

## List of Equipment and Consumables for the Male Network Monitoring Stations and Laboratories

No.	Description	Area of use
<b>1</b>	<b>Site Equipment</b>	
1.1	PM10 sampler	DD-hvs:pm, SO <sub>2</sub> ,NO <sub>2</sub>
1.2	Wet and dry collector	WD
1.3	pH/electrical conductivity meter	WD; WT
1.4	Thermometer	WT-pH,ec
1.5	Fridge 60 L	DD; WD; SL; VG; WT; SD
1.6	Bulk collector (Option)	
	<i>Site Equipment Specifications</i>	
1.1	PM10 sampler	
	Filter holder: Suitable for glass microfibre, filter paper size: effective 23 x 18 cms, attachment for PM10: cyclone or impactor, blower: 1.5 auto shutoff timer: 0-24 hrs, flow measurement: based on orifice plate and pressure difference or U-tube manometer, impinger tubes: 4 nos, needle valves: 4 nos, rotameter: 3 lpm capacity, impinger box: insulated ice box with drain, power: 220-240 V, 50-60 Hz AC.	
1.2	wet and dry collector	
	Rain sensor: collector container or funnel opens within one minute of precipitation and closes promptly at the end of the precipitation event, wet deposition side: capacity min 20 lit, should be protected from contamination from dry deposition, collector: collector bucket and funnel should be chemically inert to major constituents from acid deposition, power: 220-240 V, 50 Hz AC.	
1.3	pH and conductivity meter hand held	
	Should be capable of measuring pH and electrical conductivity simultaneously, water proof construction, calibration data storable electrode, data storage for 100 sets of data, connectable to external printer through a RS 232 port, range: 0.00-14.00, 0-±1999mV, 0-19.99 S/m, operating range: 0-99.9 deg C for pH and 0-80 deg C for EC, power: battery, weight: less than 1 kg, cover.	
1.4	Thermometer	
	Range: -20 to 105 deg C. Least count: 0.1 deg C.	
1.5	Fridge	
	60 L, power: 220-240 V, 50-60 Hz AC.	
	Equipment may require voltage stabilizers or uninterrupted power supply, as required. These will be decided for each laboratory and site on a case-by-case basis.	
<b>2</b>	<i>Laboratory - Equipment</i>	
2.1	Spectrophotometer	DD-hvs:SO <sub>2</sub> ,NO <sub>2</sub> ; SL-PO <sub>4</sub> ; WT-NH <sub>4</sub>
2.2	Oven	DD-pm; SL-bd,mc,penet,ec,P,N;WT-pH,ec,a
2.3	Balance	DD; WD; SL; SD
2.4	pH meter	WD; SL
2.5	Electrical conductivity meter	WD; SL

2.6	Thermometer	WT-pH,ec
2.7	Fridge	DD; WD; SL; VG; WT; SD
2.8	Desiccator	SL-pH,SO <sub>4</sub>
2.9	Hot plate	DD; WD; SL; VG; WT; SD
2.10	Distillation Unit	
	<b>Laboratory Equipment Specifications</b>	
2.1	Spectrophotometer*	
	<p>a) Vis: Microprocessor-based grating type spectrophotometer with builtin datalogger, RS 232, connection for downloading data to computer. The unit should have builtin self diagnostics and the sample compartment should have compatibility to use round cells, square cuvettes, 16 mm tubes. wavelength range: 350-1000 nm; wavelength accuracy: <math>\pm 2</math> nm; wavelength resolution: 5 nm max; photometric range: 0.125% T, 0.1-2.5 A, 3.0 to 3.0 abs; photometric accuracy: <math>\pm 0.005</math> A; photometric stray light: <math>&lt;0.5\%</math> T 3.3 abs, min or 0.05% T max at 340 nm; optical system: grating-based; grating: 1200 grooves nm; light source: quartz halogen(1000 hr life/ tungsten; detector: silicon photodiode; measuring modes: conc, transmittance (% T), absorbance (abs); wavelength selection:automatic; operating temp: 0-40 deg C; power: 220-240 V, 50-60 Hz AC, should operate with rechargeable batteries. accessories: rechargeable batteries; software and cable to connect to connect to computer; 6 batteries; cell holder.</p>	
	<p>b) UV/vis: computer compatible with RS 232 port; optics: double beam or diode array; wavelength range: 190-1100 nm; wavelength readability: better than or equal to 0.2 nm; wavelength accuracy: better than or equal to <math>\pm 0.5</math> nm; wavelength repeatability: better than or equal to <math>\pm 0.5</math> nm; spectral bandwidth: provisions should include at least 2.0 nm SBW; scan speed: wide range and provide max limit at least upto 800 nm/min; photometric range: should cover -0.500 to +3.0 ABS; photometric accuracy: better than or equal to 0.005 A at 1 A; photometric noise: <math>&lt;0.0005</math> A at 0 A; photometric readout: should at least provide ABS (4 digit), % T and concentration modes; stray light: <math>&lt;0.03\%</math>; drift: <math>&lt;0.0004</math> ABS/hr after warmup; power: 220-240 V, 50-60 Hz AC. The system should provide facilities for the storage of spectra/ methods, multi wavelength mode, baseline correction, peak area and other statistical computations.</p>	
	* -- either a vis or a UV/vis spectrophotometer would be the standard analytical instrument for the network.	
2.2	Oven	
	temp range: 85-250°C, power: 220-240 V, 50-60 Hz AC, 1KW.	
2.3	Balance	
	<p>a) Electronic balance, range: 10 kg to 0.1kg; readability: 0.1 gm; stabilization time: 3 sec; temperature range: -20 to 60 deg C; RH range: 5-100%; power: 220-240 V, 50-60 Hz AC.  b) Electronic balance, range: 100 gm to 0.1 mg, readability: 0.001 mg; stabilization time: 3 sec; temperature range: -20 to 60 deg C; RH range: 5-100%; power: 220-240 V, 50-60 Hz AC.</p>	
2.4	<b><i>PH and conductivity meter- hand held</i></b>	
	Should be capable of measuring pH and electrical conductivity simultaneously, water proof construction, calibration data storable electrode, data storage for 100 sets of data, connectable to external printer through a RS 232 port, range: 0.00-14.00, 0 - $\pm 1999$ mV, 0 - 99.9 deg C for pH and 0-80 deg C for EC, power: battery, weight: less than 1 kg, cover.	
2.5	<b><i>Thermometer</i></b>	

	Range: -20 to 105 deg C. Least count: 0.1 deg C.	
2.6	<b>Fridge</b>	
	60 L, power: 220-240 V, 50-60 Hz AC.	
<b>3</b>	<i>Laboratory Consumables</i>	
A	Glassware and other consumables	
3.1	Washing bottle with ground glass stopper	DD-hvs
3.2	Measuring cylinder 100 ml	DD-hvs
3.3	Glass tubes with ground-in stopper	WD-NH4
3.4	Volumetric flask 500 ml	DD-hvs;
3.5	Pipette 25 ml	DD-hvs
3.6	Filter paper	
3.7	Bottle polypropylene 1 L	
3.8	Stirrer	
	<b>Chemicals and other consumables</b>	
3.9	Distilled water	
3.10	Sodium tetrachloromercurate or	DD-hvs:SO <sub>2</sub>
3.11	Mercuric chloride	DD-hvs:SO <sub>2</sub>
3.12	Sodium chloride	DD-hvs:SO <sub>2</sub>
3.13	p-Rosaniline hydrochloride	DD-hvs:SO <sub>2</sub>
3.14	Hydrochloric acid conc	DD-hvs:SO <sub>2</sub>
3.15	Formaldehyde or	DD-hvs:SO <sub>2</sub>
3.16	Sodium metabisulphite	DD-hvs:SO <sub>2</sub>
3.17	Iodine 0.01N	DD-hvs:SO <sub>2</sub>
3.18	Starch	DD-hvs:SO <sub>2</sub>
3.19	Sodium hydroxide soln 0.025 M, 38%, 1 M, 1 N or	DD-hvs:NO <sub>2</sub> ; WD-ea;
3.20	Sodium hydroxide	
3.21	Sulphanilamide or	DD-hvs:NO <sub>2</sub>
3.22	Sulphanilamide	DD-hvs:NO <sub>2</sub>
3.23	Phosphoric acid conc (85%)	DD-hvs:NO <sub>2</sub>
3.24	NEDA soln or	DD-hvs:NO <sub>2</sub>
3.25	1-naphthyl ethylenediamine dihydrochloride	DD-hvs:NO <sub>2</sub>
3.26	Hydrogen peroxide (30%)	DD-hvs:NO <sub>2</sub>
3.27	Standard nitrite soln or	DD-hvs:NO <sub>2</sub>
3.28	Desiccated sodium nitrite (>97%)	DD-hvs:NO <sub>2</sub>
3.29	Potassium chloride 1 M, 0.1 M, 0.01 M or	WD-ec,
3.30	Potassium chloride	
3.31	Primary buffer soln	WD-pH
3.32	Sodium carbonate 0.4 M	WD-anions
3.33	Sulphuric acid 1.5 M	WD-anions
3.34	Tartaric acid 1 M	WD-cations
3.35	2,6 Pyridinedicarboxylic acid	WD-cations
3.36	Ammonium chloride	WD-NH <sub>4</sub>
3.37	Indophenol blue	WT-NH <sub>4</sub>

3.38	Alkaline phenol or	WD-NH4
	Sodium chloride	WD-NH4
	Phenol	WD-NH4
	Sodium nitroprusside	WD-NH4
3.39	Sodium hypochlorite (5.25%)	WD-NH4; WT-NH4
3.40	Ammonium acetate 1M or	WD-ebc
	Ammonium acetate	WD-ebc
	Acetic acid 1 M	WD-ebc
	Ammonia	WD-ebc
3.41	Washed/dried sea sand	WD-ebc; SL-N
3.42	Ethanol 80%, 96%	WD-ebc,ea
3.43	Acetone	WD-ec
<b>4</b>	<i>Site Consumables</i>	
4.1	Filter paper Whatmans GF/A	DD-hvs:pm
4.2	Impingers	DD-hvs:SO <sub>2</sub> ,NO <sub>2</sub>
4.3	Syringe 100 ml	DD-hvs
4.4	Glass/inert plastic tubing	
4.5	Silicon grease	DD-hvs
4.6	Measuring cylinder 100 ml	DD-hvs
4.7	Pipette 20 ml	DD-hvs
4.8	Passive samplers SO <sub>2</sub> , NO <sub>2</sub>	DD
4.9	Polyethylene containers 20 ml	DD-hvs
4.10	Distilled water	
4.11	Thymol	WD
4.12	Bucket	WD; WT; AE
4.13	Funnel	WD
4.14	Capped bottles 1 L	WD
4.15	Bags	WD
4.16	Ice box	DD; WT

#### Abbreviations:

DD: dry deposition, WD: wet deposition, SL: soil, VG: vegetation, WT: inland water, SD: sediment, AE: aquatic ecology hvs: PM10 sampler, NH<sub>4</sub>: ammonia, pm: particulate matter, bd: bulk density, penet: penetration resistance, ec: electrical conductivity, a: alkalinity, SO<sub>4</sub>: sulphate, CO<sub>3</sub>: carbonate, C: total carbon, N: total nitrogen, ebc: exchangeable base cations, exg Al: exchangeable aluminium and hydrogen, PO<sub>4</sub>: phosphate, ea: exchangeable acidity, Cl: chloride.