

SURFACE WATER QUALITY ASSESSMENT REPORT

FOR

MM PORT FZE ESIA

Executive Summary

The proposed project is located at the Federal Ocean Terminal (FOT) in Onne, Eleme Local government Area and the neighborhood of Bonny River in Rivers State. Bonny River receives water from the Atlantic Ocean. The Surface water samples collected during wet season study indicates that the water body are slightly alkaline. The high electrical conductivity is attributed to the high ions and salinity concentrations of the water bodies coupled with the tidal directional flow. Water quality indicates that the water body is brackish.

Introduction

The surface water assessment study was carried out as part of the Environmental and Social Impact Assessment (ESIA) study for the proposed MM Port FZE Project to be located at Federal Ocean Terminal (FOT), Onne Port Complex, Oil & Gas Free Zone, Onne in Eleme Government Area, Rivers State. The project is located on the bank of the Bonny River which opens into the Atlantic Ocean on the south. The Bonny Rivers is the ocean line for the companies operating within the Onne Port.

The proposed project site is in an area with no particular environmental designation (not near a site with an international, national or local designation, such as a Special Area of Conservation, a Special Protection Area, a Ramsar site, or a Site of Special Scientific Interest).

Scope of Study

The scope of work includes:

- Delineation of ten (10) sampling stations and two (2) control stations on Bonny River
- Sample collection and laboratory analysis.

Field Work Approach

Surface water sampling was conducted on the 5th – 6th July 2023 on Bonny River using a stainless steel surface water sampler as shown in pictures below. A total of twelve surface water samples (inclusive of two controls) were collected. Prior to collecting the surface water samples, each container was first rinsed thrice with the sampled water.

- Samples for physicochemical parameters were collected into 1-litre polythene bottles.
- For heavy metal analysis, samples were collected into 1-liter pre-cleaned glass bottles and preserved by the addition of 2 ml AR grade concentrated nitric acid to pH <2.0.
- For analysis of Oil & grease and THC- Samples were collected into 1-liter pre-cleaned glass bottles and preserved by the addition of 2 ml concentrated Sulfuric acid.
- For microbiology analysis, samples were collected into 25 ml sterilized glass bottles.
- For BOD - Samples were collected into 300 ml amber-colored BOD bottles.

The composite samples were collected from the midstream with the use of water sampler at the depth of minimum 30cm of the sampled river. The collected samples were properly labeled and stored at 4°C±2 ice chest on the field before transportation to the laboratory for further storage at 4°C. Laboratory analysis was performed by M/s Anal Concept Limited, Port Harcourt, a FMEnv accredited laboratory. The laboratory analysis was witnessed by FMEnv representative. Chain of custody procedures including sample handling, transportation, logging and crosschecking in the laboratory were also performed.

In-situ measurements were carried out for pH, Temperature, Dissolved Oxygen (DO), Total Dissolved Solids (TDS), Electrical conductivity (EC), Salinity and Turbidity using calibrated instruments, (Jenway Model 430 for pH and Temperature, Hanna HI 98703 Portable Turbidity meter for Turbidity, Hanna HI 9835 for EC, TDS and Salinity, and Hanna HI 98186 for DO).

Sampling Locations

A Judgmental sampling design protocol was applied in the selection of study stations, taking into account ecological features, geographical location of communities and control points apparently in upstream and downstream of the project environs. The Bonny River is under tidal influence and hence control samples were collected below and above the sample locations. Sampling points 1 to

5 were approximately 100 metres from the riverbank whereas the remaining sampling points either approximately in the middle section of the river or were about 160/200 metres away. The coordinates of sampling locations are shown in Table 1 whereas the sampling map is shown in Figure 1.

Table 1: Sampling Station

Station Code	Environmental Sphere	Coordinates (WGS 84)	
		LATITUDE	LONGITUDE
SW1	Surface Water	4°39'39.2"N	7° 08'50.5"E
SW2	Surface Water	4°39'55.9"N	7° 08'24.5"E
SW3	Surface Water	4°40'02.8"N	7° 08'10.1"E
SW4	Surface Water	4°40'07.0"N	7° 07'47.2"E
SW5	Surface Water	4°40'14.6"N	7° 07'28.8"E
SW6	Surface Water	4°39'59.6"N	7° 09'14.7"E
SW7	Surface Water	4°40'29.6"N	7° 09'22.3"E
SW8	Surface Water	4°40'28.9"N	7° 07'00.7"E
SW9	Surface Water	4°40'24.7"N	7° 06'.45.7"E
SW10	Surface Water	4°39'30.0"N	7° 08'03.6"E
SWC1	Surface Water	4°36'38.0"N	7° 10'35.3"E
SWC2	Surface Water	4°42'44.4"N	7° 05'39.9"E

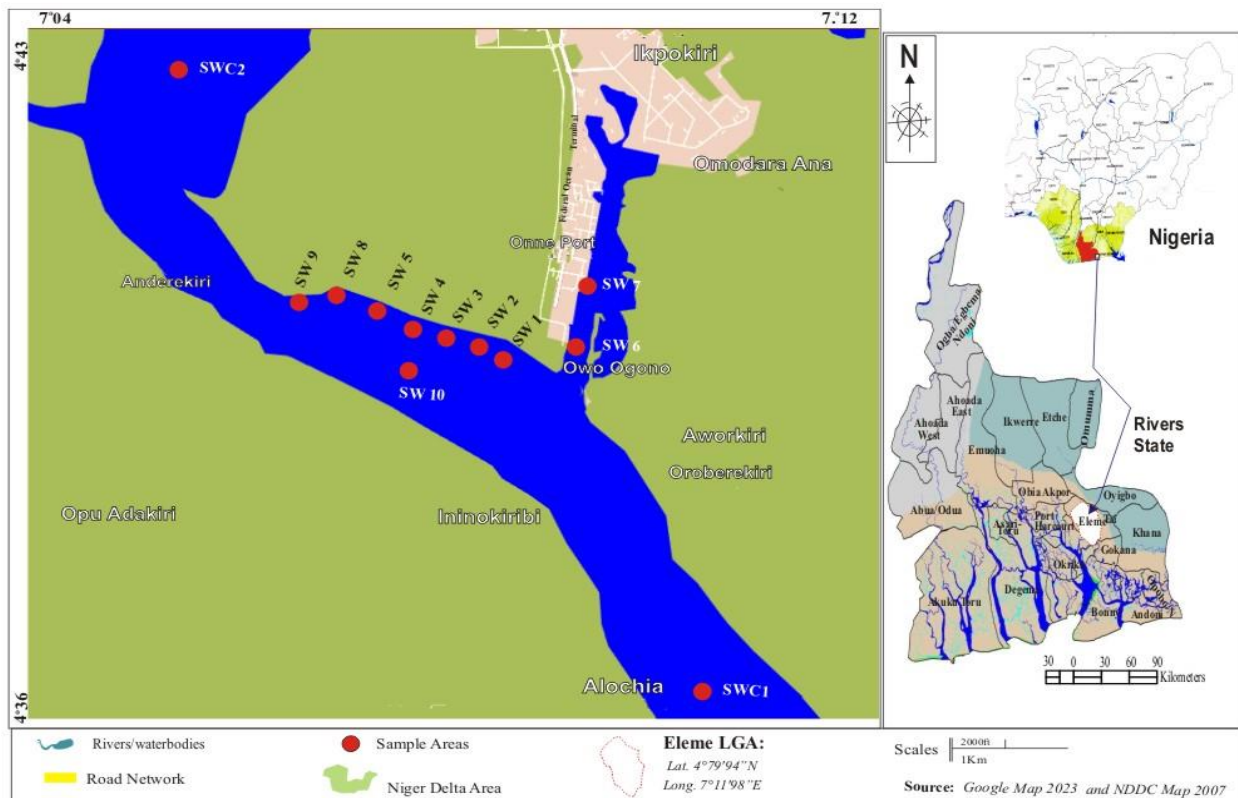
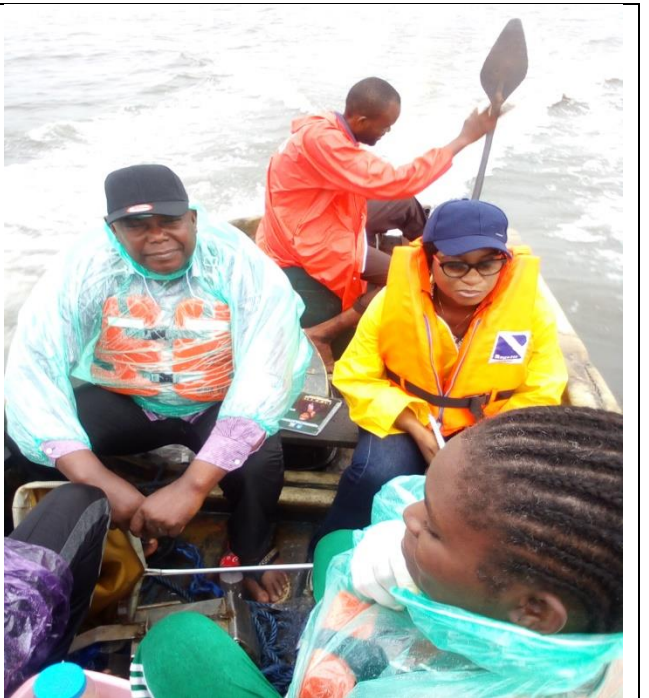
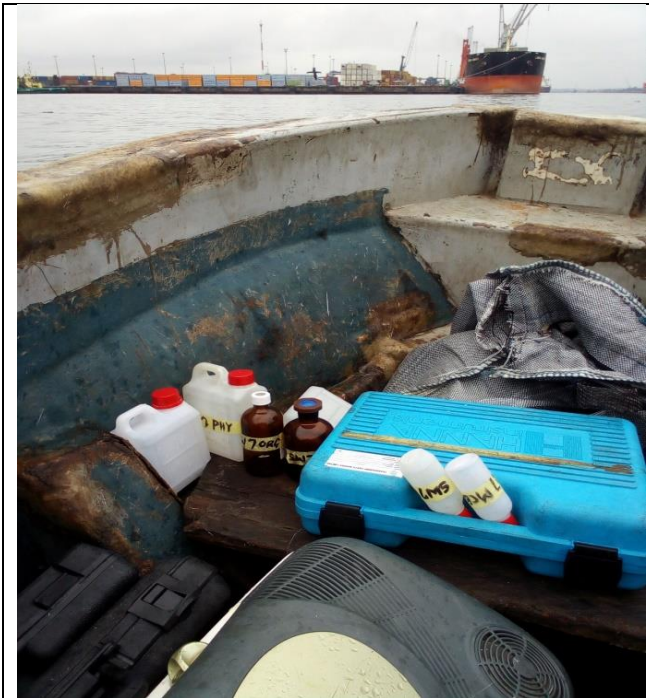
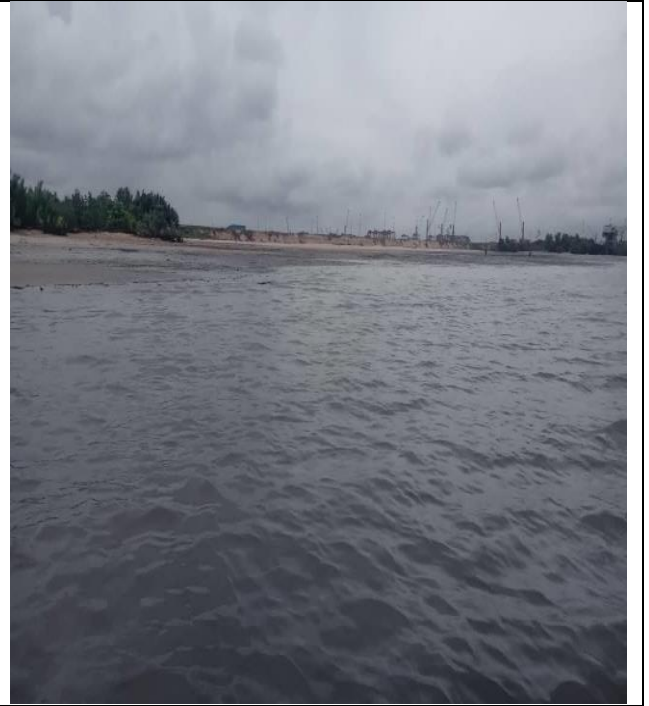
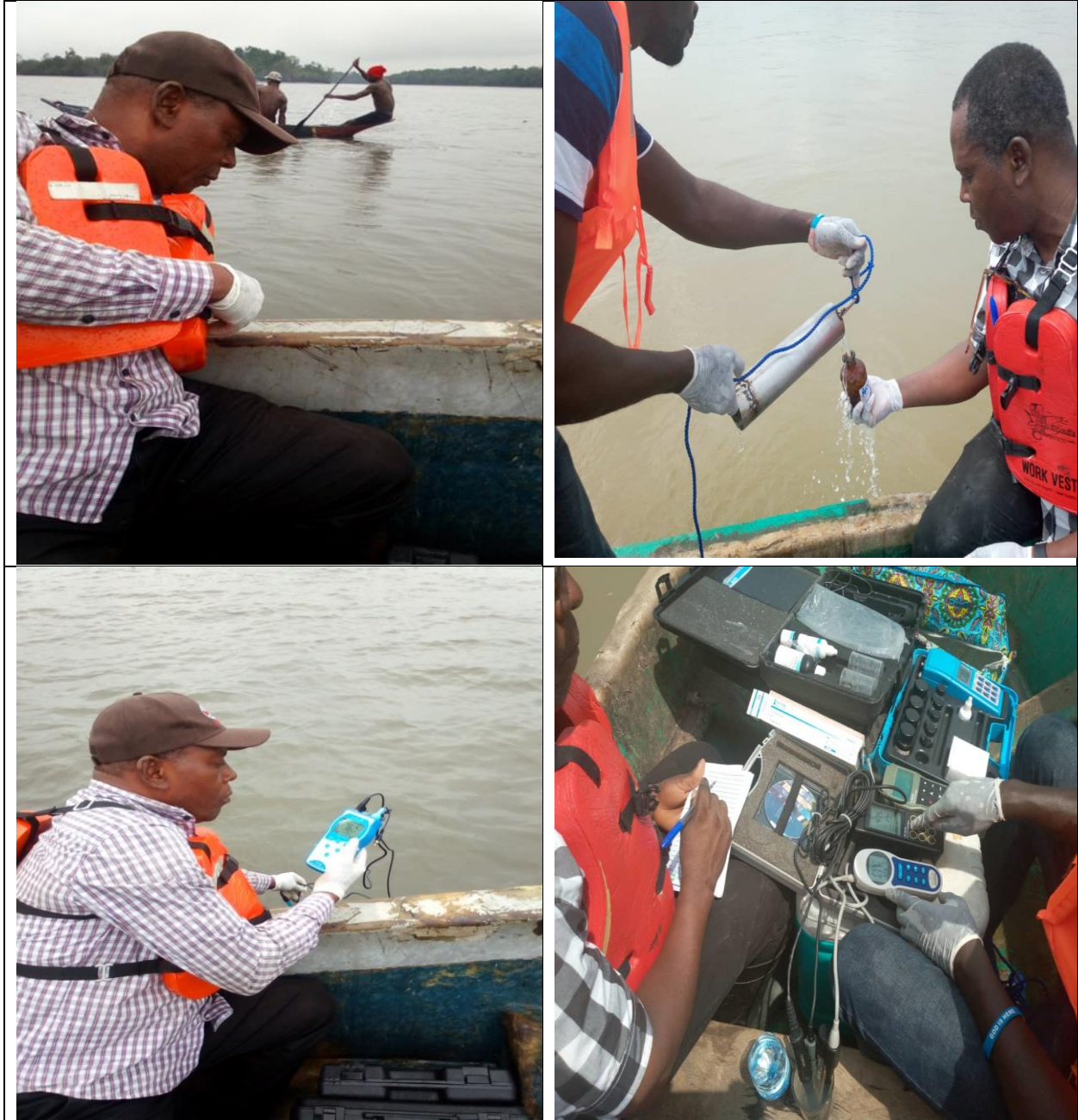


Figure 1: Surface water sampling map

Field Photographs





Surface Water Physico-chemistry

The result of the physico-chemical characteristic of the surface water is presented in Table 2 whereas the range and mean \pm SD is shown in Table 3.

Table 2: Surface Water Analysis

S/N	Parameter(s)	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	SWC 1	SWC 2
0	Depth (meters)	4.8	4.3	6.5	4.0	3.5	6.0	8.7	8.9	5.2	6.5	9.2	7.9
1	pH	7.60	7.60	7.50	7.60	7.65	7.50	7.55	7.65	7.40	7.60	7.60	7.70
2	Appearance	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
3	Temperature (°C)	27.4	27.3	27.3	27.4	27.4	27.4	27.3	27.4	27.4	27.4	27.1	27.1
4	Elec. Conductivity (µs/cm)	18,900	19,592	20,980	20,591	19,972	20,261	19,718	20,300	20,439	20,891	21,400	15,783
5	TDS (mg/l)	10,395	10,776	11,539	11,325	10,985	11,144	10,845	11,165	11,241	11,490	11,770	8,681
6	Turbidity (NTU)	7.2	7.4	6.7	6.1	6.5	12.2	16.7	7.3	8.4	9.2	7.8	10.4
7	TSS (mg/l)	6.0	6.3	6.4	5.2	4.9	10.9	13.8	6.1	6.9	7.7	6.6	9.1
8	Salinity (ppt)	8.85	9.61	10.93	10.42	9.85	9.92	9.68	12.19	10.13	10.98	9.78	7.89
9	Total Hardness (mg/l)	1280.0	1260.0	1220.0	1200.0	1230.0	1290.0	1220.0	1180.0	1190.0	1260.0	1240.0	1090.0
10	Alkalinity (mg/l)	65.0	60.0	60.0	65.0	70.0	85.0	90.0	65.0	55.0	60.0	75.0	50.0
11	Chloride, Cl ⁻ (mg/l)	6,130	6,150	6,250	6,220	6,120	6,100	6,080	6,190	6,200	6,160	6,300	5,560
12	Sulphate, SO ₄ ²⁻ (mg/l)	380	410	350	380	430	370	350	400	450	360	590	340
13	Phosphate, PO ₄ ³⁻ (mg/l)	1.25	1.60	1.52	1.45	1.32	1.20	1.18	1.30	1.40	1.25	1.86	1.35
14	Nitrate, NO ₃ ⁻ (mg/l)	2.60	2.80	2.50	2.50	2.20	3.20	2.90	2.00	2.20	2.70	3.20	2.60
15	Cyanide (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
16	Ammonia (mg/l)	0.20	0.20	0.10	0.30	0.20	0.40	0.40	0.30	0.30	0.30	0.20	0.50
17	Urea	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
18	Total Nitrogen (mg/l)	4.98	5.27	5.21	5.37	5.29	6.25	6.86	5.08	5.37	5.16	5.47	6.58
19	Oil & Grease (mg/l)	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
20	DO (mg/l)	4.56	5.21	5.76	4.92	5.38	5.26	5.11	5.60	5.48	5.10	6.24	6.01
21	BOD ₅ (mg/l)	9.20	10.10	9.70	9.20	8.50	10.50	8.90	8.70	9.00	8.50	8.70	9.80
22	COD (mg/l)	31.80	33.70	30.60	32.40	29.80	36.50	38.30	30.60	27.60	30.60	32.10	28.50
23	Sodium, Na (mg/l)	3492.32	3526.85	3565.87	3576.62	3526.59	3459.74	3494.93	3593.76	3594.09	3529.44	3701.90	3190.74
24	Potassium, K (mg/l)	215.66	200.58	205.65	201.69	196.65	219.65	212.27	202.64	205.12	195.35	201.78	194.21
25	Calcium, Ca (mg/l)	275.07	276.52	275.45	274.52	278.43	276.41	271.87	270.93	274.00	271.03	273.12	233.74
26	Magnesium, Mg (mg/l)	125.31	122.01	119.25	117.28	120.31	131.71	119.84	113.84	115.12	118.25	124.15	112.10
27	Silver, Ag (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Cobalt, Co (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

S/N	Parameter(s)	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10	SWC 1	SWC 2
29	Manganese, Mn (mg/l)	0.128	0.098	0.117	0.129	0.112	0.192	0.215	0.097	0.064	0.107	0.152	0.101
30	Vanadium, V (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
31	Nickel, Ni (mg/l)	0.029	0.032	0.026	0.025	0.029	0.078	0.092	0.035	0.022	0.029	0.036	0.019
32	Chromium, Cr (mg/l)	0.018	0.014	0.013	0.072	0.055	0.082	0.091	0.018	0.019	0.045	0.052	0.017
33	Iron, Fe (mg/l)	0.176	0.138	0.129	0.165	0.176	0.259	0.268	0.113	0.122	0.124	0.143	0.090
34	Lead, Pb (mg/l)	0.011	0.009	0.014	0.012	0.017	0.058	0.065	0.012	0.016	0.026	0.035	<0.001
35	Copper, Cu (mg/l)	0.045	0.083	0.078	0.042	0.063	0.170	0.264	0.082	0.064	0.116	0.142	0.058
36	Zinc, Zn (mg/l)	0.129	0.170	0.191	0.086	0.098	0.199	0.174	0.102	0.132	0.153	0.283	0.138
37	Mercury, Hg (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
38	Cadmium, Cd (mg/l)	0.015	0.012	0.016	0.036	0.087	0.068	0.060	0.037	0.084	0.110	0.144	0.042
39	Arsenic, As (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
40	HUB (CFU/ml) x 10 ²	1.0	0.4	0.9	0.6	0.5	0.2	0.3	0.6	0.2	0.4	0.5	0.2
41	HUF (CFU/ml) x 10 ²	0.6	0.1	0.5	0.2	0.4	NIL	NIL	0.1	0.2	0.1	0.1	0.2
42	THB (CFU/ml) x 10 ²	2.2	1.4	2.6	1.8	2.7	2.3	1.9	1.4	1.8	2.9	2.4	2
43	THF (CFU/ml) x 10 ²	1.6	0.3	1.7	0.4	0.8	0.3	0.2	0.3	0.7	0.3	0.3	0.6
44	SRB (MPN/100ml)	3	0	0	0	0	0	0	0	0	0	0	0
45	Fecal Coliform (MPN/100ml)	210	4	7	6	4	3	9	3	6	9	28	64
46	Total Coliform (MPN/100ml)	1,100	43	150	11	9	16	21	37	24	29	290	460

Table 3: Statistical analysis of surface water analysis results

Parameter	SW PROJECT AREA (SW1-10)		SW CONTROL (SWC-SWC2)	
	Range	Mean \pm SD	Range	Mean \pm SD
Colour (Pt-Co)	Not Clear	-	Not Clear	-
pH	7.50 – 7.60	7.57 \pm 0.08	7.60 – 7.70	7.65 \pm 0.07
Temperature ($^{\circ}$ C)	27.3 – 27.4	27.4 \pm 0.05	27.1 – 27.1	27.1 \pm 0
Electrical Conductivity (μ S/cm)	18900 –20980	20164 \pm 636	15783 -21400	1859 \pm 3971
Total Dissolved Solids (mg/l)	1039 –11539	11090 \pm 349.7	8681 – 11770	10225 \pm 2,184
Turbidity (NTU)	6.1 – 16.7	8.7 \pm 3.30	7.8 – 10.4	9.10 \pm 1.84
Total Suspended Solids (mg/l)	4.9 – 13.8	7.42 \pm 2.80	6.6 – 9.1	7.85 \pm 1.76
Salinity (ppt)	8.85 – 12.9	10.3 \pm 1.10	7.89 – 9.78	8.84 \pm 1.34
Total Hardness (mg/l) (CaCO ₃)	1180 - 1290	1233 \pm 38.0	1090 - 1240	1165 \pm 106.1
Alkalinity (mg/l)	55.0 – 90.0	67.5 \pm 11.4	50.0 – 75.0	62.5 \pm 17.6
Ammonia (mg/l)	0.10 – 0.40	0.27 \pm 0.09	0.20 – 0.50	0.35 \pm 0.21
Urea (mg/l)	<0.10	ND \pm 0	<0.10	ND \pm 0
Total Nitrogen (mg/l)	4.98 – 6.86	5.48 \pm 0.60	5.47 – 6.58	6.03 \pm 0.78
Oil & Grease (mg/l)	<1.0	ND \pm 0	<1.0	ND \pm 0
Dissolved Oxygen (mg/l)	4.56 - 5.76	5.25 \pm 0.33	6.01 – 6.24	6.13 \pm 0.16
Biological Oxygen Demand (mg/l)	8.50 – 10.50	9.23 \pm 0.68	8.70 – 9.80	9.25 \pm 0.78
Chloride Ion (mg/l)	6080 – 6220	6160 \pm 54.5	5560 - 6300	5930 \pm 523.2
Sulphate (mg/l)	350 - 450	388 \pm 33.9	340 - 590	465 \pm 176.8
Phosphate (mg/l)	1.18 – 1.60	1.65 \pm 0.92	1.35 – 1.86	1.60 \pm 0.36
Nitrate (mg/l)	2.00 – 2.90	2.56 \pm 0.36	2.60 – 3.20	2.90 \pm 0.42
Cyanide (mg/l)	0.001 – 0.001	ND \pm 0	0.001 – 0.001	ND \pm 0
Sodium (mg/l)	3459.7 -3594.0	3536 \pm 45.8	3190.7 – 3701.9	3446 \pm 361.5
Potassium (mg/l)	195.4 – 215.7	205.3 \pm 8.01	194.2 – 201.8	198.0 \pm 5.35
Calcium (mg/l)	270.9 – 278.4	274.4 \pm 2.50	233.7 – 273.1	253.4 \pm 27.8
Magnesium (mg/l)	113.8 – 131.7	120.1 \pm 5.07	112.1 – 124.2	118.1 \pm 8.52
Silver (mg/l)	<0.001	ND \pm 0	<0.001	ND \pm 0
Cobalt(mg/l)	<0.001	ND \pm 0	<0.001	ND \pm 0
Manganese (mg/l)	0.064 – 0.215	0.13 \pm 0.05	0.10 – 0.15	0.13 \pm 0.04
Vanadium (mg/l)	<0.001	ND \pm 0	<0.001	ND \pm 0
Nickel (mg/l)	0.02 – 0.09	0.04 \pm 0.02	0.02 – 0.04	0.03 \pm 0.01
Chromium (mg/l)	0.01 - 0.91	0.04 \pm 0.03	0.017 - 0.052	0.03 \pm 0.02
Iron (mg/l)	0.11 – 0.27	0.17 \pm 0.06	0.090 – 0.143	0.12 \pm 0.04
Lead (mg/l)	0.01 – 0.07	0.02 \pm 0.02	<0.001 – 0.035	0.04 \pm 0.02
Copper (mg/l)	0.05 – 0.27	0.10 \pm 0.07	0.058 – 0.142	0.10 \pm 0.06
Zinc (mg/l)	0.09 – 0.20	0.14 \pm 0.04	0.138 – 0.283	0.12 \pm 0.10
Mercury (mg/l)	<0.001	ND \pm 0	0.001	ND \pm 0
Cadmium (mg/l)	0.012 -0.110	0.05 \pm 0.03	0.042 -0.144	0.14 \pm 0.04
Arsenic (mg/l)	0.001	ND \pm 0	0.001	ND \pm 0

Results and Discussion

Physical Characteristics of Bonny Water

The Bonny water is located on the immediate eastern flank of the Niger Delta between longitudes 7°00' and 7°15' E and latitudes 4°25' and 4°50' (Folorunsho and Awosika, 2014). The strategic location of the water serves as an entrance point to the Port Harcourt and Onne ports in Rivers State. Immediately east of the water is the Bonny barrier island. The mouth of the water is jointly shared by the Caw throne channel and the New Calabar River. The width of the mouth of the water is over 13.8 km and drains a total area of 621,351 km² (Folorunsho and Awosika, 2014). It has an estimated area of 206 km² and extends 7 km offshore to a average depth of about 7.5m (Folorunsho and Awosika, 2014).

Physical attributes of a water body are an important indicator of the water quality. The most basic physical attribute of a stream is the path along which it flows. The Bonny River is characterized by deep and shallow channels with semi diurnal tides that generate tidal current in phase with the tidal direction. The morphology is shaped by high tidal oscillations superimposed on waves and sediments brought in by tributaries and creeks that flow into their drainage basins. The Bonny River is further characterized with strong currents, sandbars and erosion (Folorunsho and Awosika, 2014). The land-water interchange is relatively extensive and more intimately connected with the surrounding land.

Table 4: Bonny River Physical Characteristics

1.	Minimum Depth	0.1 meters
2.	Maximum Depth	18.7 meters
3.	Approximate Length	173 kilometers
4.	Average Width	2.0 Kilometers
5.	Average ebb tide flow rate	1.5 meter per second
6.	Average current flowrate	0.8 meter per second
7.	Open surface area	Approx. 312 Sq. Km

Surface water flow

The velocity of a river is directly related to the amount of water received into the river channel. It is affected by weather, increasing during rainstorms and decreasing during dry season. The flow is also a function of water volume and velocity. It is important because of its impact on water quality and on the living organisms including habitats in the ecosystem.

Bonny River is brackish tidal water body which flows and ebb in both directions into Bonny channel. The flow rate of Bonny Channel which receives Atlantic Ocean water has increased due to dredging to increase both the depth of ship lines and shore reclamation. The flow rate of the rivers is influenced by the shape of its channel, the gradient of the slope, volume of water that the sections carries and the amount of friction caused by rough edges within the stream bed.

Table 5: Sampling stations depths and flow rate

S/No	Station Code	Depth (m)	Flow rate (m/s)
1	SW1	4.8	1.1
2	SW2	4.3	1.1
3	SW3	6.5	1.3
4	SW4	4.0	1.2
5	SW5	3.5	1.2
6	SW6	6.0	0.9
7	SW7	8.7	0.9
8	SW8	4.9	1.0
9	SW9	5.2	1.5
10	SW10	6.5	1.4
11	SWC1	9.2	1.3
12	SWC2	7.9	1.4

Surface water quality

The water quality is a key determinant of resource suitability for intended purpose. The water quality is influenced by geomorphology, geology, climatic and biological factors, as well as anthropogenic activities performed. Bonny water quality is influenced by anthropogenic activities and tidal effect. The pH was slightly alkaline for all stations sampled. The high electrical conductivity is attributed to high ions and salinity concentrations in the water body coupled with

the tidal directional flow. The moderate alkalinity value of surface water could be linked to the type of dissolved inorganic and organic compounds present in the water, the amount of suspended organic matter in the water (Tripathi, 2022), and the amount of bicarbonate in the water, which is also evident from the elevated values of TDS recorded. The BOD and COD values observed across all sampled stations including the control stations implicate the use of the shores as industrial site and associated surface run-off in the study area. Heavy metals concentrations were generally low.

Surface water users and co-dependent habitats

The numerous anthropogenic activities (oil and gas companies, import and export logistics, sand mining/dredging, waste dump) performed in and around the Bonny River. The dredging activities/Bed sweeping are required to maintain channel depth, which has modified Bonny River characteristics. Bonny River is being used for navigation of marine vessels. The fishing settlements (communities) at and nearby Bonny Rivers are involved in fishing activities, however Federal authorities have limited access to Port influence zone.

Surface Water Availability

The water availability of the Bonny River is relatively high, and water can be used for navigation of marine vessels without significant harm to ecosystem and other users. The Bonny River is a perennial water body which receives the Atlantic Ocean water. It consists of the main river channel with large numbers of associated creeks and creek-lets.

Flood risk appraisal

The risk of flooding from all flooding mechanisms for the project site from the Bonny River is low. The topography of the proposed sites is relatively flat with average elevation of 6 meters above the mean sea level (Lagos datum). The Bonny River banks elevation is higher than water level at high tide and least possibility of River flooding. Also, the proposed project site has an inland drainage canal wide enough to convey storm run-off of extreme precipitation. More so, the internal drainage will be developed within the project site to drain the surface run-off and also the quay will be at appropriate height.

Possible Impact Description

The main influence on Bonny River water quality is associated with anthropogenic activities such as possibility of oil spillage from oil and gas associated activities, import and export transport and navigation activities, fishing and farming, dredging activities, and use for dumping of community waste. Due to dredging and Bed sweeping activities, the Bonny River depth and width is altered. During the operation phase, accidental spill of chemicals the discharge of untreated sewage may have some impact on water quality.

Mitigation Measures

- Good housekeeping and waste management practices in line with global best practice.
- Spill contingency / Emergency Response Plan
- Effective operation of sewage treatment plant.
- Periodic monitoring of water body for changing conditions.

References

Folorunsho, R., & Awosika, L. (2014). Morphological characteristics of the Bonny and Cross River (Calabar) estuaries in Nigeria: Implications for navigation and environmental hazards. *The land/ocean interactions in the coastal zone of West and Central Africa*, 87-96.

Akankali, J. A., and I. C. Davies. "Heavy Metals and Physicochemical Parameters Evaluation in the Upper Reaches of Bonny River, Niger Delta, Nigeria." *Journal of Applied Sciences and Environmental Management* 25.8 (2021): 1341-1348.

Appendix: Calibration Certificates



152, Lagos Road
Ikoroju
Lagos
Tel: 07084594001, 07084594004
Email: aas@aasnj.com
Website:
<http://www.aasnj.com>

No: 2023/03/04/006

Certificate of Calibration

Customer Information

Transparent Earth Nigeria Limited
13B/15A Road 2
Federal Housing Estate,
Off Agip Road, Rumueme,
Port Harcourt, Rivers

Instrument Identification

Description: Hanna Turbidity Meter Model: HI98703 Serial No: 00050671

Standards/Equipment Used

Description	Serial No.	Due Date	Traceable Reference
Formazine Standards	5119098	30/12/2024	Specific Primary Standard as per USEPA Method 180.1

Certificate Information

Engineer: Hakeem Owolabi Calibration Date: 04 March 2023 Calibration Due: 03 March 2024

Test Conditions

Temperature: 23.5°C
Relative Humidity: 64.5%

Calibration Data

Nominal Value	Measured Value	Tolerance	Error	Comments
20NTU	20.01	±0.5%	0.1	Passed
100NTU	100.3	2.0%	0.3	Passed
800NTU	800.6	2.0%	0.6	Passed

This instrument was calibrated using formazine primary turbidity standards as specified in USEPA Guidelines and methods 180.1 (1979). The calibration meets specification as outlined in ISO9001, ISO/IEC17025, ANSL/NCL 2540-1-1994 and applicable documents. The results contained herein relate to the item calibrated.

O.A. Adebola
QC Manager



152, Lagos Road
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Lagos
Tel: 07084594001, 07084594004
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Website: <http://www.aaasms.com>

Certificate of Calibration

No: 2023008012

Customer Information

Endpoint Laboratories and Equipments Ltd,
13B/15A, Road 2, Federal Housing Estate,
Off Agip Road, Rumueme,
Port Harcourt,
Rivers state.

Instrument Identification

Description: Portable pH Meter Model: PCS0 S/N: 761001001713100

Standards/Equipment Used

Description	Serial No	Due Date	Lot No
pH Buffer 4.00	19932601	06/2023	SO1004
pH Buffer 7.00	18258901	07/2024	SO1007
pH Buffer 10.00	SB116	11/2023	116555

Certificate Information

Engineer: Owolabi Hakeem Calibration Date: 27/02/2023 Calibration Due: 26/02/2024

Test Conditions:

Temperature: 23 °C
Relative Humidity: 58.0%

Calibration Data

Parameter	Nominal Value	Measured Value	Tolerance	Error	Comments
pH 4.0	4.00	4.01	±0.02	0.01	Passed
pH 7.0	7.00	7.02	±0.03	0.02	Passed
pH 10.0	10.00	10.2	±0.03	0.02	Passed

This instrument was calibrated using pH buffer solutions traceable to National Institute of Standards and Technology, NIST. The calibration meets specifications as outlined in ISO9001, ISO/IEC17025, ANSI/NCSL Z540-1-1994 and applicable documents. The results contained herein relate only to the item calibrated.

Owolabi Hakeem
Senior Technical Support Executive



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Certificate of Calibration

No: 2023/03/04/005

Customer Information

Transparent Earth Nigeria Limited
13B/15A Road 2
Federal Housing Estate,
Off Agip Road, Rumueme,
Port Harcourt, Rivers

Instrument Identification

Description: Hanna DO Meter Model: HI98193 S/N: 0031001101

Standards/Equipment Used

Description	Serial No.	Due Date	NIST Traceable Reference
Standard Zero Oxygen Solution	CZ00501052	09/11/2024	OEM Test Product

Certificate Information

Engineer: Hakeem Owolabi Calibration Date: 04 March 2023 Calibration Due: 03 March 2024

Test Conditions

Temperature: 24.0°C
Relative Humidity: 69.5%

Calibration Data

Nominal Value	Measured Value	Tolerance	Error	Comments
0.00	0.00	±0.01	0.00	Passed
100%	100%	±1.0%	0.00	Passed

This instrument was calibrated using the OEM's test method and materials. The calibration meets specifications as outlined in ISO9001, ISO/IEC17025, ANSI/NCCL Z540-1-1994 and applicable documents. The results contained herein relate only to the item calibrated.

O.A. Adebola
QC Manager