APPENDIX - B

B. Specifications for Gas Chromatograph Triple Quadrupole (GC-MS MS) along with Processing Accessories

The GC-MS/MS system is targeted for environmental laboratory and field analysis of following contaminants in environmental samples (gas, liquid and solid) viz.,

1. Polycyclic aromatic hydrocarbons (PAHs),
2. Multi residue pesticide analysis
3. Polychlorinated biphenyls (PCBs)
4. Persistent organic pollutants (POPs)
5. Hydrocarbons (HCs)
6. Total dioxins and furans
7. Volatile Organic Compounds (VOCs)
8. WBPCBToxicity characteristic leaching procedure (TCLP)
9. Manufacture, supply, installation, commissioning and demonstration of Gas Chromatograph/mass Spectrometer/mass Spectrometer system having capability for both qualitative and Quantitative analysis. It should be configurable with triple-quadrupole mass spectrometer system.
10. Gas chromatograph should be capable of accommodating three detectors apart from mass detector & two or more injectors at a time. Gas chromatograph shall have temperature programming with capillary column, electronic Flow control, FID, ECD liquid cum headspace auto samplers, Direct Insertion probe device and dedicated Interface with Mass spectrometer, with turbo molecular Pump, ion source (EI), triple quadrupole Technology Mass analyzer with suitable software with Latest NIST library.
11. The instrument shall be supplied with the following basic

    units: Gas Chromatograph
    a. Injection port
    b. Column oven
    c. Liquid autosampler
    d. Head space sampler
    e. Direct Insertion Probe device for solids, slurries & powders through disposable vials
    f. Gas Sampling Valve -10 port
    WBPCB
    g. Flame Ionization detector
    h. Electron capture detector

Mass spectrometer

a. Interface
b. Ion source
c. Quadrupole mass analyzer
d. Detector
e. Vacuum system
f. Pneumatic control
g. Columns
h. Library search
i. Standards
j. Air compressor w/air filter & regulator unit

CBIPMP								
		B. Specifications for Gas Chromatograph Triple Quadrupole (GC-MS MS) along with Processing Accessories						
		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
	MAKE & MODEL							
	Manufacture	-						
	Model	-						
	Electricity	-						
	Other necessary utility	-						
	Dimension / Weight	-						
1	Analyzer MS Specification	It should offer femtogram sensitivity, 10-1200 amu mass range or better with linear bench space size. It should be Switched from EI to CI modes with in minutes.						
	Scan Modes	Q1MS, Q3MS, Precursor, Product, Neutral Loss, Selected Ion Monitoring (SIM),Multiple Reaction Monitoring (MRM).						
	Ionization Modes	EI,PCI,NCI						
	Source	Inert Electron Ionization (EI)/Chemical Ionization (CI) source with vacuum interlock for quick change of ion volumes. It should be compatible with abrasive cleaning for the life of the source.						
	Mass axis stability	± 0.1 m/z over 24 hours						
	Scan Speed	5000 u/s or better						
	Collision cell	It should be a curved or a linear collision cell with a long path ensures high Dissociation efficiency and reduces chemical noise. It should have high efficiency electron multiplier.						
	EI dynamic range	10^5 or better						
	Carrier gas flow	up to 8 mL/min or better						
	Turbo molecular pump	270 L/Sec or better , air cooled						

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		Central Lab ☐	1	Regional Lab ☐		Total ☐	1
BOARD'S SPECIFICATION				BIDDER'S RESPONSE			
	EI Full Scan Sensitivity	1 pg OFN should give 400 or better					
	EI SIM Scan Sensitivity	50 fg OFN should give 20					
	EI MS/MS San Sensitivity	100 fg OFN should give 500					
	PCI Full Scan Sensitivity [Methane]	20 pg BZP should give 20					
	PCI MS/MS Scan Sensitivity	100 fg BZP should give 20					
	NCI SIM Scan Sensitivity	25fg OFN OFN should give 10:1 S/N or better					
2	GC Specification						
2.1	Column Oven	It should accommodate up to two 100 m x 0.53 mm id capillary columns at a time.					
	Ambient temp	+4 0C to 4500C or better, With N2 : -100 0C to 450 0C & with CO2 -65 0C to 450 0C					
	Temperature programmed ramps	24 ramps with 25 isothermal holds or better					
	Maximum temperature ramp rate	120 0C/min or better for all voltages					
	Cool-down rate	400 0C to 50 0C in 5 min or better					
	Heated zones for GC	7 [including column oven]					
2.2	Injectors						
2.1	Split/Split less Injector [S/SL] – 1 No						
	Pressure range	0-150 psi or 0-1000 Kpa					
	Total flow	500 mL/min at 10 psi or better; 1200 mL/min at 10 psi (He) or better					

CBIPMP								
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		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
	Maximum temperature	450 °C						
	Split range	1-10,000 or better						
	It should suit for the columns	Wide bore [0.53 mm] & narrow bore [0.05 to 0.32 mm]						
2.2	Programmable Temperature Vaporizing (PTV) Injector -1 No.							
	Pressure range	0-150 psi or 1000 Kpa better						
	Total flow	500 mL/min at 10 psi or better						
	Temperature range							
	Ambient + 10 °C to 450 °C using air cooling							
	-100 °C to 450 °C using liquid N2 cooling							
	-60 °C to 450 °C using liquid CO2 cooling							
	Maximum temperature ramp rate	200 °C/min or better						
	Temperature ramps/holds	3/4 or better						
	Split range	1-10,000 or better						
	Operational modes							
	Large volume injection							
	Temperature ramped splitless							
	Cold on-column							

CBIPMP								
		B. Specifications for Gas Chromatograph Triple Quadrupole (GC-MS MS) along with Processing Accessories						
		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
	Split and splitless							
	Direct Insertion Probe for solid sample introduction optional							
	It should suit for columns	Wide bore (0.53 mm) & Narrow bore (0.05 to 0.32 mm)						
	Maximum injection volume	250 µL (LVI mode) or better						
3	Detectors							
3.1	FID	Flame Ionization Detector:						
	Maximum temperature	450 °C or better						
	Detectivity	2 pg °C/sec or better						
	Linear dynamic range	107 or better						
	Flame tip type	ceramic						
	Operational quality	Flame-out detection & Auto re-ignition						
3.2	ECD	Electron Capture Detector						
	Maximum temperature	400 °C or better						
	Detectivity	7 fg/s Lindane or better						
	Linear dynamic range	104 or better						
	Radioactive source	63Ni – 10-15 mCi (300-555 Mbq)						
	Electronic Pneumatic Control (EPC)	For inlets and detectors, Pneumatics must be electronically controlled and programmable. Each EPC unit has to be optimized for its intended use with a specific inlet and detector option.						
4	Automatic Liquid autosampler	Sample Tray types: 98 x 2 mL vials/200 x 1 mL vials/32 x 10 mL/20 mL vials or better 96-well plates. Dual and duplicate mode, internal standard						

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		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
		addition						
		Modes of operation: Liquid						
		Solid Phase Micro Extraction [Thermal Desorption/Sample Concentrator]						
		Sample heating and cooling/Purge & Trap Concentrator.						
		Pre-programmed modes of injection (Pre-concentrator)						
		Injections: Should be able to inject 10 µL, to 500 µL for liquid injection & should be able to inject in to two syringes						
5	Head Space Analyzer: (Details provided separately in section below under –concentrator for organic extracts)	Should be supplied with suitable trays & vials.						
	Carousel:	Shall hold twelve 10 mL or 20 mL vials at near-ambient with shaking in off, Low or High						
	Modes:	1-min increments from 1-999 min.						
	Incubation:	With vials are individually lifted up into the heating zone for Constant Heating Time [CHT] and immediately returned to the carousel after injection. Vial heating during the GC run for the Previous vial specified in the method.						
6	Analysis Conditions	Vial heating: from 0-999 mins in 0.1-min increments at temperatures from 40 to 200 ^{o}C Injection Volume: 1-mL standard using a gas sampling valve or a gas tight syringe; a 3-mL loop or 5 ml syringe is shipped with the instrument. Valve and loop temperature range: 50-200^{o}C.or Syinge temprange- 150 °C Transfer line to the GC, temperature range: 50 to 220 ^{0}C (The line is made of nickel)						

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		B. Specifications for Gas Chromatograph Triple Quadrupole (GC-MS MS) along with Processing Accessories						
		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
		Loop fill and loop equilibration times: settable from 0-99 mins in 0.01-min increments. (A short fill time permits injection of pressurized sample) Injection time (carrier flows through loop): 0-99 min in 0.01-min increments.						
7	Manufacturer's standard accessories	1 set						
8	Uninterrupted power supply system	Single phase, online UPS with maintenance free battery, 1hr backup, Capacity suitable for the entire system.						
9	Helium (He) gas with cylinder (47 L) and regulator	2 gas cylinders and 1 regulator (two stage) with necessary tubings and connectors.						
10	Micro syringe	(10 µL), 4 sets						
11	Gas syringe	(1 mL), 4 sets						
12	Soap bubble gas flow meter (15 L)	2 sets						
13	Soap bubble gas flow meter (50 L)	2 sets						
14	Sample & standard injection system, appropriate multiway valves and controllers.	For TO-14 EPA method						
15	Sample tubes for TO-14 EPA method	TO-14 uses canisters & sample tubes are not used-.needs to be clarified						
16	Calibration standard kits (along with accessories appropriate for making dilutions and injections to the respective GC columns)	1) EPA 502/524 Volatility Organic Compounds (conc. 2mg/mL) Mix 54 Components in Methanol 1 mL						
		2) EPA 502/524 Volatility Organic Compounds (conc. 2mg/mL) Mix 12 Components in Methanol 1 mL						
		3) EPA 502/524 Volatility Organic Compounds						

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		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
		(conc. 2mg/mL) Mix 13 Components in Methanol 1 mL						
		4) EPA 503/1 Volatility Organic Compounds (conc. 2mg/mL) Mix 3 Components in Methanol 1 mL.						
		5) EPA 505/525 Pesticide (conc 0.5 mg/mL) Mix 5 Components in Acetone 1mL						
		6) EPA 505/524 the newest Pesticide (conc 0.5mg/mL) Mix 7 Components in Acetone 1						
		7) EPA 505/525 Pesticide (conc. 0.5mg/mL) Mix 7 Components in Acetone 1 mL.						
		8) EPA 505/525 the newest Pesticide (conc. 0.5mg/mL) Mix 9 Components in Acetone 1 mL.						
		9) PCB kit (conc. 0.2mg/mL) 7 each components in Methanol:kit						
		10) EPA 550/550 1 Polycyclic Aromatic onents in Acctonitrile and Methanol 1 mL.						
		11) EPA 525 Semi-Volatility Organic Compounds (conc. 1mg/mL) Mix 25 Components in Acetone : 1mL						
		12) EPA 525/525 1 PCB (conc.0.5 mg/mL) Mix 8 Components in Hexane : 1 mL						
		13) EPA 525 the newest Phthalate Ester (conc. 0.5 mg/mL) Mix 7 Components in Methanol 1mL						
		14) EPA 601 Purgeable Halogenide Hydrocarbon (conc. 2mg/mL) Mix 22 Components in Methanol 1 mL						
		15) EPA 604 Phenol Compounds Mix 11 Components in Methanol 1mL						
		16) EPA 613 2,3,7,8-TCDD (conc. 0.01 mg/mL) in Toluene : 1mL						
		17) EPA 625 Semi-Volatility Organic Compounds						

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		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
		(conc. 1mg/mL) Mix 55 Components 1 mL						
		18) EPA Aromatic Hydrocarbon Mix 16 Components : 1mL						
		19) EPA TO-1 Injurious Organic Matter Mix 1 A(2 mg/mL) 9 Components in Methanol 1 mL						
		20) EPA TO-1 Injurious Organic Matter Mix 1 B(2 mg/mL)14 Components in Methanol 1 mL						
		21) EPA TO11/IP-6A Aldehyde/Ketone DNPH Mix 15 Components in Acetonitrile 1 mL.						
		22) VOC Mix for Stack Gas (0.2 mg/mL) 37 Components in Methanol & Water 1mL						
		23) EPA 507 Standard Material for Performance Check 6 Components 1 mL						
		24) EPA 507 Internal Standard (Triphenyl phosphate) 1mL						
		25) TCLP 1311 Acidity Mix (conc. 1mg/mL) Mix 6 Components in Methanol 1mL						
		26) TCLP 1311 Basic-Neutral Mix A(conc. 1mg/mL) Mix 5 Components in Acetone 1mL						
		27) TCLP 1311 Basic-Neutral Mix B(conc. 1mg/mL) Mix 7 Components in Methanol 1mL						
		28) TCLP 1311 Volatility Mix (conc. 1mg/mL) Mix 11 Components in Methanol 1 mL						
		29) TCLP 1311 Herbicide Mix 2 Components (conc. 1mg/mL) Mix 2 in Acetonitrile 1 mL						
		30) TCLP 1311 Pesticide Mix 2 Components (conc. 1 mg/mL) Mix 5 in Methanol 1 mL)						
		31) EPA 8010 Halogenide Volatile Compounds (conc. 2 mg/mL) Mix 14 Components in Methanol 1 mL						
		32) EPA 8010 Halogenide Volatile Compounds (conc. 2mg/mL) Mix 2 13 Components in Methanol 1 mL						

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		B. Specifications for Gas Chromatograph Triple Quadrupole (GC-MS MS) along with Processing Accessories						
		Central Lab ☐	1	Regional Lab ☐		Total ☐	1	
BOARD'S SPECIFICATION				BIDDER'S RESPONSE				
		33) EPA 8010 Volatility Organic Compounds (conc.2 mg/mL) Mix 6 Components in Methanol 1 mL.						
No. of Installations	Give details of the no. of installations in India, and particular in Kolkata (mention the contact telephone numbers and address)							
Warranty	Refer to Special Conditions of Contract							
Annual Maintenance Contract	Refer to Special Conditions of Contract							
Application Notes	Complete technical notes on environmental samples and hazardous waste							
Training	Training must be in different stages, to the satisfaction of the client. Stage-1: Theoretical training on instrument at Board Office, WBPCB Stage-2: Hands –on-Training for officials of Board at the Board Office, WBPCB.							
Spares	Any such parts for trouble free function of the system for five years							

Concentrator for Organic Extracts

General:

The scope of analysis for hazardous waste or chemicals lie in identification and quantitative determination of the concentrations of a huge number of complex organic molecules. Many of these organics are volatiles, some are semi-volatiles and non-volatiles. In most of the case these analytes co-exist. This warrants arrangement of a number of steps to be performed and techniques to be applied to a sample for it's preparation before loading on to the final analytical instrument. This item thus consists of different small items, all of which are sampling and pre-processing accessory type of item required for processing and analysis for VOCs, SVOCs and complex persistent organic pollutants (POPs) like dioxins, furans and poly chlorinated biphenyls (PCBs).

A. Headspace Autosampler

The headspace autosampler has to be a versatile sample and pre-concentration system for all types of samples – solid, liquid and gaseous with the following basic features. The system should be capable of septum-free sample handling approach to accommodate analysis of solids, liquids, and gases. Vacuum sealed sample vials should be mounted on to the sampler for direct (static) headspace analysis and through vacuum extraction technique to facilitate recovery of heavy and polar analytes.

j) Stand alone autosampler with single flow path (preferably heated silica coated) line ensuring quantitative transfer of VOCs from canister to preconcentrator system.
k) Coupled canister heater for analysis of semi-volatiles, liquids and solids. l) Improved sample analysis with volume measurement from canister.
m) Three stage, active SPME based preconcentrator system for accurate recovery of VOCs over a wider molecular range (gases to semi-volatiles)

The headspace autosampler shall be capable of performing the following:

The headspace inlet should allows from large volume of gaseous sample to be focused down to a few microliters before GC injection & has to have optimization system for concentrations over a high range. Samples in SS canisters or glass head-space vials should have a method of heating (up to at least 160 dec-C) for equilibration between phases before injection. Samples to be analyzed are: fugitive emission gases of industrial or landfill origin, hazardous wastes of solid or liquid in nature, food materials, biological samples like bone, flesh, nail and other liquid, solid, and gas-phase matrices. The headspace sample injection should have the coupling with a separate loop injection valve mounted on the GC. The sampler should be capable of sampling from SS canisters with samples collected conventionally also as well.

Wide mouth sampling vials for liquids and solids, Vacuum bottle samplers and Silonite® coated stainless steel vacuum sampling MiniCans for gas phase sampling and analysis are to be supplied. All supplied sampling bottles and canisters shall have to be complete in assembly for sampling and analysis. Appropriate sampling pumps and accessories have to be supplied for gas-phase sampling of VOCs and SVOCs.

Spare parts and accessories for five years of operation of the entire system have to be

provided. B. Pre-concentrator

The preconcentrator should be a stand-by unit coupled with the headspace autosampler and the GC. Option for both large volume headspace samples and pulsed vacuum headspace extraction samples should exist. The preconcentrator should be capable of having an inert transfer-line to load the concentrated the samples onto the GC columns. It should have facility to employ liquid-nitrogen aided concentrating and focussing of gaseous samples with very low concentration of analytes. The preconcentrator should be capable of loading samples from thermal desorber tubes directly

onto the GC column after preconcentration in its' cold trap avoding the employment of and additional device for injection of such samples or any separate desorber before injection.

C. Sample concentrator by evaporation of organic solvents

The sample concentrator should be an unit capable of evaporating solvent organics under nitrogen gas blowing system with heating of the samples in tubes. The evaporated solvents could be trapped in a low temperature trap (-56 dec-C) to contain the evaporated samples not to contaminate the environment. Individual tubes should have individual needles provided for equal flow of gas for fast and consistent consistent evaporation of solvents. The unit should rapidly evaporate common organic solvents for samples like POPs, PAHs etc for injection to HPLC, GCMS like analytical instruments. Needle valves should be provided to control the flow of gas into the supply manifold, which provides equal gas flow and uniform evaporation for each tube. Needles should be made of stainless steel or some inert material that is cleanabel and does not contaminate the samples. Easy height adjustment facility to be provided to accommodate a variety of tube sizes.

Heated Evaporator/Concentrator trays should be provided that can accommodate 12 mm & 16 dia tubes and also EPA vials. Temperature controller should be capable of maintaining an accuracy of ±0.5% of the set value. Heater should be of heating block type and a manifold has to be provided for pre-heating of the evaporating gas before introduction onto the sample tube. Sample heating tray should have option for multiple sample loading (20 at lease) and of course the 96 well ELISA trays. The gas flow rate should be at least 35 l/m and the heating temperature should have a range of ambient to 100 deg-C.

D. Purge & Trap Concentrator

The purge & trap concentrator should be capable of extracting and concentrating volatile organic compounds (VOCs) from liquid, semi solid and solid samples employing appropriate line gases and heat, and has to be according to the specifications of US EPA approved purge & trap methodologies. The system may have it's own trap and analyte focussing system and, additionally, be capable of collecting the samples in appropriate matrix in thermal desorber tubes of size 11.5 cm length and 6 mm OD and desorption and injection on to the GC system or a cryo-preconcentrator.

14 Moisture trap: The purge & trap technique eventually giver rise towater vapour. Efficient trap to remove these water vapours to move over to the adsorption matrix and then to the GC column should be provided.
15 Cycle Time: Approximately 20 minute including back to room temperature.
16 Trap Furnace: Ambient to 350°C cooling rate should be 2 °C per second or more.
17 Switching valve: Standard 6-port valve, temperature range from ambient to 300°C.
18 External Transfer Line: Ambient to 300°C.
19 Sample Mount: Ambient to 100°C.
20 Condenser: Ambient to 250°C.
21 Sample Heater: Ambient to 90°C.
22 Sample Pathway: Inert coating to all tubing and related fittings
23 Mass Flow Controller: User controlled flow rates, 2mL/min to 500mL/min. Controller should be capable of keeping record of pressure and doing auto leak check.
24 Controller and Software: Appropriate controller and software capable of cross-talking with all renowned international makes of GC / GCMS system.
25 Operating conditions: 220 VAC, 50Hz; ambieht temperature range: 15 deg-C to 35 deg-C.
26 SS thermal desorption tubes tubes with clips to be provided in 200 numbers with adequate adsorption matrix (all types) to fill them twice, and one full matrix loading assembly.
27 Spare parts and accessories for 5 years of operation to be supplied along-with.

E. Spare parts & accessories:

28. Spare parts and accessories for all the items to be provided for 5 years of operation.

29. Four numbers of Nitrogen cylinder (47 ltr) and four number of Helium cylinders (47 ltr) to be supplied each with a two stage regulator.

30. Two number of liquid nitrogen cans (small volume, approximately 10 ltr with trolly and four numbers of small (approx. 500 ml) liquid nitrogen jar (for handling, decanting and transfer of liquid nitrogen) to be supplied.

F. Analytical columns for Sample Preparation for Dioxin and PCB Analysis:

31 The system should be a highly efficient means of extracting and isolating dioxins, furans, and PCBs from stack gases, wastewater, soil, food, blood etc. Technique of multilayer silica column chromatography with clean up and set up for concentration of extract are to be proposed.

32 Two sets of the system are to be propsoed each complete in all senses.

33 Each set should be accommodated with the vacuum chamber, pumps and acessories.

34 Number of columns, media and reagents should be sufficient for 500 samples of stack gases and PUF of ambient air.