreeable** | **Agreeable** | Agreeable | Agreeable | Agreeable |
| 3 | Taste | **Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C | -- | **Agreeable** | **Agreeable** | Agreeable | Agreeable | Agreeable |
| 4 | Turbidity | **Nephelometric Method** APHA 23RD Ed,2017 :2130 B | NTU | **1** | **5** | 6.6 | 6.8 | 7.4 |
| 5 | pH Value | **pH Meter** APHA 23RD Ed,2017 : 4500$H^+$ B | -- | **6.5-8.5** | **No Relaxation** | 6.74 | 6.87 | 6.88 |
| 6 | Total Hardness (as $CaCO_3$) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C | mg/l | **200** | **600** | 182.0 | 194.0 | 190.0 |
| 7 | Iron (as Fe) | **By AAS Method** APHA 23RD Ed,2017 : 3111, B | mg/l | **1.0** | **No Relaxation** | 0.26 | 0.31 | 0.28 |
| 8 | Chloride (as Cl ) | **Argentometric Method** APHA 23RD Ed,2017 : 4500$Cl^-$ B | mg/l | **250** | **1000** | 36.0 | 38.0 | 44.0 |
| 9 | Residual, free Chlorine | **Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B | mg/l | **0.2** | **1** | ND | ND | ND |
| ***Desirable Characteristics*** | | | | | | | | |
| 10 | Dissolved Solids | **Gravimetric Method** APHA 23RD Ed,2017 : 2540 C | mg/l | **500** | **2000** | 292.0 | 340.0 | 280.0 |
| 11 | Calcium (as Ca ) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B | mg/l | **75** | **200** | 50.8 | 56.0 | 60.0 |
| 12 | Magnesium (as Mg) | **Calculation Method** APHA 23RD Ed,2017 : 3500Mg B | mg/l | **30** | **100** | 20.0 | 24.0 | 30.0 |
| 13 | Copper (as Cu) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **0.05** | **1.5** | <0.05 | <0.05 | <0.05 |
| 14 | Manganese (as Mn) | **Persulfate Method** APHA 23RD Ed,2017: 3500Mn B | mg/l | **0.1** | **0.3** | <0.05 | <0.05 | <0.05 |
| 15 | Sulphate (as $SO_4$) | **Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E | mg/l | **200** | **400** | 30.0 | 31.0 | 34.0 |
| 16 | Nitrate (as $NO_3$) | **By UV-Screen Method** APHA 23RD Ed,2017: 4500 $NO_3^-$ E | mg/l | **45** | **No Relaxation** | 6.8 | 7.2 | 6.2 |
| 17 | Fluoride (as F) | **Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500$F^-$ C | mg/l | **1.0** | **1.5** | 0.14 | 0.16 | 0.21 |
| 18 | Phenolic Compounds (as $C_6H_5OH$) | **Chloroform Extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D | mg/l | **0.001** | **0.002** | <0.001 | <0.001 | <0.001 |
| 19 | Mercury (as Hg) | **AAS Method** APHA 23RD Ed,2017: 3112 B | mg/l | **0.001** | **No Relaxation** | <0.001 | <0.001 | <0.001 |

**Ref : Envlab/20/R-4626** **Date : 10.10.2020**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 20 | Cadmium (as Cd) | **AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **0.003** | **No Relaxation** | <0.001 | <0.001 | <0.001 |
| 21 | Selenium (as Se) | **By AAS Method** APHA 23RD Ed,2017: 3500 Se C | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 22 | Arsenic (as As) | **By AAS Method** APHA 23RD Ed,2017: 3114 B | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 23 | Cyanide (as CN) | **Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 $CN^-$ C,D | mg/l | **0.05** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 24 | Lead (as Pb) | **By AAS Method** APHA 23RD Ed,2017 3111 B | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 25 | Zinc (as Zn) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **5** | **15** | 1.2 | 1.4 | 1.6 |
| 26 | Anionic Detergents (as MBAS) | **Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C | mg/l | **0.2** | -- | ND | ND | ND |
| 27 | Mineral Oil | **Partition-Gravimetric Method** APHA 23RD Ed,2017: 5520 B | mg/l | **0.5** | **No Relaxation** | ND | ND | ND |
| 28 | Alkalinity | **Titration Method** APHA 23RD Ed,2017:2320 B | mg/l | **200** | **600** | 190.0 | 210.0 | 180.0 |
| 29 | Aluminium as( Al) | **AAS Method** APHA 23RD Ed,2017: 3111 D | mg/l | **0.03** | **0.2** | <0.01 | <0.01 | <0.01 |
| 30 | Boron (as B) | **Curcumin Method** APHA 23RD Ed,2017: 4500B, B | mg/l | **0.5** | **2.4** | 0.51 | <0.1 | <0.1 |
| 31 | Total Coliform as TC | **MPN Method** APHA 23RD Ed,2017 : 9221 b | MPN/ 100ml | Shall not be detectable in any 100ml sample | -- | <1.8 | <1.8 | <1.8 |

***CL – Colourless, U/O – Unobjectionable, ND – Not detected.***
***BDL (Below detection limit) Values :***(Cu<0.05 mg/l , Mn<0.005 mg/l, $C_6H_5OH$<0.001 mg/l, Hg<0.005mg/l, Cd<0.001 mg/l ,Se<0.001 mg/l, As<0.001 mg/l,Pb<0.01 mg/l, Zn<0.05 mg/l, $Cr^{+6}$<0.05 mg/l, Al<0.001 mg/l , B<0.01 mg/l, $NO_3$<0.01 mg/l)

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

*Reviewed By*

*Approved By*

**Ref : Envlab/20/R-4627** **Date : 10.10.2020**

## GROUND WATER QUALITY ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **GW4:** Open Well Near Ostapal Village
   **GW5:** Tube Well inside the Shiva Temple of Village Gurujanga
   **GW6:** Tube Well outside Shiva Temple of Village Gurujanga
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 22.09.2020**
6. Date of Analysis **: 23.09.2020 TO 29.09.2020**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No. | Parameter | Testing Method | Unit | Standard as per IS -10500:2012 Amended on 2015 & 2018 | | Analysis Result | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Acceptable Limit | Permissible Limit | GW4 | GW5 | GW6 |
| ***Essential Characteristics*** | | | | | | | | |
| 1 | Colour | **Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C | Haze n | **5** | **15** | <5 | <5 | <5 |
| 2 | Odour | **Threshold Odour Test** APHA 23RD Ed,2017 :2150 B | -- | **Agreeable** | **Agreeable** | Agreeable | Agreeable | Agreeable |
| 3 | Taste | **Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C | -- | **Agreeable** | **Agreeable** | Agreeable | Agreeable | Agreeable |
| 4 | Turbidity | **Nephelometric Method** APHA 23RD Ed,2017 :2130 B | NTU | **1** | **5** | 6.8 | 7.4 | 7.8 |
| 5 | pH Value | **pH Meter** APHA 23RD Ed,2017 : 4500$H^+$ B | -- | **6.5-8.5** | **No Relaxation** | 7.2 | 7.42 | 7.41 |
| 6 | Total Hardness (as $CaCO_3$) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C | mg/l | **200** | **600** | 110.0 | 90.0 | 60.0 |
| 7 | Iron (as Fe) | **By AAS Method** APHA 23RD Ed,2017 : 3111, B | mg/l | **1.0** | **No Relaxation** | 0.24 | 0.21 | 0.18 |
| 8 | Chloride (as Cl ) | **Argentometric Method** APHA 23RD Ed,2017 : 4500$Cl^-$ B | mg/l | **250** | **1000** | 42.0 | 50.0 | 48.0 |
| 9 | Residual, free Chlorine | **Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B | mg/l | **0.2** | **1** | ND | ND | ND |
| ***Desirable Characteristics*** | | | | | | | | |
| 10 | Dissolved Solids | **Gravimetric Method** APHA 23RD Ed,2017 : 2540 C | mg/l | **500** | **2000** | 190.0 | 110.0 | 90.0 |
| 11 | Calcium (as Ca ) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B | mg/l | **75** | **200** | 42.0 | 30.0 | 24.0 |
| 12 | Magnesium (as Mg) | **Calculation Method** APHA 23RD Ed,2017 : 3500Mg B | mg/l | **30** | **100** | 21.2 | 12.8 | 10.8 |
| 13 | Copper (as Cu) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **0.05** | **1.5** | <0.05 | <0.05 | <0.05 |
| 14 | Manganese (as Mn) | **Persulfate Method** APHA 23RD Ed,2017: 3500Mn B | mg/l | **0.1** | **0.3** | <0.05 | <0.05 | <0.05 |
| 15 | Sulphate (as $SO_4$) | **Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E | mg/l | **200** | **400** | 4.2 | 4.6 | 3.2 |
| 16 | Nitrate (as $NO_3$) | **By UV-Screen Method** APHA 23RD Ed,2017: 4500 $NO_3^-$ E | mg/l | **45** | **No Relaxation** | 1.1 | 0.72 | 0.61 |
| 17 | Fluoride (as F) | **Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500$F^-$ C | mg/l | **1.0** | **1.5** | 0.011 | 0.014 | 0.012 |
| 18 | Phenolic Compounds (as $C_6H_5OH$) | **Chloroform Extraction by Colorimric Method** APHA 23RD Ed,2017: 5530 B,D | mg/l | **0.001** | **0.002** | <0.001 | <0.001 | <0.001 |
| 19 | Mercury (as Hg) | **AAS Method** APHA 23RD Ed,2017: 3112 B | mg/l | **0.001** | **No Relaxation** | <0.001 | <0.001 | <0.001 |
| 20 | Cadmium (as Cd) | **AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **0.003** | **No Relaxation** | <0.001 | <0.001 | <0.001 |
| 21 | Selenium (as Se) | **By AAS Method** APHA 23RD Ed,2017: 3500 Se C | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |

**Ref : Envlab/20/R-4627** **Date : 10.10.2020**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 22 | Arsenic (as As) | **By AAS Method** APHA 23RD Ed,2017: 3114 B | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 23 | Cyanide (as CN) | **Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 $CN^-$ C,D | mg/l | **0.05** | **No Relaxation** | <0.05 | <0.05 | <0.05 |
| 24 | Lead (as Pb) | **By AAS Method** APHA 23RD Ed,2017 3111 B | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 25 | Zinc (as Zn) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **5** | **15** | 2.6 | 3.2 | 3.8 |
| 26 | Anionic Detergents (as MBAS) | **Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C | mg/l | **0.2** | -- | ND | ND | ND |
| 27 | Mineral Oil | **Partition-Gravimetric Method** APHA 23RD Ed,2017: 5520 B | mg/l | **0.5** | **No Relaxation** | ND | ND | ND |
| 28 | Alkalinity | **Titration Method** APHA 23RD Ed,2017:2320 B | mg/l | **200** | **600** | 88.0 | 28.0 | 20.0 |
| 29 | Aluminium as( Al) | **AAS Method** APHA 23RD Ed,2017: 3111 D | mg/l | **0.03** | **0.2** | <0.01 | <0.01 | <0.01 |
| 30 | Boron (as B) | **Curcumin Method** APHA 23RD Ed,2017: 4500B, B | mg/l | **0.5** | **2.4** | <0.1 | <0.1 | <0.1 |
| 31 | Total Coliform as TC | **MPN Method** APHA 23RD Ed,2017 : 9221 b | MPN/ 100ml | Shall not be detectable in any 100ml sample | -- | <1.8 | <1.8 | <1.8 |

***CL – Colourless, U/O – Unobjectionable, ND – Not detected.***
***BDL (Below detection limit) Values :***(Cu<0.05 mg/l , Mn<0.005 mg/l, $C_6H_5OH$<0.001 mg/l, Hg<0.005mg/l, Cd<0.001 mg/l ,Se<0.001 mg/l, As<0.001 mg/l,Pb<0.01 mg/l, Zn<0.05 mg/l, $Cr^{+6}$<0.05 mg/l, Al<0.001 mg/l , B<0.01 mg/l, $NO_3$<0.01 mg/l)

*Reviewed By*

*Approved By*

**Ref : Envlab/20/R-4628** **Date : 10.10.2020**

## GROUND WATER QUALITY ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **GW7:** Eastern Side of the Quarry (PZ-1)
   **GW8:** Southern Side of the Quarry (PZ-2)
   **GW9:** Western Side of the Quarry (PZ-3)
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 22.09.2020**
6. Date of Analysis **: 23.09.2020 TO 29.09.2020**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No. | Parameter | Testing Method | Unit | Standard as per IS -10500:2012 Amended on 2015 & 2018 | | Analysis Result | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Permissible Limit | Permissible Limit | GW7 | GW8 | GW9 |
| ***Essential Characteristics*** | | | | | | | | |
| 1 | Colour | **Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C | Haze n | **5** | **15** | <5 | <5 | <5 |
| 2 | Odour | **Threshold Odour Test** APHA 23RD Ed,2017 :2150 B | -- | **Agreeable** | **Agreeable** | Agreeable | Agreeable | Agreeable |
| 3 | Taste | **Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C | -- | **Agreeable** | **Agreeable** | Agreeable | Agreeable | Agreeable |
| 4 | Turbidity | **Nephelometric Method** APHA 23RD Ed,2017 :2130 B | NTU | **1** | **5** | 6.88 | 7.44 | 7.82 |
| 5 | pH Value | **pH Meter** APHA 23RD Ed,2017 : 4500$H^+$ B | -- | **6.5-8.5** | **No Relaxation** | 7.31 | 7.5 | 7.49 |
| 6 | Total Hardness (as $CaCO_3$) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C | mg/l | **200** | **600** | 124.0 | 110.0 | 80.0 |
| 7 | Iron (as Fe) | **By AAS Method** APHA 23RD Ed,2017 : 3111, B | mg/l | **1.0** | **No Relaxation** | 0.29 | 0.18 | 0.12 |
| 8 | Chloride (as Cl ) | **Argentometric Method** APHA 23RD Ed,2017 : 4500$Cl^-$ B | mg/l | **250** | **1000** | 38.0 | 42.0 | 41.0 |
| 9 | Residual, free Chlorine | **Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B | mg/l | **0.2** | **1** | ND | ND | ND |
| ***Desirable Characteristics*** | | | | | | | | |
| 10 | Dissolved Solids | **Gravimetric Method** APHA 23RD Ed,2017 : 2540 C | mg/l | **500** | **2000** | 210.0 | 198.0 | 146.0 |
| 11 | Calcium (as Ca ) | **EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B | mg/l | **75** | **200** | 48.0 | 36.0 | 32.0 |
| 12 | Magnesium (as Mg) | **Calculation Method** APHA 23RD Ed,2017 : 3500Mg B | mg/l | **30** | **100** | 18.0 | 10.2 | 9.2 |
| 13 | Copper (as Cu) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **0.05** | **1.5** | <0.05 | <0.05 | <0.05 |
| 14 | Manganese (as Mn) | **Persulfate Method** APHA 23RD Ed,2017: 3500Mn B | mg/l | **0.1** | **0.3** | <0.05 | <0.05 | <0.05 |
| 15 | Sulphate (as $SO_4$) | **Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E | mg/l | **200** | **400** | 3.2 | 4.8 | 3.1 |
| 16 | Nitrate (as $NO_3$) | **By UV-Screen Method** APHA 23RD Ed,2017: 4500 $NO_3^-$ E | mg/l | **45** | **No Relaxation** | 1.2 | 0.84 | 0.74 |
| 17 | Fluoride (as F) | **Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500$F^-$ C | mg/l | **1.0** | **1.5** | 0.012 | 0.016 | 0.013 |
| 18 | Phenolic Compounds (as $C_6H_5OH$) | **Chloroform Extraction by Colorimric Method** APHA 23RD Ed,2017: 5530 B,D | mg/l | **0.001** | **0.002** | <0.001 | <0.001 | <0.001 |
| 19 | Mercury (as Hg) | **AAS Method** APHA 23RD Ed,2017: 3112 B | mg/l | **0.001** | **No Relaxation** | <0.001 | <0.001 | <0.001 |
| 20 | Cadmium (as Cd) | **AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **0.003** | **No Relaxation** | <0.001 | <0.001 | <0.001 |
| 21 | Selenium (as Se) | **By AAS Method** APHA 23RD Ed,2017: 3500 Se C | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |

**Ref : Envlab/20/R-4628** **Date : 10.10.2020**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 22 | Arsenic (as As) | **By AAS Method** APHA 23RD Ed,2017: 3114 B | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 23 | Cyanide (as CN) | **Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 $CN^-$ C,D | mg/l | **0.05** | **No Relaxation** | <0.05 | <0.05 | <0.05 |
| 24 | Lead (as Pb) | **By AAS Method** APHA 23RD Ed,2017 3111 B | mg/l | **0.01** | **No Relaxation** | <0.01 | <0.01 | <0.01 |
| 25 | Zinc (as Zn) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **5** | **15** | 3.8 | 4.2 | 4.6 |
| 26 | Anionic Detergents (as MBAS) | **Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C | mg/l | **0.2** | -- | ND | ND | ND |
| 27 | Mineral Oil | **Partition-Gravimetric Method** APHA 23RD Ed,2017: 5520 B | mg/l | **0.5** | **No Relaxation** | ND | ND | ND |
| 28 | Alkalinity | **Titration Method** APHA 23RD Ed,2017:2320 B | mg/l | **200** | **600** | 52.0 | 40.0 | 26.0 |
| 29 | Aluminium as( Al) | **AAS Method** APHA 23RD Ed,2017: 3111 D | mg/l | **0.03** | **0.2** | <0.01 | <0.01 | <0.01 |
| 30 | Boron (as B) | **Curcumin Method** APHA 23RD Ed,2017: 4500B, B | mg/l | **0.5** | **2.4** | <0.1 | <0.1 | <0.1 |
| 31 | Total Coliform as TC | **MPN Method** APHA 23RD Ed,2017 : 9221 b | MPN/ 100ml | Shall not be detectable in any 100ml sample | -- | <1.8 | <1.8 | <1.8 |

***CL – Colourless, U/O – Unobjectionable, ND – Not detected.***
***BDL (Below detection limit) Values :***(Cu<0.05 mg/l , Mn<0.005 mg/l, $C_6H_5OH$<0.001 mg/l, Hg<0.005mg/l, Cd<0.001 mg/l ,Se<0.001 mg/l, As<0.001 mg/l,Pb<0.01 mg/l, Zn<0.05 mg/l, $Cr^{+6}$<0.05 mg/l, Al<0.001 mg/l , B<0.01 mg/l, $NO_3$<0.01 mg/l)

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

*Reviewed By*

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

*Approved By*

**Ref : Envlab/20/R-4635** **Date : 10.10.2020**

## MEASUREMENT OF GROUND WATER QUALITY ANALYSIS REPORT SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location :**GW1:** Bore well Near Workshop of the Mines
   **GW2:** Bore well Near Main Gate
   **GW3:** Open Well Near Ostia Village
   **GW4:** Open Well Near Ostapal Village
   **GW5:** Tube Well Inside Shiv Temple of Gurujanga Village
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 22.09.2020**
6. Date of Analysis **: 23.09.2020 TO 29.09.2020**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No. | Parameter | Testing Method | Unit | Standard as per IS -10500:2012 Amended on 2015 & 2018 | | Analysis Result | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Acceptable Limit | Permissible Limit | GW1 | GW2 | GW3 | GW4 | GW5 |
| 1 | Hexavalent Chromium as $Cr^{6+}$ | **By AAS Method** APHA 23RD Ed,2017: 3500 Cr B | mg/l | -- | -- | BDL | BDL | BDL | BDL | BDL |

*BDL Value :$Cr^{6+}$ <0.05 mg/l*

*Reviewed By*

*Approved By*

**Ref : Envlab/20/R-4636** **Date : 10.10.2020**

## MEASUREMENT OF GROUND WATER QUALITY ANALYSIS REPORT SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location :**GW6 :** Tube Well Outside Shiv Temple of Gurujanga Village
   **GW7:** Eastern Side of the Quarry (PZ-1)
   **GW8:** Southern Side of the Quarry (PZ-2)
   **GW9:** Western Side of the Quarry (PZ-3)
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 22.09.2020**
6. Date of Analysis **: 23.09.2020 TO 29.09.2020**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No. | Parameter | Testing Method | Unit | Standard as per IS -10500:2012 Amended on 2015 & 2018 | | Analysis Result | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Acceptable Limit | Permissible Limit | GW6 | GW7 | GW8 | GW9 |
| 1 | Hexavalent Chromium as $Cr^{6+}$ | **By AAS Method** APHA 23RD Ed,2017: 3500 Cr B | mg/l | -- | -- | BDL | BDL | BDL | BDL |

*BDL Value: $Cr6^{+}$ <0.05 mg/l*

*Reviewed By* *Approved By*

**Annexure-4**

# EFFLUENT WATER QUALITY ANALYSIS REPORT

**Ref : Envlab/20/R-4629** **Date : 10.10.2020**

## EFFLUENT WATER DISCHARGE ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **EW1:** ETP Outside Discharge Point
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 22.09.2020**
6. Date of Analysis **: 23.09.2020 TO 29.09.2020**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No. | Parameters | Testing Methods | Unit | Standards (In land Surface water) | Analysis Results EW-1 |
|---|---|---|---|---|---|
| 1 | Colour | Visual Comparison Method APHA 2120 B; 23rd Edition, 2017 | Hazen | **Colourless** | 05 |
| 2 | Odour | Threshold Odour Method APHA 2150 B; 23rd Edition, 2017 | -- | **Odourless** | Pungent Smell |
| 3 | pH at $25^0$C | pH Meter APHA 4500 $H^+$B; 23rd Edition, 2017 | -- | **5.5-9.0** | 7.88 |
| 4 | Total Suspended Solids | Gravimetric Method APHA 2540 D; 23rd Edition, 2017 | mg/l | **100** | 20.0 |
| 5 | Copper as Cu | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **3** | <0.05 |
| 6 | Fluoride as F | Distillation followed by Spectophotometric Method APHA 4500 $F^-$ C,D; 23rd Edition, 2017 | mg/l | **2** | 0.31 |
| 7 | Total Residual Chlorine | Iodometric Method APHA 23RD Ed,2017 : 4500Cl, B | mg/l | **1** | ND |
| 8 | Iron as Fe | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **3** | 0.48 |
| 9 | Manganese as Mn | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **2** | <0.05 |
| 10 | Nitrate as $NO_3$ | By UV-Screen Method APHA 4500 $NO_3^-$ B; 23rd Edition, 2017 | mg/l | **10** | 8.2 |
| 11 | Phenolic Compounds as $C_6H_5OH$ | Distillation Followed by Spectophotometric Method APHA 5530-B, D; 23rd Edition, 2017 | mg/l | **1** | <0.001 |
| 12 | Selenium as Se | By AAS Method APHA 3500 Se C; 23rd Edition, 2017 | mg/l | **0.05** | <0.01 |
| 13 | Cadmium as Cd | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **2.0** | <0.001 |
| 14 | Cyanide as CN | Distillation Followed by Spectophotometric Method APHA 4500 –CN-C,E; 23rd Edition, 2017 | mg/l | **0.2** | <0.05 |
| 15 | Lead as Pb | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **0.1** | <0.01 |
| 16 | Mercury as Hg | By AAS Method APHA 3112 B; 23rd Edition, 2017 | mg/l | **0.01** | <0.001 |
| 17 | Nickel as Ni | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **3** | <0.05 |
| 18 | Arsenic as As | By AAS Method APHA 3114 B; 23rd Edition, 2017 | mg/l | **0.2** | <0.05 |
| 19 | Total Chromium as Cr | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **2** | 0.34 |
| 20 | Zinc as Zn | By AAS Method APHA 3111 B; 23rd Edition, 2017 | mg/l | **5** | 0.028 |
| 21 | Hexavalent Chromium as $Cr^{+6}$ | By AAS Method APHA 3500 Cr B; 23rd Edition, 2017 | mg/l | **0.1** | <0.001 |
| 22 | Vanadium as V | By AAS Method APHA 3500 V; 23rd Edition, 2017 | mg/l | **0.2** | <0.001 |
| 23 | Temperature | By Thermometer APHA 2550 B; 23rd Edition, 2017 | °C | **Shall not exceed $5^0$C above the receiving water temperature** | 28 |
| 24 | Dissolved Oxygen | Modified Winkler Method APHA 4500 O. C; 23rd Edition, 2017 | mg/l | -- | 7.4 |

**Ref : Envlab/20/R-4629** **Date : 10.10.2020**

| | | | | | |
|---|---|---|---|---|---|
| 25 | Biochemical Oxygen Demand as BOD | Oxygen Depletion Method IS 3025 ( Part 44 ):2003 | mg/l | **30** | 6.3 |
| 26 | Chemical Oxygen Demand as COD | Open Reflux Method APHA 5220 B; 23rd Edition, 2017 | mg/l | **250** | 20.0 |
| 27 | Oil & Grease | Gravimetric Method (Solvent Extraction) APHA 5520 B; 23rd Edition, 2017 | mg/l | **10** | 5.2 |
| 29 | Ammonical Nitrogen as N | By TKN Method APHA 4500-$NH_3$ C; 23rd Edition, 2017 | mg/l | **50** | 1.8 |
| 30 | Total Kjeldahl Nitrogen as N | By TKN Method APHA 4500-$N_{org}$ C; 23rd Edition, 2017 | mg/l | **100** | 5.4 |
| 31 | Sulphide as S | By Methylene Blue Method APHA 4500-S D; 23rd Edition, 2017 | mg/l | **2** | <0.001 |
| 32 | Free Ammonia as $NH_3$ | By Calculation | mg/l | **10** | 4.6 |
| 33 | Particulate Size of Suspended Solids | Gravimetric Method APHA 2540 D; 23rd Edition, 2017 | µ | **Shall pass 850 micron IS Sieve** | <850 |
| 34 | Bio-assay Test | Evaluating Acute Toxicity IS 6582 (P-2) 2008 | % | **90% survival of fish after 96 hours in 100% effluent** | 90% Survival of Fish after 96 Hrs in 100% Effluent |

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

*Reviewed By*

VISIONTEK CONSULTANCY SERVICES PVT. LTD.

*Approved By*

**Ref : Envlab/20/R-4637** **Date : 10.10.2020**

## SURFACE WATER QUALITY ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **SW1:** Damsala Nallah Upstream Water ( 100 mtr Up)
   **SW2:** Damsala Nallah Downstream Water (100 mtr Up)
   (with impact of other mines discharge)
4. Method of Sampling **: APHA 1060 B**
5. **Date of Sampling : 23.09.2020**
6. Date of Analysis **: 24.09.2020 TO 30.09.2020**
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No | Parameter | Testing Method | Unit | Standards as per IS-2296:1992 Class –'C' | Analysis Results | |
|---|---|---|---|---|---|---|
| | | | | | SW-1 | SW-2 |
| 1 | Colour (max) | **Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C | Hazen | **300** | <5 | 5 |
| 2 | pH Value | **pH Meter** APHA 23RD Ed,2017 : 4500$H^+$ B | -- | **6.0-9.0** | 7.41 | 7.28 |
| 3 | Suspended solids | **Gravimetric Method** APHA 23RD Ed,2017 : 2540 D | mg/l | -- | 44.0 | 78.0 |
| 4 | Dissolved Oxygen (minimum) | **Modified Winkler Method** APHA 23RD Ed,2017 : 2540 C | mg/l | **4.0** | 7.2 | 7.0 |
| 5 | Turbidity | **Nephelometric Method** APHA 23RD Ed,2017: 2130 B | NTU | -- | 7.0 | 10.0 |
| 6 | Chloride (max) | **Titrimetric Method** APHA 23RD Ed,2017: 4500$Cl^-$ B | mg/l | **600** | 7.6 | 8.4 |
| 7 | Total Dissolved Solids | **Gravimetric Method** APHA 23RD Ed,2017: 2540 C | mg/l | **1500** | 88.0 | 102.0 |
| 8 | BOD (3) days at $27^0$C (max) | IS 3025(P-44) : 1993 RA 2003 | mg/l | **3.0** | BDL | BDL |
| 9 | Arsenic as As | **By AAS Method** APHA 23RD Ed,2017: 3114 B | mg/l | **0.2** | BDL | BDL |
| 10 | Lead as Pb(max) | **By AAS Method** APHA 23RD Ed,2017 3111 B | mg/l | **0.1** | BDL | BDL |
| 11 | Cadmium as Cd (max) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **0.01** | BDL | BDL |
| 12 | Hexa Chromium as $Cr^{+6}$ | **Diphenyl Carbazide Method** APHA 23RD Ed,2017: 3500Cr B | mg/l | **0.05** | BDL | BDL |
| 13 | Copper as Cu (max) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **1.5** | BDL | BDL |
| 14 | Zinc as Zn(max) | **By AAS Method** APHA 23RD Ed,2017: 3111 B | mg/l | **15** | BDL | BDL |
| 15 | Selenium as Se (max) | **By AAS Method** APHA 23RD Ed,2017: 3500 Se C | mg/l | **0.05** | BDL | BDL |
| 16 | Cyanide as CN (max) | **Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 $CN^-$ C,D | mg/l | **0.05** | ND | ND |
| 17 | Fluoride as F (max) | **Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500$F^-$ C | mg/l | **1.5** | 0.10 | 0.14 |
| 18 | Sulphates ($SO_4$) (max) | **Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E | mg/l | **400** | 0.72 | 0.91 |

**Ref : Envlab/20/R-4637** **Date : 10.10.2020**

| | | | | | | |
|---|---|---|---|---|---|---|
| 19 | Phenolic Compounds as $C_6H_5OH$ (max) | **Chloroform Extraction By Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D | mg/l | **0.005** | BDL | BDL |
| 20 | Iron as Fe (max) | **By AAS Method** APHA 23RD Ed,2017: 3500Fe, B | mg/l | **0.5** | 0.41 | 0.051 |
| 21 | Nitrate as $NO_3$, (max) | **By UV-Screen Method** APHA 23RD Ed,2017: 4500 $NO_3^-$ E | mg/l | **50** | 1.6 | 1.3 |
| 22 | Anionic Detergents (max) | **Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C | mg/l | **1.0** | ND | ND |
| 23 | Total Coli form | **By Multiple Tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B | MPN/ 100 ml | **5000** | 1200.0 | 1800.0 |

*Reviewed By*

*Approved By*

**Annexure-5**

# DUSTFALL MEASUREMENT ANALYSIS REPORT

**Ref : Envlab/20/R-4634** **Date : 10.10.2020**

## DUST FALL ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. **Sampling Location : DF1- Near Roof Top of Office Building**
4. **Date of Sampling : 22.09.2020**
5. Sample Collected by : VCSPL Representative in presence of Client's Representative

| SL.No. | Parameters | Unit (mg of deposit per square meter per day) | Analysis Result |
|---|---|---|---|
| | | | DF1 |
| 1 | Mercury as Hg | $mg/m^2d$ | ND |
| 2 | Nickel as Ni | $mg/m^2d$ | ND |
| 3 | Cobalt as CO | $mg/m^2d$ | ND |
| 4 | Arsenic as As | $mg/m^2d$ | ND |

*Reviewed By*

*Approved By*

**Annexure-6**

# SOIL QUALITY ANALYSIS REPORT

**Ref : Envlab/20/R-4630** **Date : 10.10.2020**

## SOIL QUALITY ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **S1 : East Side Quarry**
   **S2 : West Side Quarry**
   **S3 : North Side Quarry**
   **S4 : South Side Quarry**
4. **Date of Sampling : 23.09.2020**
5. Date of Analysis **: 24.09.2020 to 25.09.2020**
6. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Sl. No. | Name of the Parameters | Unit | Testing Method | Analysis Result | | | |
|---|---|---|---|---|---|---|---|
| | | | | S1 | S2 | S3 | S4 |
| 1 | Mercury as Hg | mg/kg | EPA 3050B, 7000B Rev 02, 1996 | ND | ND | ND | ND |
| 2 | Nickel as Ni | mg/kg | EPA 3050B, 7000B Rev 02, 1996 | ND | ND | ND | ND |
| 3 | Cobalt as CO | mg/kg | EPA 3050B, 7000B Rev 02, 1996 | ND | ND | ND | ND |
| 4 | Arsenic as As | mg/kg | EPA 3050B, 7000B Rev 02, 1996 | ND | ND | ND | ND |

BDL Value : Ni <50 mg/kg, Co< 10 mg/kg, As < 10 mg/kg, Hg <10 mg/kg

*Reviewed By*

*Approved By*

**Annexure-7**

# FUGITIVE EMISSION MONITORING REPORT

**Ref : Envlab/20/R-4633** **Date : 10.10.2020**

## FUGITIVE EMISSION ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. Sampling Location : **F1-** Near Mines Ore Plot Area
   **F2-** Near COB Plant Area
   **F3-** Near Mines Loading & Unloading Point
4. Method of Sampling : IS 5182(P-5) 1975 RA 2014
5. Date of Sampling : 24.09.2020
6. Date of Analysis : 25.09.2020
7. Sample Collected by : VCSPL Representative in presence of Client's Representative

| SL. No. | Test Parameters | Test Method | Unit | Analysis Result | | |
|---|---|---|---|---|---|---|
| | | | | F1 | F2 | F3 |
| 1 | Suspended Particulate Matter as SPM | IS 5182 (P-4)1999 RA 2014 Gravimetric Method | $\mu g/m^3$ | 124.0 | 228.0 | 178.0 |

*Reviewed By*

*Approved By*

**Annexure-8**

# GROUND WATER LEVEL MONITORING REPORT

**Ref : Envlab/20/R-4632** **Date : 10.10.2020**

## GROUND WATER LEVEL REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. **Date of Sampling : 23.09.2020**
4. Sample Collected by : VCSPL Representative in presence of Client's Representative

| SL.No. | Locations | Unit | Analysis Result |
|---|---|---|---|
| 1 | Bore well Near Workshop of Mines | mt/bgl | 11.2 |
| 2 | Bore well Near Main Gate of OCM | mt/bgl | 10.4 |
| 3 | Open Well Near Ostia Village | mt/bgl | 3.4 |
| 4 | Open Well Near Ostapal Village | mt/bgl | 5.1 |
| 5 | Tube well inside Shiva Temple of the Village Gurujanga | mt/bgl | 10.4 |
| 6 | Tube well outside Shiva Temple of the Village Gurujanga | mt/bgl | 10.8 |
| 7 | Eastern side of the Quarry (PZ-1) | mt/bgl | 4.4 |
| 8 | Southern side of the Quarry (PZ-2) | mt/bgl | 3.8 |
| 9 | Watstern side of the Quarry (PZ-3) | mt/bgl | 4.2 |

*Reviewed By*

*Approved By*

Annexure-9

# NOISE QUALITY MONITORING REPORT

**Ref : Envlab/20/R-4631** **Date : 10.10.2020**

## NOISE QUALITY ANALYSIS REPORT- SEPTEMBER 2020

1. Name of Client : **M/s FERRO ALLOYS CORPORATION LIMITED , BHADRAK**
2. Name of the Project : **OSTAPAL CHROMITE MINES , KALIAPANI, JAJPUR**
3. **Date of Sampling : 23.09.2020**
4. Sample Collected by : VCSPL Representative in presence of Client's Representative

| Location ID | Location | | Result in dB (A) | |
|---|---|---|---|---|
| | | Ambient | Day Time (6.00 am to 10.00pm) | Night Time (10.00pm to 6.00 am) |
| **N1** | **Open Cast Quarry** | | 72.0 | 68.0 |
| **N2** | **COB Plant** | | 68.0 | 62.0 |
| **N3** | **Mines Loading & Unloading** | | 73.6 | 70.0 |

### AMBIENT NOISE LEVEL STANDARD

| Category Area/Zone | Limit in dB (A) | |
|---|---|---|
| | Day Time (6.00 am to 10.00pm) | Night Time (10.00pm to 6.00 am) |
| **Industrial Area** | 75 | 70 |
| **Residential Area** | 55 | 45 |
| **Commercial Area** | 65 | 55 |
| **Silence Zone** | 50 | 40 |

*Reviewed By*

*Approved By*

# Visiontek Consultancy Services Pvt. Ltd

*(An Enviro Engineering Consulting Cell)*

**Plot No.-M22&M23, Chandaka Industrial Estate, Patia , Bhubaneswar-751024**
**Tel.: 0674-3511721**
**E-mail : visiontekin@gmail.com, visiontekin@yahoo.co.in, Visit us at : www.vcspl.org**

***Committed For Better Environment***

**ISO 9001: 2015**
**ISO 14001:2015**
**ISO 45001:2018 (OH&S)**
**ISO/IEC 17025:2005**

ANNEXURE - 10

Regional Director

भारत सरकार
केन्द्रीय भूमि जल प्राधिकरण
जल संसाधन, नदी विकास
और गंगा संरक्षण मंत्रालय

Government of India
Central Ground Water Authority
Ministry of Water Resources,
River Development & Ganga Rejuvenation

File No: - 21-4/1456/OR/MIN/2017 - 1735

NOC No: - CGWA/NOC/MIN/ORIG/2018/3957

Date:- 28 AUG 2018

To

M/s Facor Ltd.
Ostapal Chromite Mines
Village Gurujanga, Block Sukinda,
District Jajapur, Odisha – 755028

**Sub: - NOC for ground water withdrawal to M/s Facor Ltd. in respect of their existing "Ostapal Chromite Mines" located at Village Gurujanga, Block Sukinda, District Jajapur, Odisha – reg.**

Refer to your application for grant of NOC for ground water withdrawal dated 28/08/2017. Based on recommendations of Regional Director, Central Ground Water Board, Central Ground Water Board, South Eastern Region, Bhubaneswar vide his letter dated 17/06/2018 and further deliberations on the subject, the NOC of Central Ground Water Authority for ground water withdrawal is hereby accorded to **M/s Facor Ltd. in respect of their existing "Ostapal Chromite Mines" located at Village Gurujanga, Block Sukinda, District Jajapur, Odisha.** The NOC is valid from 02/08/2018 to 01/08/2020 and is subject to the following conditions:-

1. The firm may abstract **100 cu.m/day** of ground water (and not exceeding **36,500 cu.m/year**) through two (2) existing bore wells and **3;300 cu.m/day** (not exceeding **12,04,500 cu.m/year**) through dewatering mine seepage through two (2) existing mine pits on account of mining intersecting the water table. The total withdrawal should not exceed **3,400 cu.m/day** (not exceeding **12,41,000 cu.m/year**). No additional dewatering and ground water abstraction structure shall be constructed for this purpose without prior approval of the CGWA. Any unexpected variation in inflow of ground water into the mine pit should be reported to the concerned Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar.
2. Both the wells as well as dewatering structures shall be fitted with digital water meters by the firm at its own cost and monitoring of monthly ground water abstraction data of each ground water abstraction structures shall be recorded in a log book. Compliance to this condition shall be reported within one month from the date of issue of this letter.
3. **M/s Facor Ltd, Ostapal Chromite Mines,** in consultation with the Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar shall implement ground water recharge measures atleast to the tune of **23,630 cu.m/year** as proposed, for augmenting the ground water resources of the areas where post monsoon water level is more than 5 meter below ground level. Firm shall report the compliance within six months from the date of issuance of this letter. Firm shall also undertake periodic maintenance of recharge structures at its own cost.
4. The photographs of the recharge structures after completion of construction of the same shall be furnished immediately to the Regional Director, Central Ground Water

Board, South Eastern Region, Bhubaneswar for verification under intimation to this office.

5. The firm, at its own cost, shall construct four (4) observation wells (piezometers) at suitable locations and install digital water level recorders along the periphery of the mine for monthly ground water level monitoring. Further, the firm shall execute ground water level monitoring four (4) times a year (January, May, August and November) in core and buffer zone by establishing sufficient number of key wells in consultation with the Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar. Firm shall install telemetry system on one of the piezometer and share the user ID and password of the telemetry system with the Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar.
6. The ground water quality shall be monitored once in a year (during pre monsoon period).
7. The monitoring data in respect of S. No. 2, 5 & 6 shall be submitted to the Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar on regular basis at least once in a year.
8. The firm shall ensure proper recycling and reuse of waste water after adequate treatment.
9. Action taken report in respect of S. No. 1 to 8 shall be submitted to CGWA within one year period.
10. The NOC is liable to be cancelled in case of non-compliance of any of the conditions as mentioned in S. No. 1 to 9.
11. This NOC is subject to prevailing Central/State Government rules/laws or Court orders related to construction of tubewell/ground water withdrawal/construction of recharge or conservation structure/discharge of effluents or any such matter as applicable.
12. The firm shall report self compliance online in the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC.
13. This NOC does not absolve the applicant / proponent of this obligation / requirement to obtain other statutory and administrative clearances from other statutory and administrative authorities.
14. The NOC does not imply that other statutory / administrative clearances shall be granted to the project by the concerned authorities. Such authorities would consider the project on merits and be taking decisions independently of the NOC.

**Regional Director**

Copy to:

1. The Member Secretary, Odisha Pollution Control Board, Paribesh Bhawan, A/118, Nilakantha Nagar, Unit-.VIII, Bhubaneswar- 751012, Odisha **with a request to ensure that the conditions mentioned in the NOC are complied by the firm in consultation with the District Collector & Magistrate, District Jajapur, Odisha.**
2. The District Collector & Magistrate, District Jajapur, Odisha for necessary action.
3. The Regional Director, Central Ground Water Board, South Eastern Region, Bhubaneswar. This has reference to your recommendation dated 17/06/2018.
4. Guard File 2018-19.

Regional Director

FACOR OSTAPAL <facor.ostapal@gmail.com>

## Your Renewal Application Submitted Successfully

1 message

no-reply-cgwa@gov.in <no-reply-cgwa@gov.in>
To: facor.ostapal@gmail.com

Fri, Jun 12, 2020 at 10:51 AM

Dear OSTAPALCHROMITEMINES ,

Your Application Submitted Successfully.Your Application Detail are :
**Application Number** :21-4/1456/OR/MIN/2017
**Applied for Renewal of NOC Number** :CGWA/NOC/MIN/ORIG/2018/3957
Applied For Renewal :1st
Name of Industry :OSTAPAL CHROMITE MINES
Please note your application number for future reference

This is system generated mail. Please do not reply.

**ANNEXURE – 11**

# CALENDAR PLAN INCLUDING EXCAVATON, QUANTUM OF MINERAL CHROMITE AND WASTE GENERATED DURING THE PERIOD 2020 – 21 (APRIL, 2020 TO SEPTEMBER, 2020) OF OSTAPAL CHROMITE MINES

| SL. NO. | MATERIALS | CALENDAR PLAN PER ANNUM (2020-21) | QUANTITY GENERATED DURING THE PERIOD FROM (April, 2020 to September, 2020) |
|---|---|---|---|
| 01. | CHROME ORE ROM (MT) | 97676 | 32762 |
| 02. | WASTE OVER BURDEN ($M^3$) | 260970 | 50680 |

Mines Manager
Ostapal Chromite Mines
M/s FACOR LTD
P.O. - Kaliapani, Dist - Jajpur
PIN- 755047

**ANNEXURE – 12**

## DETAILS OF EXPENDITURE INCURRED ON ENVIRONMENTAL PROTECTION MEASURES DURING THE YEAR 2020-21 AND PROPOSED BUDGETED AMOUNT FOR THE YEAR 2020-21 FOR OSTAPAL CHROMITE MINES

| Sl. No. | I T E M | Proposed budgeted amount for the year 2020-21 (In Rs.) |
|---|---|---|
| 1. | **AFFORESTATION** | |
| a) | Seedlings @ Rs. 70/- each | 4,65,800.00 |
| b) | Fertilizer/Insecticide/Cow dung @ Rs. 20 | 1,66,375.00 |
| c) | Digging of Pits/Planting, Labour cost @ Rs. 40 | 2,66,200.00 |
| d) | Post Plantation care @ Rs. 120/- (Watering, Weeding, Basin Making etc) | 7,98,600.00 |
| e) | Supervising | 4,82,230.00 |
| | **Sub-Total** | **21,79,205.00** |
| 2. | **WATER MANAGEMENT & TREATMENT** | |
| a) | ETP Operation & Maintenance (including costs of chemical & Manpower) | 23,87,000.00 |
| b) | Power Consumption | 7,07,447.00 |
| c) | Sludge disposal | 79,430.00 |
| d) | Water sample analysis | 76,000.00 |
| | **Sub-Total** | **32,49,877.00** |
| 3. | **DUST SUPRESSION & AIR MONITORING** | |
| a) | Water spraying at dust generating points by water tanker | 12,21,200.00 |
| b) | Air monitoring charges | 2,53,000.00 |
| c) | Noise level measurement | 1,980.00 |
| | **Sub-Total** | **14,76,200.00** |
| | | |
| | **Grand Total** | **69,05,282.00** |

Mines Manager
Ostapal Chromite Mines
M/s FACOR LTD
PO - Kaliapani, Dist - Jajpur
PIN- 755047