

## 2.

**Particular Specification of Water Quality Analysis Equipment**

Water quality analysis equipment shall consist of minimum required items to be used for a daily/ weekly/ monthly measurement of raw water and/or treated water.

**2.1 Turbidity and Residual Chlorine Meter**

Specification of the equipment to be provided in the Project shall be mentioned as follows;

No.	Item	Specification
1	Quantity	3 sets
2	Turbidity Measurement	
2-1	Range	0.00 - 1,000 NTU or Equivalent
2-2	Resolution	0.01 NTU from 0.00 - 9.99 NTU, 0.1 NTU from 10.0 - 99.9 NTU, 1 NTU from 100 - 1,000 NTU, or Equivalent
2-3	Accuracy	Plus or minus 2% of reading, or Equivalent
2-4	Method	Ratio Nephelometric Method (90 degree), Ratio of scatter and transmitted light
3	Residual Chlorine Measurement	
3-1	Range	0.00 - 5.00 mg/l or Equivalent
3-2	Resolution	0.01 mg/l from 0.00 - 3.50 mg/l, 0.10 above 3.50 mg/l, or Equivalent
3-3	Accuracy	Plus or minus 0.02 mg/l @1.00mg/l, or Equivalent
3-4	Method	Absorptiometry using a DPD reagent
4	Environment	0 - 50 degree or equivalent
5	Battery Type	4 x 1.5V AA alkaline batteries or equivalent
6	Reagent/ Standard Calibration Solution for Turbidity Measurement	Calibration solution set: (3) or four (4) points (1 set/ unit)
7	Reagent/ Standard Calibration Solution for Residual Chlorine Measurement	(1) Reagent for free chlorine At least 300 times (1 set/ unit) (2) Reagent for free chlorine At least 300 times (1 set/ unit)

*Note: Multi-parameter instrument is recommendable for the equipment provision in the Project. However, procurement of the individual instruments, which is divided into residual chlorine meter and turbidity meter, might be allowed, only if specifications for residual chlorine and turbidity meter are met in the above descriptions. In case that individual instruments will be procured, three (3) residual chlorine meters and three (3) turbidity meters shall be provided.*

**2.2 Portable Turbidity Meter**

Specification of the equipment to be provided in the Project shall be mentioned as follows;

No.	Item	Specification
1	Quantity	1 set
2	Range	0.00 - 1,000 FTU or Equivalent
3	Resolution	0.1 and 1 FTU, or Equivalent
4	Accuracy	Plus or minus 0.5 FTU or Plus or minus 5% of reading (whichever is greater), or Equivalent
5	Method	Ratio Nephelometric Method (90 degree), Ratio of scatter and transmitted light
6	Environment	0 - 50 degree or equivalent
7	Battery Type	4 x 1.5V AA alkaline batteries or equivalent
8	Reagent/ Standard Calibration Solution for Turbidity Measurement	Calibration solution set: three (3) or four (4) points (1 set)
9	Accessory	(1) Spare glass cuvette: 4 pcs (1 set) (2) Cuvette cap: 4 pcs (1 set)

### 2.3 pH and Temperature Tester

Specification of the equipment to be provided in the Project shall be mentioned as follows:

No.	Item	Specification
1	Quantity	3 sets
2	Range	(1) pH: 0.0 - 14.0 pH, or Equivalent (2) Temperature: -5.0 - 50 degree, or Equivalent
3	Resolution	(1) pH: 0.1 pH or Equivalent (2) Temperature: 0.1 degree or Equivalent
4	Accuracy	(1) pH: Plus or minus 0.1 pH or Equivalent (2) Temperature: Plus or minus 0.5 degree or Equivalent
5	Environment	0 - 50 degree or equivalent
6	Battery Type	4 x 1.5 V batteries or Equivalent
7	Reagent/ Standard Calibration Solution	(1) pH 10 standard solution (1 set/unit) (2) pH 7 standard solution (1 set/unit)
8	Accessory	(1) Electrode cleaning solution (1 set/unit) (2) Electrode storage solution (1 set/unit)

### 2.4 pH/ EC/ TDS Tester

Specification of the equipment to be provided in the Project shall be mentioned as follows:

No.	Item	Specification
1	Quantity	1 set
2	Range	(1) pH: 0.00 - 14.00 pH or Equivalent (2) EC: 0 - 3,999 $\mu$ S/cm or Equivalent (3) TDS: 0 - 2,000 mg/l or Equivalent (4) Temperature: 0.0 - 50.0 degree or Equivalent

No.	Item	Specification
3	Resolution	(1) pH: 0.01 pH or Equivalent (2) EC: 0.1 $\mu$ S/cm or Equivalent (3) TDS: 1 mg/l or Equivalent (4) Temperature: 0.1 degree or Equivalent
4	Accuracy	(1) pH: Plus or minus 0.05 pH or Equivalent (2) EC: Plus or minus 2 % F.S. or Equivalent (3) TDS: Plus or minus 2 % F.S. or Equivalent (4) Temperature: Plus or minus 0.5 degree or Equivalent
5	Environment	0 - 50 degree or equivalent
6	Battery Type	4 x 1.5V batteries or Equivalent
7	Reagent/ Standard Calibration Solution	(1) pH 10 standard solution (1 set) (2) pH 7 standard solution (1 set) (3) Standard calibration for EC measurement (1,413 $\mu$ S/cm: 1 set) (4) Standard calibration for TDS measurement (1,382 ppm: 1 set)
8	Accessory	(1) Electrode cleaning solution (1 set) (2) Electrode storage solution (1 set)

## 2.5 Iron and Manganese Portable Photometer

Specification of the equipment to be provided in the Project shall be mentioned as follows;

No.	Item	Specification
1	Quantity	3 sets
2	Iron Measurement	
2-1	Range	0.00 – 1.60 mg/l or Equivalent
2-2	Resolution	0.01 mg/l or Equivalent
2-3	Accuracy	Plus or minus 0.01 mg/l, Plus or minus 8 % of reading, or Equivalent
2-4	Method	TPTZ method, or Equivalent
3	Manganese Measurement	
3-1	Range	0 - 300 $\mu$ g/l or Equivalent
3-2	Resolution	1 $\mu$ g/l or Equivalent
3-3	Accuracy	Plus or minus 10 $\mu$ g/l, Plus or minus 3 % of reading, or Equivalent
3-4	Method	PAN Method
4	Environment	0 - 50 degree or equivalent
5	Battery Type	9 V batteries or equivalent
6	Reagent/ Standard Calibration Solution for Iron Measurement	Reagent At least 300 times (2 sets/unit)
7	Reagent/ Standard Calibration Solution for Manganese Measurement	Reagent At least 150 times (2 sets/unit)

No.	Item	Specification
8	Accessory	(1) Spare glass cuvette: 4 pcs (1 set/unit) (2) Cuvette cap: 4 pcs (1 set/unit)

## 2.6 Color of Water Portable Photometer

Specification of the equipment to be provided in the Project shall be mentioned as follows:

No.	Item	Specification
1	Quantity	3 sets
2	Range	0 - 500 PCU or equivalent
3	Resolution	5 PCU or Equivalent
4	Accuracy	Plus or minus 10 CPU, Plus or minus 5% of reading, or Equivalent
5	Method	Colorimetric Platinum Cobalt method
6	Environment	0 - 50 degree or Equivalent
7	Battery Type	1.5 V AAA battery or equivalent
8	Reagent/ Standard Calibration Solution	Color of Water Certified Standard Kit (1 set/unit)

## 2.7 Multi-Parameter Photometer

Specification of the equipment to be provided in the Project shall be mentioned as follows:

No.	Item	Specification
1	Quantity	1 set
2	Absorbance Range	0.000 - 4.000 Abs or Equivalent
3	Absorbance Resolution	0.001 Abs or Equivalent
4	Absorbance Accuracy	Plus or minus 0.003 Abs (at 1.000 Abs) or Equivalent
5	Absorbance Light Source	Light-emitting diode or Equivalent
6	Environment	0 - 50 degree or Equivalent
7	Battery Type	Li-polymer rechargeable battery or Equivalent
8	Reagent/ Standard Calibration Solution	(1) Residual Chlorine (0.000 - 0.500 mg/L or Equivalent) DPD Method, at least 300 times (1 set) (2) Iron (0.000 to 1.600 mg/L or Equivalent), TPTZ Method, at least 300 times (2 sets) (3) Manganese (0.0 to 20.0 mg/L or Equivalent) Periodate Method, at least 300 times (1 set) (4) Ammonium Nitrogen (0.00 to 3.00 mg/L or Equivalent) Nessler Method, at least 100 times (1 set) (5) Chloride (0.0 to 20.0 mg/L or Equivalent) Mercury(II) Thiocyanate Method,

No.	Item	Specification
		<p>at least 100 times (1 set)</p> <p>(6) Nitrate Nitrogen (0.0 to 30.0 mg/L or Equivalent) Cadmium reduction Method, at least 100 times (1 set)</p> <p>(7) Hardness (200 to 500 mg/L or Equivalent) Calmagite Method, at least 100 times (1 set)</p> <p>(8) Calcium (0 to 400 mg/L or Equivalent) Oxalate Method, at least 50 times (1 set)</p>