

(2) Technical Note on Field Study of the Basic Design

TECHNICAL NOTE

**THE BASIC DESIGN STUDY ON THE PROJECT FOR
ESTABLISHMENT OF ENVIRONMENTAL MONITORING SYSTEM
IN ISLAMIC REPUBLIC OF PAKISTAN**

Based on the agreed Minutes of Discussions (M/D) for the captioned Study signed between the Pakistani side and Japanese side on February 26, 2005, the field study in Pakistan has been completed in close corporation between JICA Study Team and counterparts of the Pak-EPA and Provincial-EPAs.

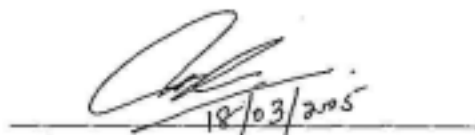
In the course of the field study, many technical items have been discussed for the Project to be implemented under the Japan's Grant Aid, and both sides agreed of the main items described in attached sheets. This is summarized to further work for the Project in Japan.

Both sides agreed that the Minutes of Discussion (M/D) dated on February 26, 2005 would prevail this Technical Note (T/N), in case any discrepancy or question arises between the M/D and the T/N.

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1. Confirmation of the PC-1

The Pakistani side submitted to the Team an OFFICE MEMORANDAM (No. 2 (218) ENV/PD/2005) dated March 3, 2005 of Planning and Development Div, upon an inquiry letter (No. 3 (5) /2002-Dir (EIA)) dated February 28, 2005. This OFFICE MEMORANDAM says that the Pak-EPA may go ahead with the implementation of the Project, while ensuring that the project works would be undertaken as per approved PC-1's scope and financing.

2. Equipment to be provided under Japan's Grant Aid

JICA Study Team submitted to Pak-EPA a list of the equipment (see **Appendix-1**), which was prepared as result of discussions with counterparts of Pak-EPA and Prov-EPAs during the field study. Pak-EPA and Prov-EPAs agreed with the Team about the equipment properly selected for the Grant Aid.

3. Air Monitoring Network System

Pakistani side agreed that the air monitoring network system consisted of fixed monitoring stations, mobile monitoring stations, Prov.-EPAs and Pak-EPA as shown in **Appendix-2** should be connected through best available medium in Pakistan. A fixed amount of monitoring data accumulated in Prov.-EPA will be transmitted to the Data Surveillance Center in Pak-EPA. Both sides agreed that the numbers of fixed and mobile air monitoring stations should be determined by the following three factors: ①financial capability of the provincial EPA, ②human resources to operate the fixed and mobile air monitoring stations, and ③the distribution maps of air pollution. Pakistani side explained that federal resources would be also available to operate and maintain the system. According to this agreement Pakistani side promised the relevant documents to Japanese side by the end of March 2005.

4. The Locations of Fixed Automatic Air Quality Monitoring Station

Pakistani side proposed the candidate sites for the fixed air monitoring stations as shown in the following table. JICA Study Team investigated and verified the appropriateness of each site during the field study. The Team explained that the suitable sites would be finalized among these candidate sites. Pakistani side suggested to consider that the fixed monitoring stations should be located at ground.



	Candidate Site
(1) Pak-EPA	1) Rooftop of the Data Surveillance & Training Center
(2) Sindh-EPA	1) Rooftop of the EPA's Building, 2) Mazar-i-Quid Park, 3) Rooftop of the Karachi Municipal Cooperation, 4) Rooftop of the Municipal Library 5) Rooftop of the Revenue Office
(3) Punjab-EPA	1) Rooftop of the new EPA building, 2) Rooftop of the Lahore City District Office
(4) NWFP-EPA	1) Rooftop of the EPA's Building
(5) Balotistan-EPA	1) Rooftop of the Commercial Building at the Meezan Market 2) Rooftop of the Quetta City District Office or Town Nazim Office. 3) Rooftop of the Media Place in the City Office

5. Layout Plan of the Data Surveillance / Training Center

Pak-EPA explained to the Team about their layout plan of the captioned building. Upon this the Team explained to Pak-EPA that further work would continue in Japan to finalize the layout plan. The analytical laboratories will be accommodated in this building to meet the requirement of Pakistani side. Pakistani side suggested to consider a basement of the building.

6. Layout Plan of the New Equipment

In order to install the equipment to be provided by the Project, the layout plans of new equipment as well as existing equipment were agreed between Pakistani side and the Team as shown in Appendix-3. The costs related to rehabilitation of laboratories including transportation and installation of the existing equipment shall be bore by Pakistani side.

7. Staffing and Training Plan for the Project

The Pakistani side explained to the Team that a total staff of about 100 would be recruited for Pak-EPA and 4 provincial EPAs within 2 years, as indicated by the PC-1 (approved by ECNEC in December 2004). In this connection the Japanese side requested detailed training plans for new staff and present staff to meet the demand of required capacity building, because PC-1 does not describe detailed training plans. The Pakistani side submitted their training plans to the Study Team, as shown in Appendix-4.

8. Construction Schedule of a New Building for Punjab-EPA

Punjab EPA explained to the Team that construction work for a new building for Punjab-EPA would be

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commenced on April 2005 and fully completed by June 2006. Responding to this, the Team explained to the Pakistani side that procurement and installation plan for the equipment would be formulated based on the schedule.

9. Request for Technical Guidance under the Grant Aid (Soft Component)

Pakistan side requested that Technical Guidance (Soft Component) should be provided to the staff of Pak-EPA and Prov.-EPAs in relationship with the Project. Upon this request the Japanese side explained the importance of proper technical guidance, referring to the Soft Component to be designed within the BD Study. The Japanese side also explained that the Soft Component would be designed in Japan based on the training plans of the Pakistani side, as attached in Appendix-5.

10. Request for Counterpart Training

Pakistani side requested to the Team that Counterpart Training should be considered in connection with the Grant Aid. The Team explained to Pakistani side that the request would be conveyed to JICA.

11. Request for Laboratory Furniture and Training Equipment/Furniture

Pakistani side requested to consider laboratory furniture and training equipment/furniture. Upon this request Japanese side explained that the request would be conveyed to JICA.

12. Undertakings of Each Government

Both Pakistani and Japanese sides agreed that the following major undertakings should be covered by Japanese side, Pak-EPA and Prov.-EPAs, as presented in the following tables.



(1) Procurement and Installation of the Equipment

	To be covered by			Remarks
	Japan	Pak-EPA	Prv.-EPA	
Procurement, transportation and instillation of the equipment	O			
Technical guidance for the new equipment	O			Soft Component
To secure relevant utilities and renovation wok for the existing laboratories and sites of fixed monitoring station.			O	Before installation work
To set up the existing equipment on the proposed location.			O	Same as above
To transfer and install the existing equipment from existing laboratory to new laboratory		O	O	Same as above (Pak-EPA& Punjab-EPA)

(2) Construction of the Data Surveillance & Training Center

	To be covered by			Remarks
	Japan	Pak-EPA	Prv.-EPA	
To construct a new building for the Project with furniture required for the Project	O			
To fill soil up to the level of the front road on the Project site		O		Before construction work
To remove the trees existing in the Project site		O		Same as above
To bring the utility lines (electricity, telephone, water, gas, sewage etc.) up to connection points on the boundary line of the site		O		
To build permanent fence, gate and other items of exterior work, including gardening with plantations		O		
To facilitate ordinary furniture for staff required in relationship with the Project		O		
To build a well as additional water source beside the piped water supply by CDA		O		

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List of Equipment to be Provided under the Project

PCI: PC-1, PS: Preparatory Study, Est: Existing, BS: Basic Design Study
 ISB: Pak-EPA, KAR: Sindh-EPA, LHO: Punjab-EPA, PES: NWFP-EPA, QLE: Balochistan

Item	Technical Specification	Quantity					Total		
		ISB	KAR	LHO	PES	QLE			
A. Air quality monitoring									
1. Automatic air quality monitoring station									
A-1-1	Fixed Automatic Air Quality Monitoring Station 6 gas analyzers of CO, NOx, O3, SO2, THC and SPM for 2.5µm. Standard gas w/ cylinder and regulator, Standard gas dilution device, Wind speed meter, Wind direction meter, Thermometer-hygrometer, Barometer, Computer w/ printer, Compressant wire conditioner	6 gas analyzers of CO, NO, O3, SO2, THC and SPM for 2.5µm, Standard gas w/ cylinder and regulator, Standard gas dilution device, Wind speed meter, Wind direction meter, Thermometer - hygrometer, Barometer, Computer w/ printer, Compressant wire conditioner (Mark *, to be examined in detail)	PC1	1	4	4	2	2	13
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	3*	2*	1	1	8
A-1-2	Mobile Automatic Air Quality Monitoring Station 6 gas analyzers of CO, NOx, O3, SO2, THC and SPM for 2.5µm. Standard gas w/ cylinder and regulator, Standard gas dilution device, Wind speed meter, Wind direction meter, Thermometer-hygrometer, Barometer, Computer w/ printer, Compressant w/ air conditioner	6 gas analyzers of CO, NOx, O3, SO2, THC and SPM for 2.5µm, Standard gas w/ cylinder and regulator, Standard gas dilution device, Wind speed meter, Wind direction meter, Thermometer - hygrometer, Barometer, Computer w/ printer, Compressant wire conditioner (Mark *, to be examined in detail)	PC1	1	1	1	0	1	4
			PS	1	1	1	0	0	3
			Est	0	0	1	0	0	1
			BS	1	1	1	1*	1*	5
2. Data Management and Reporting System in EPA									
A-2-1	Data Processing System in Pak-EPA (Hardware & Software) Data acquisition and control system. Store, record and display process and experimental data. Software for environmental lab data analysis, monitoring network analysis, data interpretation, statistical description and graphics.	Personal Computer with following functions -Data acquiring from fixed/mobile monitoring station and Piv-EPA. -Database storage & archiving -Data editing and report generating system	PC1	1	0	0	0	0	1
			PS	1	0	0	0	0	1
			Est	0	0	0	0	0	0
			BS	1	0	0	0	0	1
A-2-2	Data Processing System in Piv-EPA (Hardware & Software) Data acquisition and control system. Store, record and display process and experimental data. Software for environmental lab data analysis, monitoring network analysis, data interpretation, statistical description and graphics.	Personal Computer with following functions -Data acquiring from fixed/mobile monitoring station. -Database storage & archiving -Data editing and report generating system	PC1	0	1	1	1	1	4
			PS	0	1	1	1	1	4
			Est	0	0	0	0	0	0
			BS	0	1	1	1	1	4
3. Secondary source monitoring (optional)									
A-3-1	Dust Monitoring Unit Portable high volume air sampler (D to ISO Pm10)	Isokinetic dust sampling unit for stack monitoring (normal type). Velocity measuring unit (pitot tube, manometer). Dust sampling unit. Moisture measuring unit	PC1	2	5	5	2	3	17
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
A-3-2	Stack Gas Analyzer NOx, SO2, O2	NOx: chemiluminescence, 0 to 4,000ppm or more, auto-ranging SO2: NDIR method, 0 to 5,000 ppm or more, auto-ranging O2: Zirconia or magnetic flow, 0 to 25%	PC1	1	1	2	1	2	7
			PS	1	1	1	1	1	5
			Est	1	1	1	0	0	3
			BS	1	1	1	1	1	5
A-3-3	Portable Gas Analyzer CO, CO2 for combustion gas of boiler	NDIR method 0 to 40,000ppm or more, auto-ranging	PC1	2	2	2	0	2	8
			PS	1	1	1	1	1	5
			Est	1	1	1	0	0	3
			BS	1	1	1	1	1	5
A-3-4	Oxygen Monitor (Magnet Type) No specification	(To be deleted)	PC1	2	2	2	1	1	8
			PS	0	0	0	0	0	0
			Est	1	1	1	0	0	3
			BS	0	0	0	0	0	0
A-3-5	Opacity Meter Smoke density meter, laser beam system	(To be deleted)	PC1	1	1	2	1	2	7
			PS	0	0	0	0	0	0
			Est	2	0	0	2	1	5
			BS	0	0	0	0	0	0
A-3-6	Portable Stack Gas Sampler CO, SOx, NOx, HC, O2, N2	Wet type gas collector Absorbing bottles : 2 bottles or more SOx Washing bottle : 1 bottle or more Vacuum pump : 1 unit (Max. Flow 4 SL/min)	PC1	2	2	2	0	2	8
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
A-3-7	Oxazi - Fischer Gas Analyzer No specification	To measure stack gas concentration. Analyte : O2, CO, CO2 Absorbing bottles : 4 bottles Inlet of sampling bags and sucking pump for 2 set of Oxazi	PC1	2	5	5	2	3	17
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
A-3-8	Wet Type Gas Meter No specification	1) Measurement range : 0.5 to 2L/min. or more Drum Capacity : 1 liter 2) Measurement range : 2.5 to 30L/min. Drum Capacity : 5 liter	PC1	2	5	5	2	3	17
			PS	2	2	2	2	2	10
			Est	0	0	0	0	0	0
			BS	2	2	2	2	2	10
A-3-9	Monitoring Car No specification	Used for carry the Stack gas monitoring equipment or some 'A Supplemental Equipment' for on site monitoring work.	PC1	0	0	0	0	0	0
			PS	1	1	1	0	0	3
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
4. Supplemental Equipment									
A-4-1	High Volume Air Sampler (HVAS Portable) High -Volume blower, Typically at a rate of 1.13 - 1.70 m3/min (40-60 ft3). Operating temp. -20 to 60°C Particle size separator < 1µm	Setting flow rate range: 600 to 1200L/min. or more	PC1	2	2	2	1	1	8
			PS	2	2	2	2	2	10
			Est	3	1	1	0	3	8
			BS	3	2	2	3	0	10
A-4-2	Low Volume Air Sampler Low -Volume blower typically at a rate of 20-30 liter/min. Operating temp -20 to 60°C. Particle size separator < 10µm and < 2.5µm.	Particle size classification : 10µm cut Classification method : cyclone or gravity sedimentation Flow rate : 1 to 20 L/min. or more	PC1	2	2	2	1	1	8
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
A-4-3	Asbestos Air Sampler No specification	Briggs Suction flow rate : 28.3 L/min (= 1 ft3/min)	PC1	2	2	2	1	1	8
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
A-4-4	Vacuumed Pump with Gas Bag No specification	Gas sampling bags coated with Teflon, Aluminum, inner volume 5 - 20 liter, Sucking vacuum pump with valve/maximum flow rate 20ft/min.	PC1	2	2	2	1	1	8
			PS	0	0	0	0	0	0
			Est	0	0	0	0	0	0
			BS	0	0	0	0	0	0

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Appendix 1

PCI: PC-1, PS: Preparatory Study, EE: Existing, BS: Basic Design Study
 ISB: F&I-EPA, KAR: Study-EPA, L&D: Project-EPA, PES: MWFP-EPA, QUE: Balakrishna

Item	Technical Specification		Quantity							
	PC-1/PS	Basic Design Study	ISB	KAR	L&D	PES	QUE	Total		
A-4-5	Inflator Gas Sampling System (Portable air sampler)	Single set with 100ml capacity	Wet type gas collector (heavy sampler) Absorbing bottles : 2 bottles or more lower vacuum pump Used for ambient air monitoring	PCI	2	2	2	1	1	8
A-4-6	Particle Counter	Count 1-9,999,999 particles having diameter 0.3-5.0 μm. Flow rates 2-3 liter/min. Concentration range 0-3,000,000.	(To be deleted)	PCI	2	2	2	1	1	8
A-4-7	Gas Detection Tube System	Fluor type pump draws 100ml of sample air with toxic gas detection tubes. Measuring ranges both in PPM and % v/v.	(To be deleted)	PCI	2	2	2	1	1	8
A-4-8	Rotor Meter	No specification	Rod float type (Corrosion resistant) Applicable gas : Air (at 1 atm, 20degC) 50 ml/min, 100 ml/min, 500 ml/min, 1 L/min, 39 L/min.	PCI	2	5	5	2	3	17
A-4-9	Mass Flow Meter	No specification	(To be deleted) Temperature Following Current Differential Detector 10 - 500 ml/min. (at 1 atm, 20degC)	PCI	2	5	5	2	3	17
A-4-10	Thermometer	No specification	(To be deleted)	PCI	2	5	5	2	3	17
A-4-11	Deposit Gauge	Dust fall samplers with glass bottle having 100mm diameter. Bottle capacity - 20 liter.	Dust fall samplers with glass bottle having 100mm diameter. Bottle capacity - 20 liter. Dustfall	PCI	2	2	2	1	1	8
B. Sound Level monitoring										
B-1	Precision Integriation Sound Level	With calibrator and data logger	(To be deleted)	PCI	1	1	2	1	2	7
B-2	Tripod	No specification	(To be deleted)	PCI	1	1	1	1	1	5
B-3	Level Recorder	for water	(To be deleted)	PCI	1	1	2	1	2	7
B-4	Phase Phase	No specification	(To be deleted)	PCI	1	1	2	1	2	7
C. Water quality monitoring										
C-1	Fixed automatic water quality monitoring station	Automatic water quality monitoring device, CM water,	(To be deleted)	PCI	1	2	2	1	2	7
C-2	Water quality monitoring vehicle	No specification	Wagon type off-road vehicle (dhp-1996 or more) Seating Capacity, 5-person	PCI	1	1	1	0	1	4
C-3. Portable water quality monitoring, water, sludge, sampling equipment										
C-3-1	Water Monitoring Kit	Portable 28 water parameter	(To be deleted)	PCI	1	1	2	1	2	7
C-3-2	Sludge Sampler	No specification	(To be deleted)	PCI	1	1	2	1	2	7
C-3-3	Water Sampler	No specification	HYDRONIT type, Capacity: 1000 ml, Filings: brass with weight, wire (SUS), Hanging chain approx. 3 m	PCI	1	1	2	1	2	7
C-3-4	Digital Current Meter	No specification	Type: Electromagnetic type, Accuracy: less than +/-2% or +/-0.5cm/sec, Depth capacity (pressure rate): more than 3kg/cm2, Measuring range: 0 +/-200cm/sec, LCD display: Digital current speed, Power: dry cell batteries.	PCI	1	1	2	1	2	7
C-3-5	Ekman Barge Slab Sampler	No specification	Area collected sample: 15 x 15 x 15 (cm), Body material: SUS, Hanging chain: 3 m	PCI	1	1	2	1	2	7

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Appendix 1

PCI: PC-1, PS: Preparatory Study, Est: Estimating, BS: Basic Design Study
 BB: Pak-EPA, KAR: Sindh-EPA, LHO: Punjab-EPA, PES: NWFP-EPA, QUR: Balochistan

Item	Technical Specification		Quantity					Total		
	PC-1/PS	Basic Design Study	BB	KAR	LHO	PES	QUR			
D. Laboratory equipment										
D-1	Atomic Absorption Spectrophotometer (AAS)	Wavelength range: 190-900nm, automatic wavelength selection with background correction, auto ignition, hydride generation mercury vapor unit, graphite furnace, Graphite lamp (related lamps), Flame mode, software based on MS Window.	Automatic wavelength selection with background correction, Graphite lamp (related lamps), Flame mode, software based on MS Window. (Hollow Cathode Lamp: Al, As, Ba, Bi, Cd, Cr, Cu, Co, Cr, Fe, Pb, Mn, Hg, Ni, Ag, Zn), Automatic cooling water circulate unit.	PCI	1	1	1	1	1	5
				PS	1	0	1	0	1	3
				Est	1	1	0	1	0	3
				BS	1	0	1	0	1	3
D-2	Attachment of AAS	No specification	Hydride generation unit, mercury vapor unit, Graphite furnace, Graphite lamp (related lamps), Up-grade of software. [Attachment of AAS prepares the method to existing AAS]: (Hollow Cathode Lamp: Al, As, Ba, Bi, Cd, Cr, Cu, Co, Cr, Fe, Pb, Mn, Hg, Ni, Ag, Zn), Automatic cooling water circulate unit. *Sindh-EPA; Up grade of the software	PCI	0	0	0	0	0	0
				PS	0	1	0	1	0	2
				Est	0	0	0	0	0	0
				BS	0	1	0	1	0	2
D-3	UV-VIS Spectrophotometer (UV-VIS)	Wavelength range: 190-1100 nm, Spectral band: 2 nm Wavelength display: 0.1 nm, Wavelength accuracy automatic, Absorbance: 0.5 - 3.999, Transmittance: 0.0 - 300%	Double beam scanning type, Tungsten-Halogen and D2 lamp, Wavelength range: should cover 190 to 900 nm, Wavelength accuracy: less than 0.3 nm, Bandpass: 4.10 to 5.00 nm *Sindh-EPA; Up grade of the software	PCI	1	1	1	1	1	5
				PS	1	1	0	0	0	2
				Est	2	1	1	1	1	6
				BS	0	0	1	1	1	3
D-4	Gas Chromatograph (GC/ECD/FTD)	Oven temperature Ambient: 4 to 450°C Advance flow control unit, FID, MPD/FTD & ECD detector, with all accessories and auto sampler.	Advance flow control unit, Operating temperature: 100 to 450 degree C, (1.0 degree C step), [FID detector] Sensitivity: Less than 0.005 ng/ml (5 ng/ml), [ECD detector] Minimum detectable quantity: 0.05 pgC/DIC *Sindh-EPA; Up grade of the software	PCI	1	1	1	0	0	3
				PS	1	1	1	1	1	5
				Est	1	1	0	0	0	2
				BS	1	0*	1	1	1	4
D-5	Ion Chromatograph	Electrochemical detector with 20 different types of column recorder, auto sampler up to 128 samples, integration and storage of chromatograms, data recorder and all accessories.	Flow rate: 0.5 to 6.0 mL/min, Max. pressure: Approx. 38.0 MPa, [Detector] Method: Electrolytic conductivity, Measuring Range: 0 to 2000 micro-s/cm, Output: 0 to 10V, Operating temp.: 10 to 40 degree C, Column: Dual column system, Solvent resistance, Integration and storage of chromatograms, data recorder and all	PCI	1	1	1	0	0	3
				PS	1	1	1	1	1	5
				Est	0	0	0	0	0	0
				BS	1	1	1	1	1	5
D-6	COD Apparatus	Detection 0 - 1000 mg/l Analyze 6 to 10 samples at a time.	Sevenson Kjeldahl Digesting apparatus with one reflux pipe, six Kjeldahl flask, (complete set), Flask volume: 500 mL (6 pc), Temp.: Max. approx. 450 degreeC with individual controller, Cooled condenser: 300 mm	PCI	1	1	1	0	0	3
				PS	1	1	1	1	1	5
				Est	0	1	1	0	1	3
				BS	1	1	1	1	1	5
D-7	BOD Apparatus	D.O 0-19.5 mg/l, Resolution: 0.01 mg/l with digital display. (5-l type)	Insulator bottles and incubator. Insulator bottles: Approx 100nos, 100 pcs	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	0	0	0	0	0
				BS	1	1	1	1	1	5
D-8	Sulfur Content Analyzer in Fuel	To measure sulfur content in fuel	Analysis method: Fluorescent X-ray analysis (oxidation method), Measuring range: 0-6wt%, Continuous measurement error: 0.02wt% standard deviation (at 1wt%), Automatic Calibration: Automatic operation two point Calibration and automatic multipoint	PCI	0	0	0	0	0	0
				PS	1	0	0	0	0	1
				Est	0	0	0	0	0	0
				BS	1	0	0	0	0	1
D-9	Oil Content Meter	To measure oil content in water	Method: Infrared rays absorption method, Measuring Range: 0.1 to 100 mg/l, Response time: ± 0.2 mg/l, Control method: Automatic processing by microcomputer	PCI	1	1	1	0	0	3
				PS	1	1	1	1	1	5
				Est	0	1	1	0	0	2
				BS	1	0	0	1	1	3
D-10	High Performance Liquid Chromatograph (HPLC)	UV-Visible detector 190-900nm, Refractive index detector, Electrochemical detector, auto sampler, all its accessories and different polarity columns and recorder.	(To be deleted)	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	1	0	0	0	1
				BS	0	0	0	0	0	0
D-11	ICP spectrophotometer	Wavelength: 160-800nm, High UV quantum efficiency, Wide Photoelectric dynamic range for ppb, RF Generator, ICP Visible software with full processing power and high resolution graphics.	(To be deleted)	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	0	0	0	0	0
				BS	0	0	0	0	0	0
D-12	Fluorescence X-ray Analyzer	X-Ray analyzer with radioactive isotopic source, high resolution mercury iodide detector, Fluorescence, Phosphorescence & Diffusion modes, software with processor and all other accessories.	(To be deleted)	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	0	0	0	0	0
				BS	0	0	0	0	0	0
D-13	Electrophoresis Equipment	No specification	(To be deleted)	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	0	0	0	0	0
				BS	0	0	0	0	0	0
D-14	TOC Analyzer	(TOC) Analyzing samples containing carbon from 1 ppb to 10,000 ppm. Ultra low level sensitivity single or multiple calibration, Non dispersive infra red detector.	Non-dispersive infrared read detector, Method: NIR method, Range: 0 to 10000 mg/L, Detection limit: 5 µg/L, Analysis time: 10 min	PCI	1	1	1	0	0	3
				PS	1	1	1	1	1	5
				Est	0	0	0	0	0	0
				BS	1	0	0	0	0	1
D-15	Ion Meter with Ion Selective Electrodes	Ion meter different ion selective electrodes, Calibration standards and with all accessories.	(To be deleted)	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	1	1	0	0	2
				BS	0	0	0	0	0	0
D-16	Mercury Analyser	Fluorescent range 0-0 g with 0.01g of mercury sensitivity.	(To be deleted)	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	0	0	0	0	0
				BS	0	0	0	0	0	0
D-17	Polarograph	Photo multiplier detector, reproducibility better than 0.002 for zero and retained reading, Fluorescence display, spectral lines selectable from instrument with all accessories.	(To be deleted)	PCI	1	1	1	0	0	3
				PS	0	0	0	0	0	0
				Est	0	0	0	0	0	0
				BS	0	0	0	0	0	0

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Appendix I

PCI: PC-I, PS: Preparatory Study, Est: Estimating, BS: Basic Design Study
 SD: Sub-EPA, KAR: South-EPA, LHD: Punjab-EPA, PES: NWFP-EPA, QCE: Balochistan

Item	Technical Specification		Quantity					Total	
	PC-I/PS	Basic Design Study	SD	KAR	LHD	PES	QCE		
D-38	Celery Counter	Accurate microbial count, Counter feature: 190mm diameter, well accommodate 10mm & 100mm petri dishes.	Display: LED, should cover 600 to 999, Lamp: Fluorescent, Counting System: Manual push button pen, probe, Petri Dish: dia 100 mm or more	1	1	1	1	1	5
D-39	Water Bath (Small)	Capacity: 5-10 liters, Temperature 3°C above ambient to 100°C, stability: +above ambient to 100°C, stability: +0.2°C.	Capacity: Approx 10 liters (ca. 230 X 230 X 170mm), Temperature 3°C above ambient to 100°C, stability: +above ambient to 100°C, stability: +0.2°C.	1	1	1	1	1	5
D-40	Water Bath (Large)	Capacity: 20-30 liters, temp. 3°C above ambient to 100°C, stability: +0.2°C.	Capacity: Approx 20 liters (ca. 920 X 320 X 100mm), temp. 3°C above ambient to 100°C, stability: +0.2°C.	1	1	1	1	1	5
D-41	CW Inc Distillation Unit with Heater	All glass parts with heating mantle.	Heating method: Electric heating, Four zone type (Approx 3.6KW, equivalent to BS K-0182). It can also used for phenol distillation.	1	1	1	1	1	5
D-42	F Inc Distillation Unit with Heater	All glass parts with heating mantle.	Heating method: Electric heating, Four zone type (Approx 3.6KW, equivalent to BS K-0182). It can also used for phenol distillation.	1	1	1	1	1	5
D-43	MIF Inc Distillation Unit with Heater	All glass parts with heating mantle.	Heating method: Electric heating, Four zone type (Approx 3.6KW, equivalent to BS K-0182). It can also used for phenol distillation.	0	0	0	0	0	0
D-44	Filter System for Suspended Solid (SS)	Vacuum filtration holders with two or three way valves for independent control with high quality filter papers for gravimetric analysis and vacuum filtration pumps.	Filter holders with flask for filter paper: dia. 47 mm, glass funnel: ca 300 ml, [Mandfold] No. of branches: 3 pc., [Glass filter] Diameter: dia. 47 mm, [Vacuum filtration pump]	2	2	2	1	1	8
D-45	Analytical Balance, 210g ± 0.1mg	Maximum loading weight 210g and readability up to 0.1mg.	Type: suspended pan or top loading, Weighing capacity of more than 200 g, Reading of less than 0.1 mg, Allowance of less than ± 0.2 mg, Pan diameter of ca 60 mm	1	1	1	1	1	5
D-46	Analytical Balance, 220g ± 0.1mg → Change to Macro Balance 2000g	Maximum loading weight 220g and readability up to 0.01mg.	Max weighing capacity of 2000 g, Allowance of less than 0.1 g, Stabilization time less than 2 sec., Pan diameter of ca 100 mm	1	1	1	1	1	5
D-47	Low Temperature Incubator	Refrigerated incubator, Temperature range: -5 to 50°C.	Incubator, Temperature range: 5 to 50°C. Capacity: Approx. 380 liter, Temperature accuracy: Less than ±1 degreeC, Temperature display: Digital	1	1	1	1	1	5
D-48	High Speed Homogenizer	To disperse, disintegrate & to homogenize solids in aqueous and organic solution buffer, system with variable speed motor of 8000-21000 rpm, include holders and nut tube holders.	(To be deleted)	1	1	1	1	1	5
D-49	Vacuum Filter Unit	Backflow: Backflow with vacuum filtration pumps, Capacity: liter up to 5-10 liter/min.	Backflow: Backflow: 90mm (300ml), Flask, Glass: 200ml, Vacuum pump, Capacity: 25 liter/min (Echvac, apton 100Pa).	1	1	1	1	1	5
D-50	Furnace	Digitally controllable furnace, Capacity: 600-700 covets. Dual LED display actual and set. Maximum continuous operating temperature 1200°C.	Electric tubular furnace, Digital temperature controller, Range of temperature: Normal temperature 1150°C and max. 1200°C. Size in inside: φ40×300mm	1	1	1	1	1	5
D-51	Muffle Furnace	Ambient to 1200°C with temperature control system.	Capacity: approx. 9-liter, Heating element: Completely muffled with no exposure to furnace chamber, Temperature range: More than 1150 degreeC, Temperature accuracy: ±1 degreeC, Temperature display: Digital, Temperature control: Thermostatic	1	1	1	1	1	5
D-52	Laminar Air Flow Cabinet	Air flow cabinet with UV light, Fluorescent light and fixture to protect the user & environment from biohazardous particulates.	UV light, Fluorescent light and fixture to protect the user & environment from biohazardous particulates. Type: Desk top type, Air velocity: Approx. 0.45 m/min., Collection efficiency: More than 99.99% at 3 micron meter, Total dimension (W x D x H): Approx. 750 x 500 x 1135	1	1	1	1	1	5
D-53	Autoclave	Microprocessor control automatic, programmable both with door & feet release. Unit include 3-4 shelves and up to 60 minutes/usage cycle time.	Temp. control range: Should cover 100 to 129 degreeC, Temp. control accuracy: Less than ±1 degreeC, Pressure range: 0 to 1.64 kPa, Temp. control: Microprocessor control, Timer: 1 to 60 min., Drum container capacity: More than 50 L.	1	1	1	1	1	5
D-54	Refrigerator	Maintain temperature to 4°C with glass door laboratory refrigerator, Capacity: 600 liter. Uniformity of temperature ± 0.5-1°C.	(To be deleted)	1	1	1	1	1	5
D-55	Freezer	Ultra low temperature freezer, maintain temperature to -120°C with microprocessor control monitor operation & alarm system, Capacity: 600 liter.	(To be deleted)	1	1	1	1	1	5
D-56	Ice Machine	Ice cube maker, Capacity: 150 Kg/day & storage capacity up to 150 Kg.	(To be deleted)	1	1	1	1	1	5
D-57	Electrophoresis Equipment	No specifications	(To be deleted)	1	1	1	1	1	5

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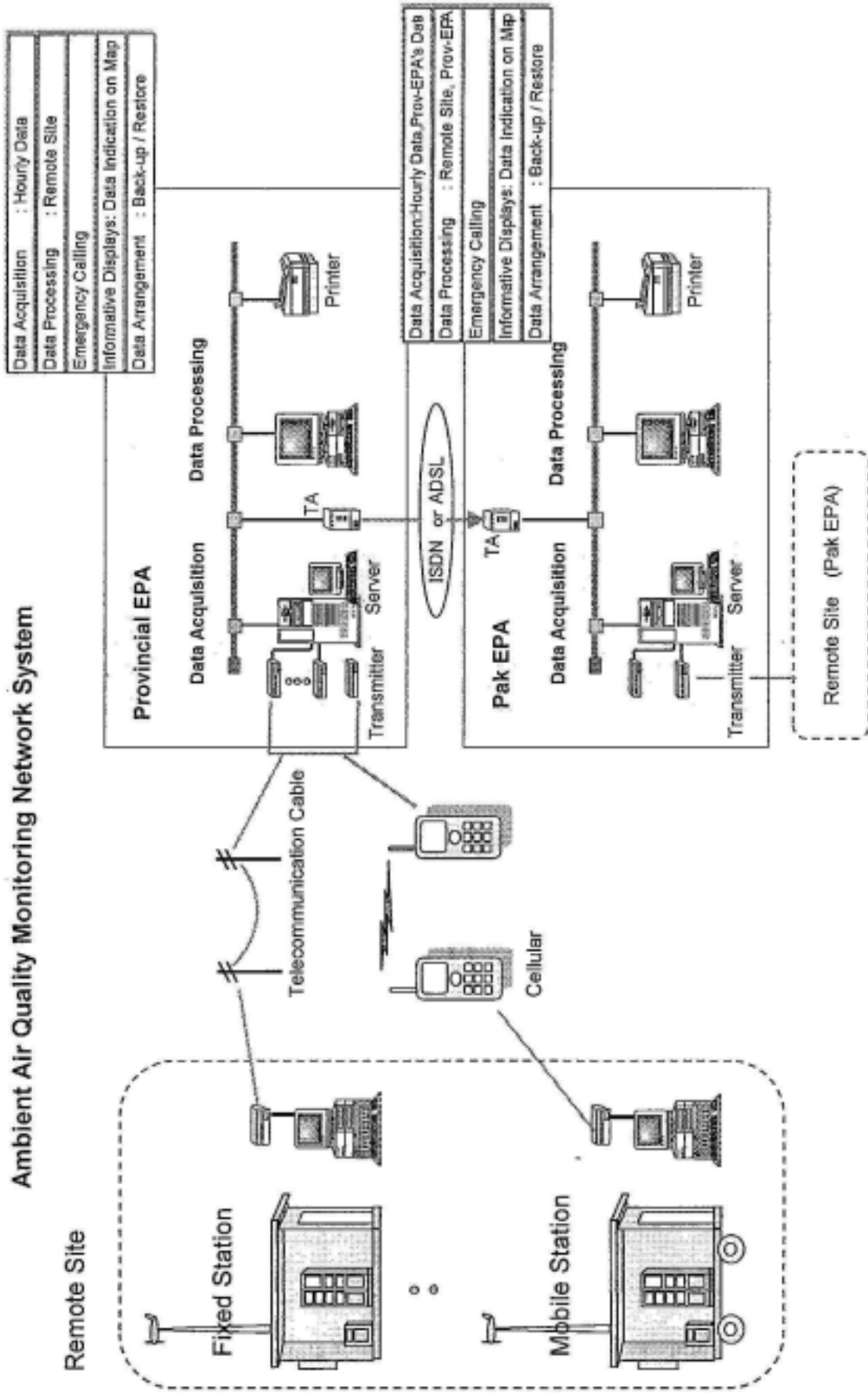
Appendix 1

PCS: PC-1, PS: Preliminary Study, Est: Estimating, BS: Basic Design Study
 ISB: Pak-EPA, KAR: Sindh-EPA, LJO: Punjab-EPA, PES: NATP-EPA, QUL: Baluchistan

Item	Technical Specification		Quantity						Total
	PC-MPS	Risk Design Study	ISB	KAR	LJO	PES	QUL		
D-58 Fire Extinguisher (Dry chemical)	No specification	(To be dictated)	PCS	1	1	1	1	1	5
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	0	0	0	0	0	0
D-59 Portable Generator Set	No specification	(To be dictated)	PCS	1	1	1	1	1	5
			PS	1	1	1	1	1	5
			Est	1	0	1	0	0	2
			BS	0	0	0	0	0	0
D-60 pH Ion Selective Meter (Change to pH Meter)	Range: 1.99-19.999, accuracy: 0.002 pH, auto calibration with ionic buffer.	Mixing method: Glass electrode method, Display: pH/mV, Temp., Clock, Temperature compensation range: 0 to 100 degree C (Automatic or manual), Measuring range: pH 0 to 14, 0 to ± 1,999.9mV, 0 to 100 degree C, Resolution: 0.001pH, 0.1mV, 0.1 degree C, Digital output: RS-232C interface	PCS	1	1	1	0	0	3
			PS	1	1	1	1	1	5
			Est	1	3	2	1	2	9
			BS	1	1	1	1	1	5
D-61 Dissolved Oxygen (DO) Meter	D.O range: 0-1.99% with 1% resolution.	Dial-top type, Measuring method: Electrode Galvanic cell or Diaphragm Polarography, Range: DO 0 - 20.0 mg/L or more, Accuracy: DO ±0.01 mg/L, Output: RS-232C, Calibration method: Automatic calibration by atmosphere and by solution (saturated, span solution)	PCS	1	1	1	0	0	3
			PS	1	1	1	1	1	5
			Est	2	1	1	1	1	6
			BS	1	1	1	1	1	5
D-62 Conductivity Meter	4 digit LCD, MS 0-199.5, with all accessories.	Dial-top type, Measuring method: Alternating current four electrode, Measuring range: 0-7.0 S/cm, Repeatability: ± 1 % of P.S., Temp. compensation: 0-50 degree C, Display: Digital, LCD, Calibration: Automatic	PCS	1	1	1	0	0	3
			PS	1	1	1	1	1	5
			Est	2	3	0	1	2	7
			BS	1	1	1	1	1	5
D-63 Turbidity Meter	4 digit LCD, MS 0-199.5, with all accessories.	Dial-top type, Measuring range: Should cover 0 to 999 NTU, Resolution: Better than 0.01 on lowest range, Repeatability: Better than ±1 %, Sensitivity: Better than 0.01 NTU, ±1 digit.	PCS	1	1	1	0	0	3
			PS	1	1	1	1	1	5
			Est	1	3	2	1	0	7
			BS	1	1	1	1	1	5
D-64 Standard Thermometer (Set)	Range 0-100°C, 1-200°C, 10-300°C, 10-400°C	Dial-top type, With authorization must look on manufacturer. Issue the proofreading certificate. Measuring range: -50-- 0 degree C, 0-- 50 degree C, 50--100 degree C, 100--150 degree C, 150--200 degree C, 200--250 degree C, 250--300 degree C, 300--350 degree C,	PCS	1	1	1	0	0	3
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
D-65 Pure Water Supply Unit	Compound demineral water production unit, operating capacity 0.5 Bw/min, water conductivity not more than 1 S/cm, AC220V.	(Equipment for water purification) Treatment method: Pre-filter, Softening water by ion exchange, Feed water: Tap water, Produced water: Distilled water approx. 1.8 liter/hour, Demineral water approx. 0.5 liter/min, Regeneration: Less than twice/day (Pure water equipment) Purification method: RO, Distillation, Ion exchange and Filtration, Production flow rate: More than 1.0 L/min, Monitoring: Conductivity	PCS	1	1	1	1	1	5
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
D-66 Water Distillation Unit	Automatic still to receive water flow and temperature, 1.5 - 2.0 liter/hour with 10 liter storage reservoir.	This item is substituted by D-65.	PCS	1	1	1	1	1	5
			PS	0	0	0	0	0	0
			Est	1	0	1	1	1	4
			BS	0	0	0	0	0	0
D-67 Water de-ionizer	Reduce excessive sodium, efficiently control, pH level and isopneic matter	This item is substituted by D-65.	PCS	1	1	1	1	1	5
			PS	0	0	0	0	0	0
			Est	1	0	1	1	0	3
			BS	0	0	0	0	0	0
D-68 Wastewater treatment equipment	No specification	Waste water containing (General heavy metals, Cyanogen, Microbial chlorine, Mercury, Alkaline substance), Treatment method: Batch system, Treatment performance: Total 100 ppm, Cyanogen 500 ppm, Mercury 50 ppm, pH 2 - 12	PCS	0	0	0	0	0	0
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5
D-69 Fume gas treatment equipment (Fume Hood with Gas Scrubber)	No specification	Fume hood with filters and base storage cabinet, controlled exhaust, maximum air flow and emergency exhaust. Water supplies connection & fluorescent light, Vent exhaust fitted with gas scrubbers to trap the toxic gases.	PCS	0	0	0	0	0	0
			PS	2	1	1	1	1	6
			Est	0	0	0	0	0	0
			BS	2	1	1	1	1	6
D-39 Personal Computer	No specification	Dial-top type	PCS	3	3	3	3	3	15
			PS	1	1	1	1	1	5
			Est	0	0	0	0	0	0
			BS	1	1	1	1	1	5

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Ambient Air Quality Monitoring Network System

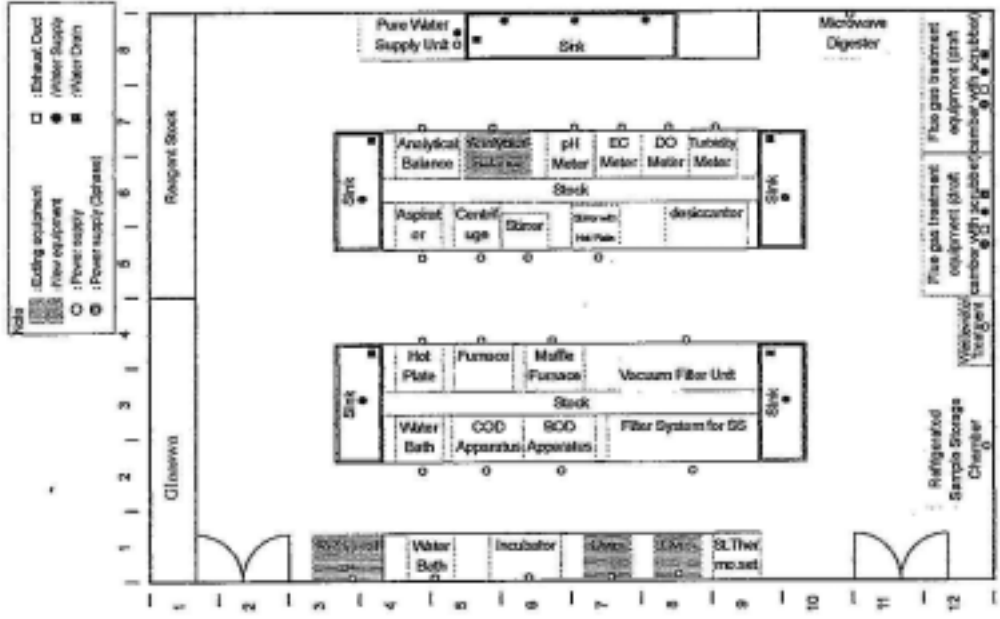


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Appendix-3

Pak-EPA Room① : Pretreatment Room

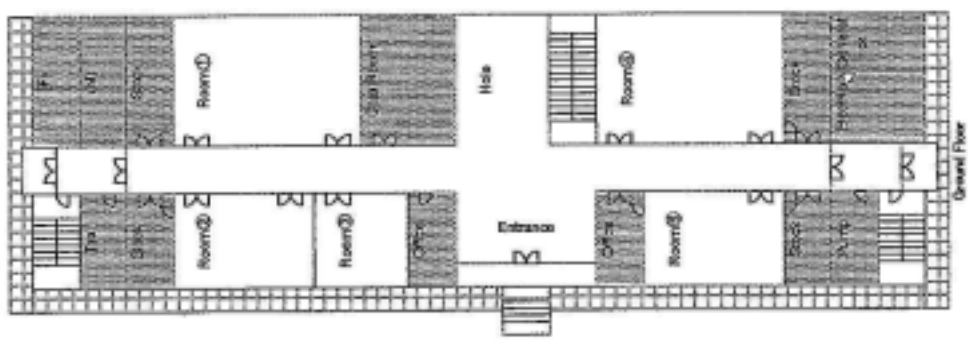


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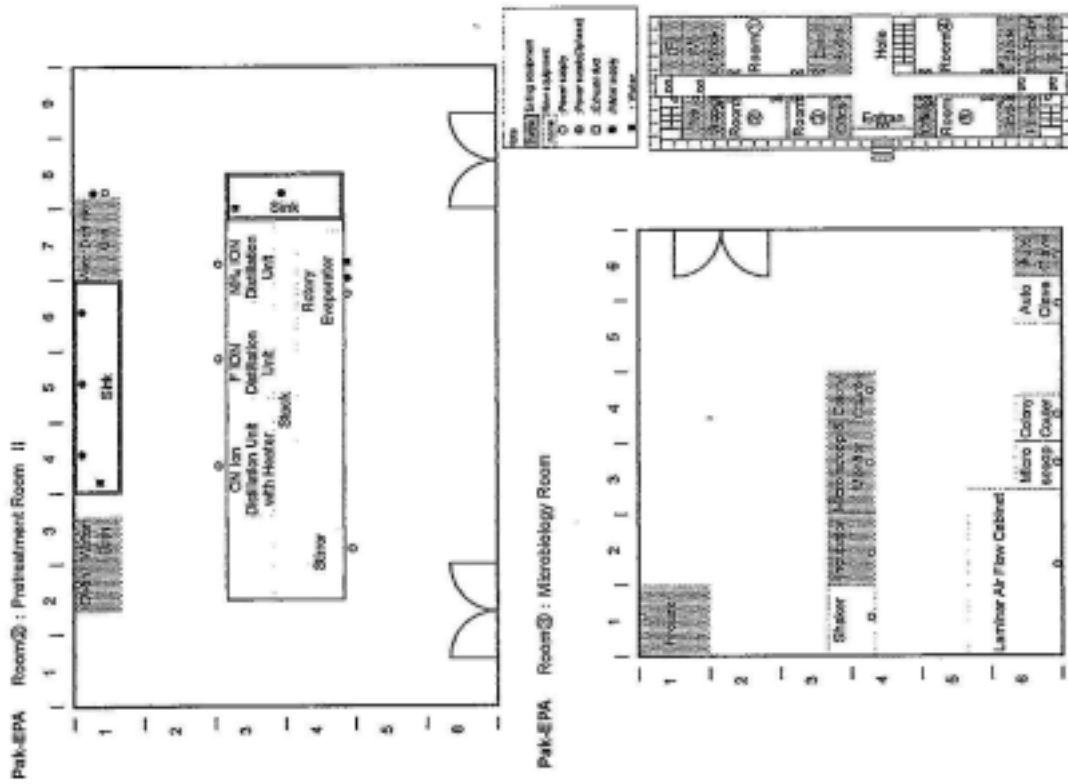
Appendix-3 Layout Plan of Equipment

Pak-EPA Laboratory layout image



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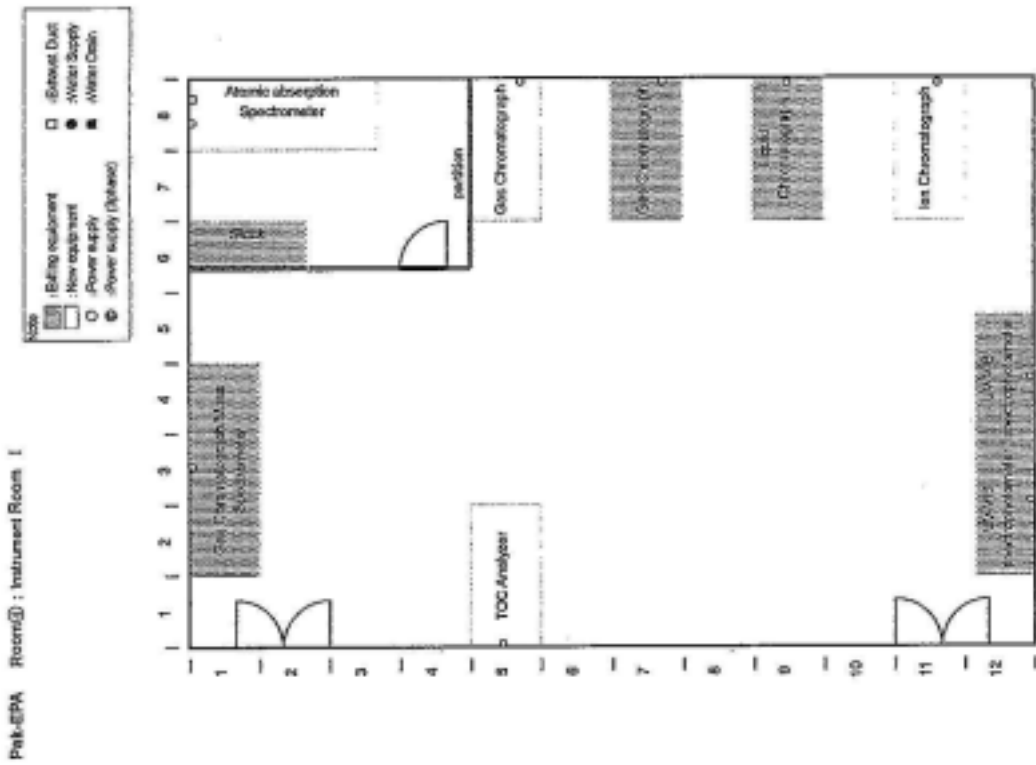
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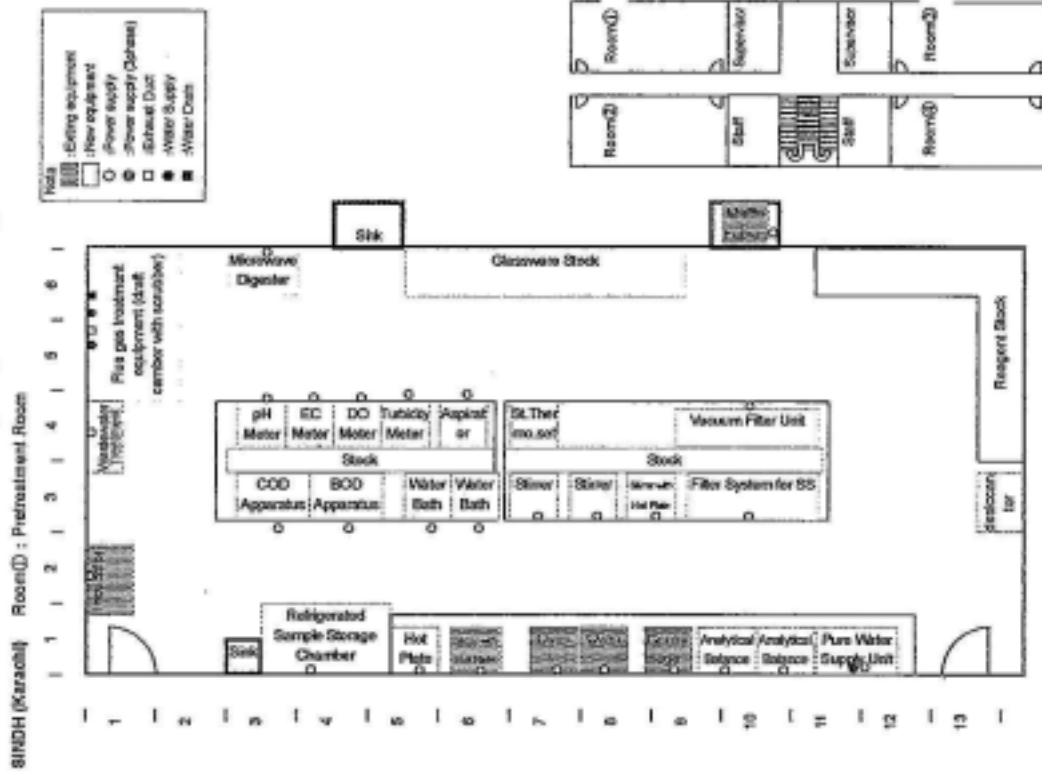


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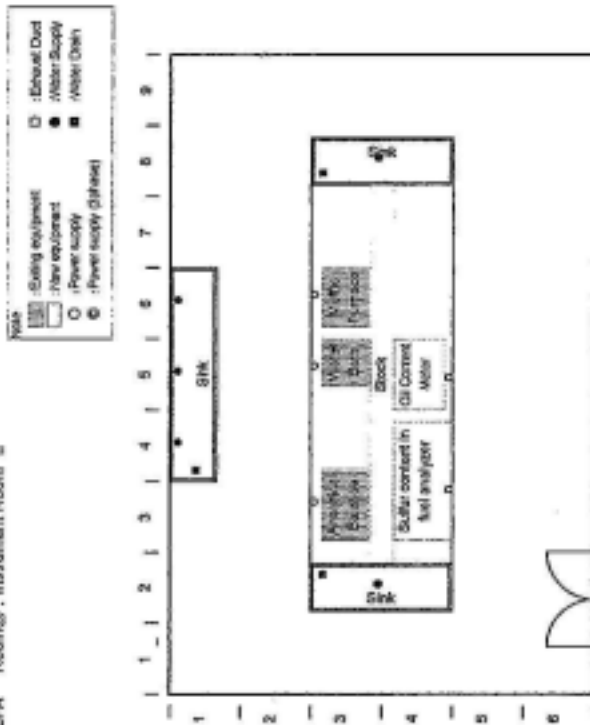
SINDH-EPA Laboratory layout image



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Appendix-3

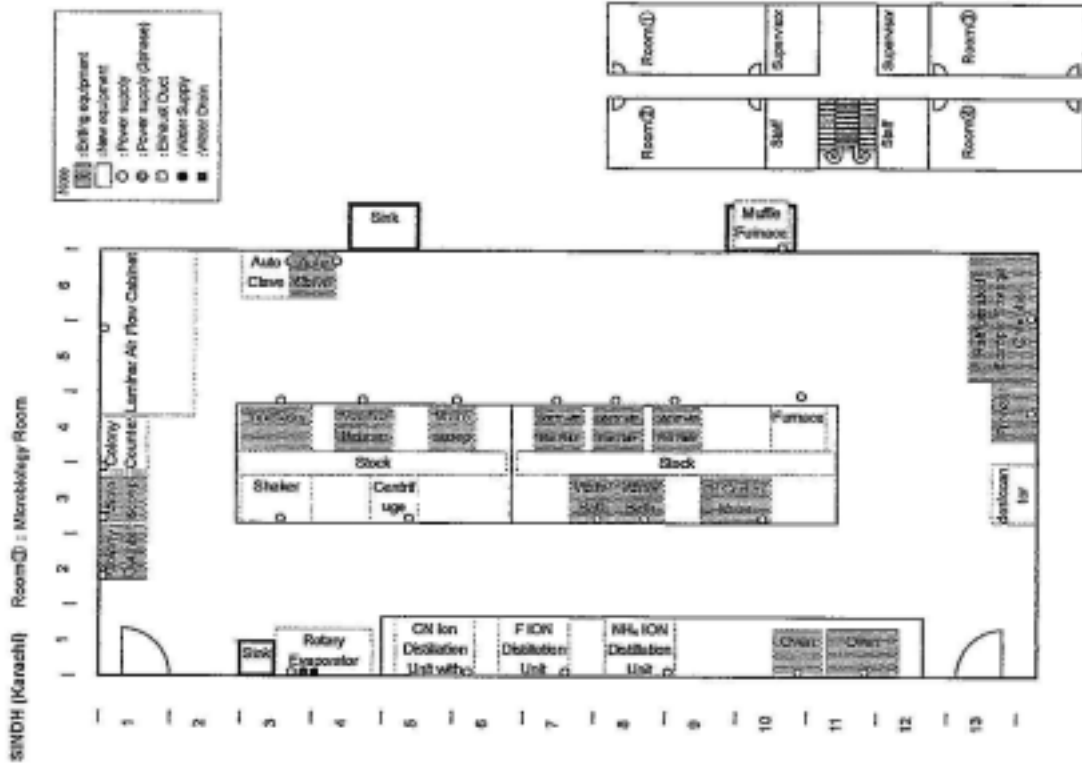
Pak-EPA RoomID : Instrument Rooms II



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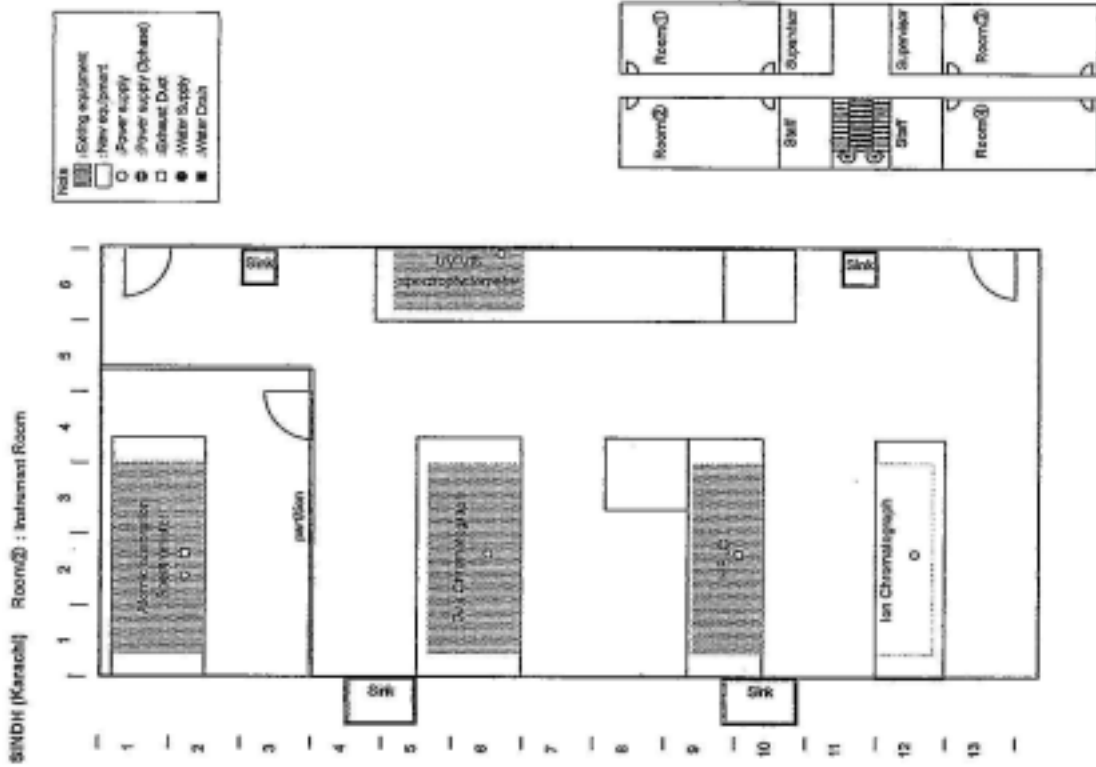
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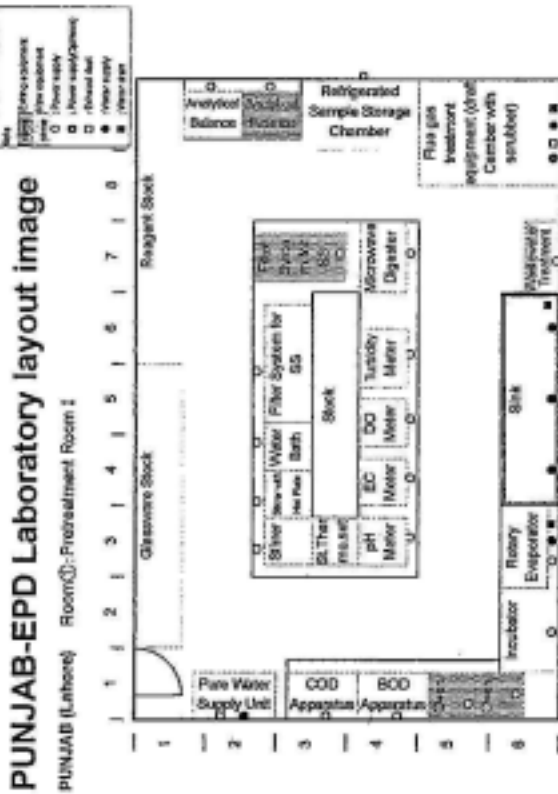
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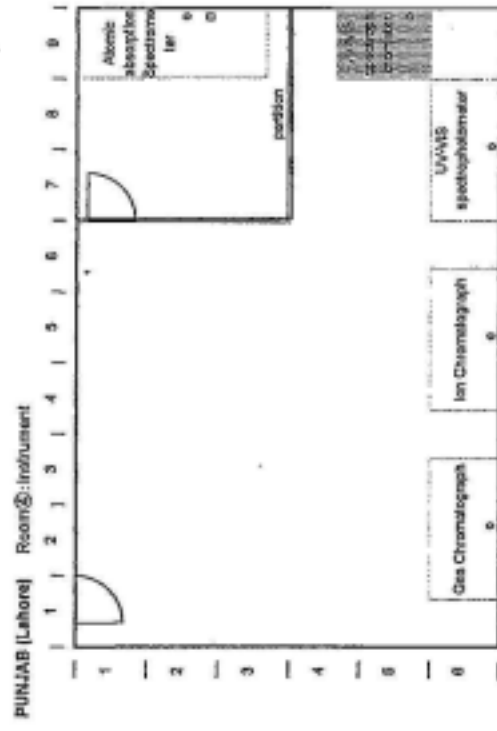


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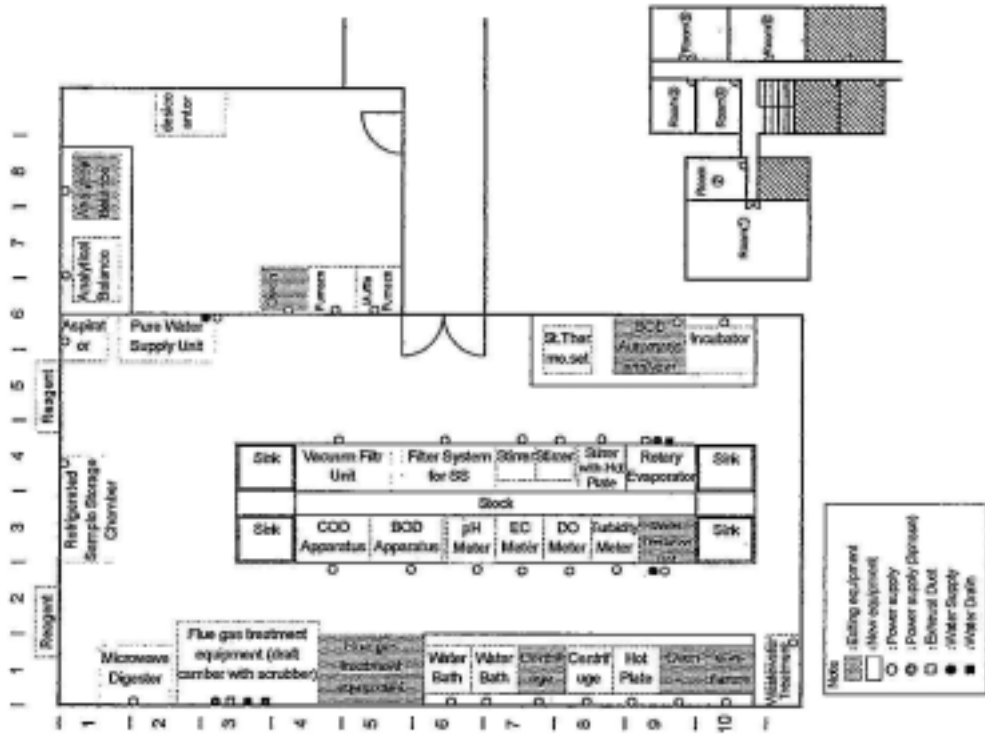


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Appendix-3

NWFP-EPA Laboratory layout image

NWFP (Peshawar) Room①: Pretreatment Room 1, Room②: Analytical Balance Room



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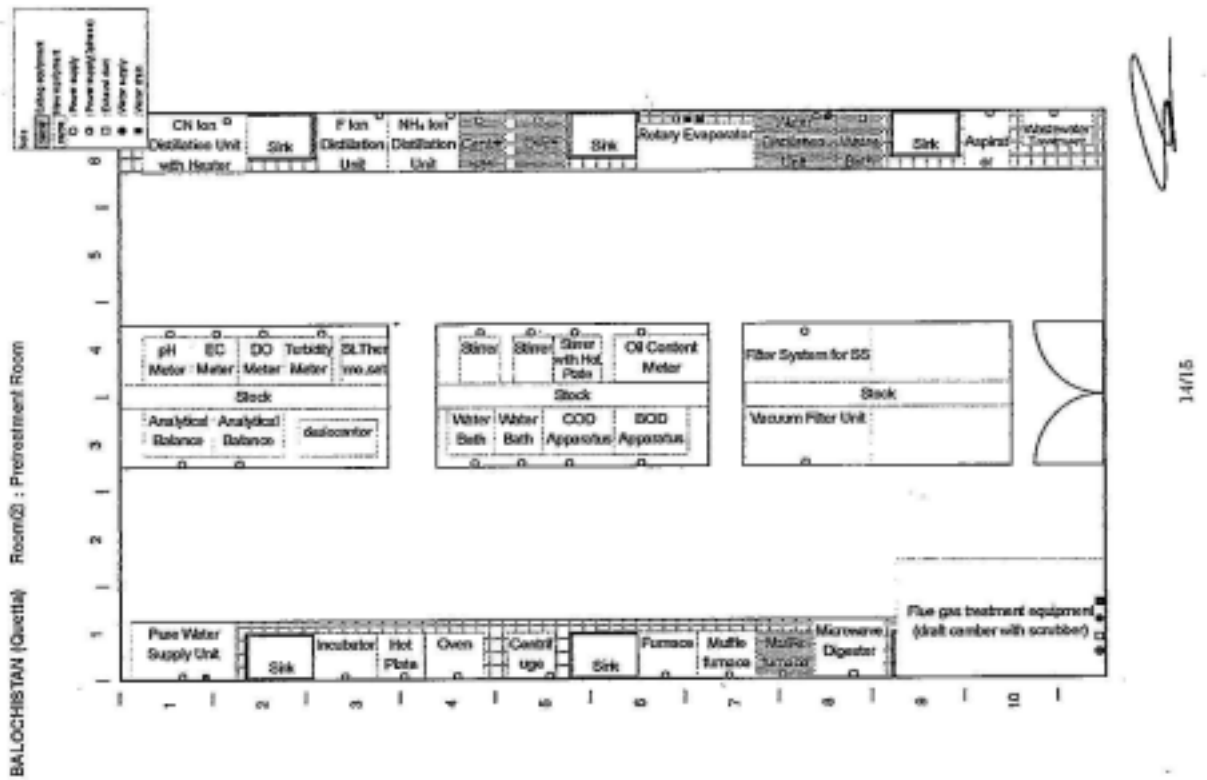
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NWFP (Peshawar) Room①: Pretreatment Room II, Room②: Instrument Room, Room③: Microbiology Room, Room④: Stock Room

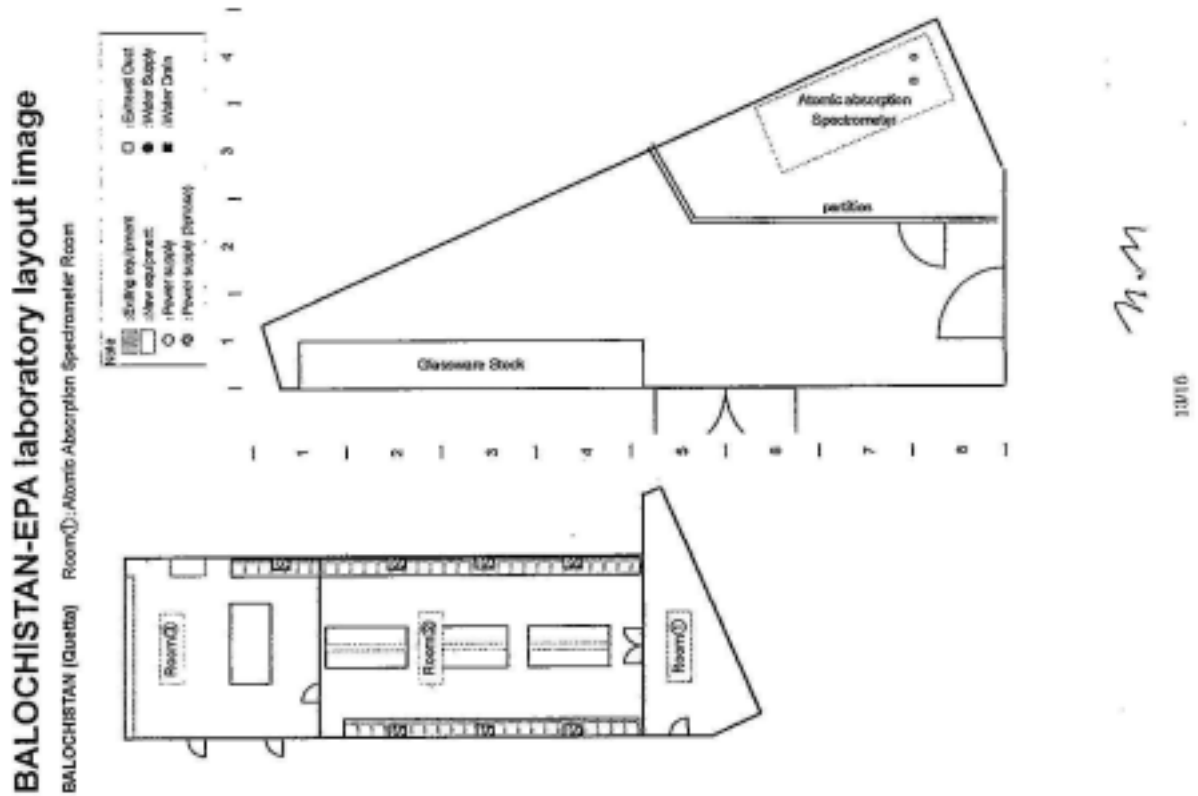


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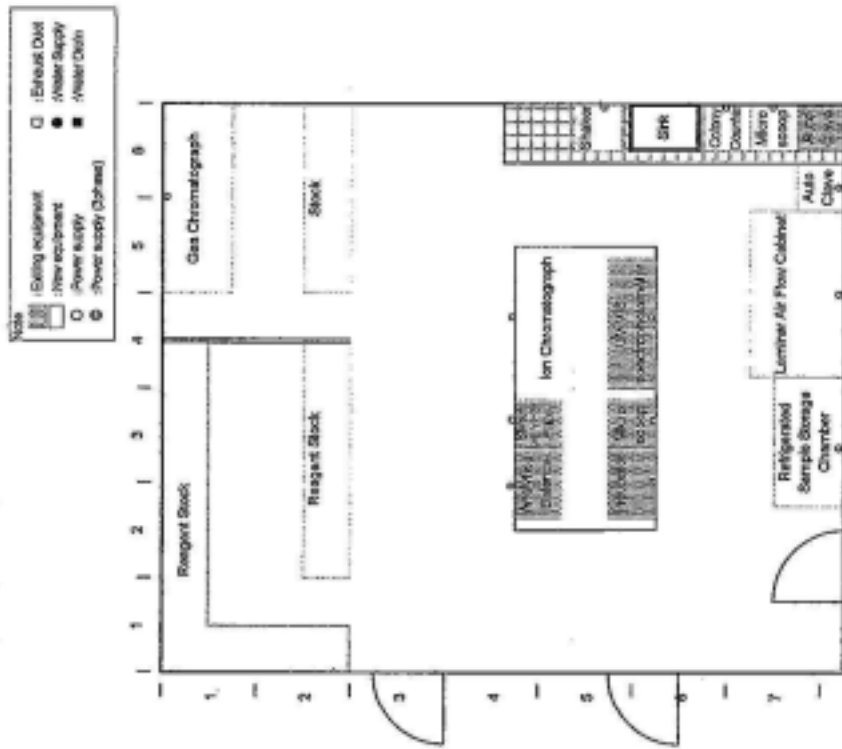


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BALUCHISTAN (Quetta) Room: Instrument Room



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Training Courses Proposed by EPA

A. General Environment

Course	Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
G-1	Introduction on Environmental Problems	To introduce the basic problems of our environment on water and ambient air, to explain the governmental roles of EPA and to promote awareness of the population	1 day	0 day	EPA staff, Professors university, JICA expert	Pak-EPA and Province industries, students and citizens	None
G-2	Operation of data surveillance center	To design data base, to learn basic concept of computer, and to understand statistical analysis of data, and reliability	5 days	7 days	EPA staff, Professors university, Engineer of software, JICA experts	Participant, Operators of monitoring system for Pak-EPA and Provincial EPA	Completion of A-2, A-3, A-4 and A-5

B. Ambient Air Quality

Course	Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
A-1	Outline of air pollution	To understand definition of air pollution, global environmental issues, control regulation, effect of air pollution on human health, vegetation and formation of acid rain, and sources of air pollution	1 day	0 day	EPA staff, Professors university, JICA experts	Pak-EPA and Province industries, students and citizens	None
A-2	Automatic air monitoring instrument	To understand principle of the monitoring instruments such as NOx, SO2, O3, CO, NMHC, SPM monitor and meteorological measurement instruments, allocation of the station, operation and maintenance, examination of reliability, telemeter system, summarizing data	2 days	10 days	Possible Lecturer: Manufacturers of instruments, Professors university, JICA experts	Participant: Pak-EPA and Province EPA	Completion of A-1

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Course	Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
A-3	Manual analysis for air quality	To understand sampling methods, basic concept of measuring, dust fall measurement, acid deposition measurement, methods of analyzing particulate matter, wet measurement method of gaseous pollutants, methods of analyzing volatile organic compounds	2 days	10 days	Professors of university, JICA experts, senior volunteer	Pak-EPA and Province EPA	Completion of A-1 and A-2
A-4	Emission from mobile sources and control	To understand exhaust gas measurement for motor vehicles, Measuring exhaust gas, automatic measurement, measuring equipment, vehicle testing system and control equipment such as catalytic converter and diesel particulate filter	5 days	2 days	Engineer instrument producing company, JICA expert	Pak-EPA and Province EPA, Industries	Completion of A-3
A-5	Air pollution predicting techniques	To understand meteorological measuring method, diffusion theory wind tunnel experiment, emission factor, statistical forecasting method, CMB (Chemical Mass Balance) method	5 days	0 day	Staff of SUPARCO & PCSIR, Meteorological Dept, JICA expert,	Pak-EPA and Province EPA	Completion of A-2 and A-4
A-6	Instrument analysis for air quality	To understand management and operation of the instruments such as UV-VIS spectrometer, Atomic absorption, Gas Chromatograph, Total Organic Carbon Analyser, Inductive Coupled Plasma, Fluorescence X-ray Analyzer, Ion Chromatograph, High Performance Liquid Chromatograph	5 days each	8 days each	Possible Lecturer Manufacturers of instrument company, JICA experts, senior volunteer	Pak-EPA and Province EPA	Completion of A-2, A-3 and A-4

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C. Water Quality

Course Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
W-1	Outline of water pollution To understand definition of water pollution, global environmental issues, ocean pollution, groundwater quality management, control regulation, effect of water pollution on human health, water body, agriculture, and eco system and sources of water pollution	1 day	0 day	EPA professors university exports volunteers staff of JICA senior	Pak-EPA and Province industries, students and citizens	None

Course Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
W-2	Water measurement instrument To understand principle of the monitoring instruments such as pH, conductivity, COD, and CN monitor and other measurement instruments, allocation of the station, operation and maintenance, examination of reliability, telemeter system, summarizing data	2 days	3 days	Manufacturers of instruments, Professors of university, JOCV	Pak-EPA and Province EPA	Completion of W-1

Course Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
W-3	Manual analysis for water quality To understand washing and keeping of glassware, pure water making and purity check, dilution standing solutions, absorption analysis, and titration	1 day	10 days	Professors university, JICA senior volunteer, JOCV	Pak-EPA and Province EPA	Completion of W-2

Course Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
W-4	Emission from stationary sources) and control To understand measuring and analytical method of air pollutants in exhaust gas, Measuring flue gas, automatic measurement, fuel test and control equipment	2 days	10 days	Engineer instrument producing company, JICA expert	Pak-EPA and Province Industries EPA,	Completion of W-1 and W-2

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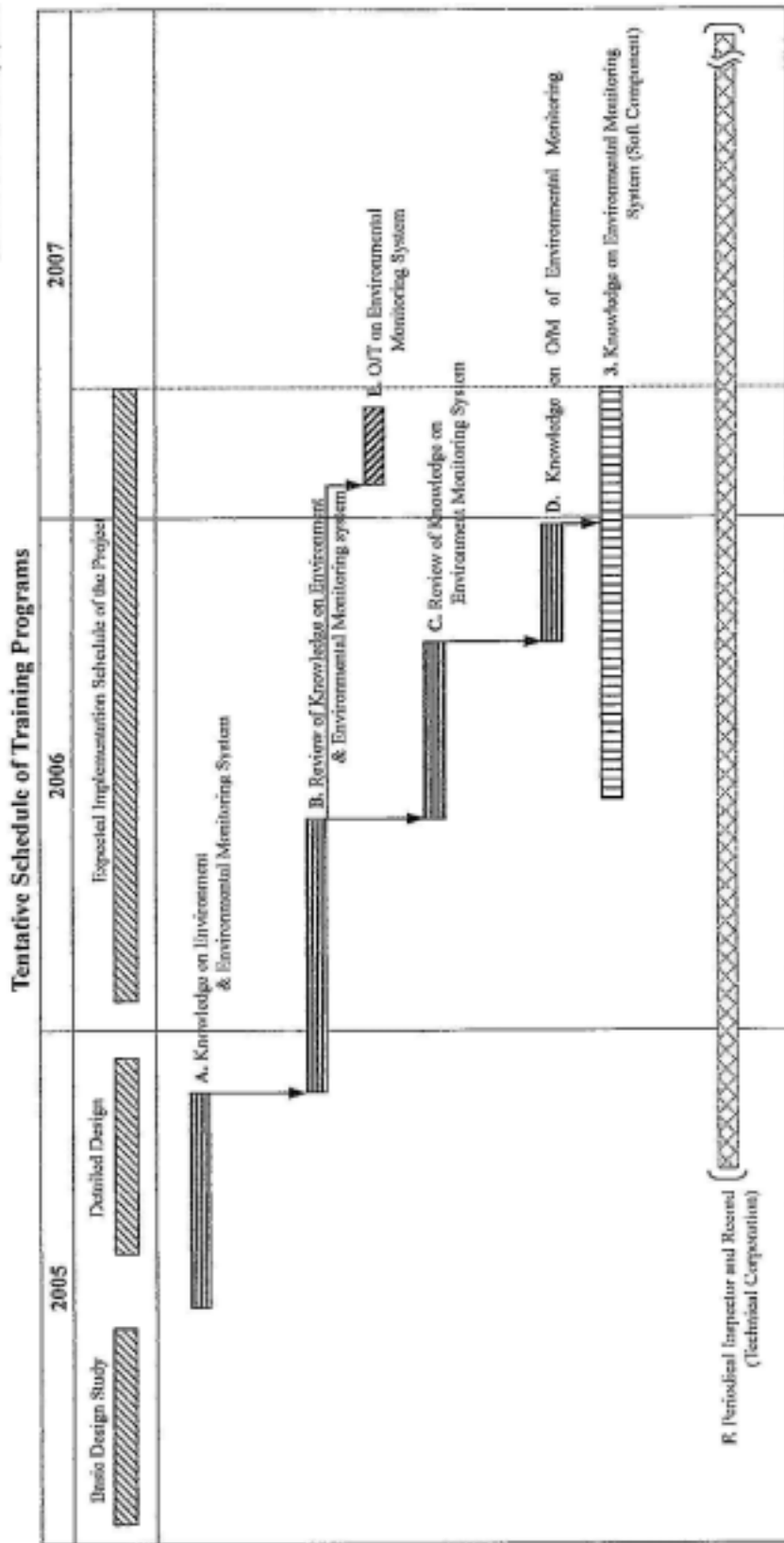
Course	Name	Content	Lecture	Practice	Possible Lecturer	Participant	Condition for Participation
W-5	Waste water measuring methods and examination	To understand measuring and analytical method of effluent from industries and treatment plant, and control equipment.	2 days	5 days	Engineer instrument producing company. JICA expert	Pak-EPA and Province Industries	Completion of W-1, W-2 and W-3
W-6	Industrial waste water treatment technology	To understand basic concept, wastewater treatment facilities design, maintenance and operation of treatment plant, pretreatment, wastewater purification by biological treatment, advanced treatment process and reuse, sludge treatment and volume reduction, and some examples	5 days	0 day	Engineer instrument producing company. JICA expert	Pak-EPA and Province Industries	Completion of W-5
W-7	Lake Eutrophication	To understand the mechanism of lake eutrophication, pollution sources, and control measure such as removing phosphate and nitrogen including by microbiology method	5 days	0 day	Professors university staff, JICA experts, senior volunteer. JOCV	Pak-EPA and Province Industries	Completion of W-5 and W-6

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Appendix-5

Basic Design Study for
the Project for Establishment of
Environmental Monitoring System



Training to be Conducted by EPA
 On-the-Job Training (OJT) to be Provided by Japanese Side (Manufacturer)
 Soft Component
 Technical Corporation

NOTE: The Project and all Trainings to be Provided by Japanese Side all Subject to the Japanese Governments Approval

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