

Amendment to:

A.)

Section I-Invitation for Bids (IFB)

Sl. No	Provisions as in Invitation for Bids (IFB) of published bid document	Modification now made (Blue)																																																						
1.	<p>Para 6 of IFB</p> <p>The Invitation for Bids (IFB) and the bidding documents are available at the Project website http://www.ncscm.org. Interested bidders can download the bidding documents and commence preparation of bids to gain time. The downloaded bidding document can be submitted along with non-refundable fee (through a demand draft) mentioned in the Table towards the cost of the bidding documents. However, in case of any discrepancy between the documents downloaded by the prospective bidder and the bidding documents (hard copy) available from the Project office, the latter shall prevail.</p> <p>The facility to download the bidding documents will be available from Dt. 03/03/2014 to Dt. 23/04/2014 up to 17.00Hrs.</p> <table border="0"> <tr> <td>(a)</td> <td>Price of bidding document (non-refundable)</td> <td>Rs. 2,100.00 (Including VAT)</td> </tr> <tr> <td>(b)</td> <td>Postal charges, inland</td> <td>Rs. 500.00</td> </tr> <tr> <td>(c)</td> <td>Postal charges, overseas</td> <td>Rs. 2,000.00</td> </tr> <tr> <td>(d)</td> <td>Date of commencement of sale of bidding document</td> <td>03/03/2014</td> </tr> <tr> <td>(e)</td> <td>Last date for sale of bidding document</td> <td>23/04/2014</td> </tr> <tr> <td>(f)</td> <td>Last date and time for receipt of bids</td> <td>23/04/2014 up to 10.00 Hrs</td> </tr> <tr> <td>(g)</td> <td>Date and Time of opening of bids</td> <td>24/04/2014 at 10.30 Hrs</td> </tr> <tr> <td>(h)</td> <td>Place of opening of bids</td> <td>National Centre for Sustainable Coastal Management, Ministry of Environment and Forests, Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India</td> </tr> <tr> <td>(i)</td> <td>Address for Communication</td> <td>National Centre for Sustainable Coastal Management, Ministry of Environment and Forests,</td> </tr> </table>	(a)	Price of bidding document (non-refundable)	Rs. 2,100.00 (Including VAT)	(b)	Postal charges, inland	Rs. 500.00	(c)	Postal charges, overseas	Rs. 2,000.00	(d)	Date of commencement of sale of bidding document	03/03/2014	(e)	Last date for sale of bidding document	23/04/2014	(f)	Last date and time for receipt of bids	23/04/2014 up to 10.00 Hrs	(g)	Date and Time of opening of bids	24/04/2014 at 10.30 Hrs	(h)	Place of opening of bids	National Centre for Sustainable Coastal Management, Ministry of Environment and Forests, Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India	(i)	Address for Communication	National Centre for Sustainable Coastal Management, Ministry of Environment and Forests,	<p>The Invitation for Bids (IFB) and the bidding documents are available at the Project website http://www.ncscm.org. 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However, in case of any discrepancy between the documents downloaded by the prospective bidder and the bidding documents (hard copy) available from the Project office, the latter shall prevail.</p> <p>The facility to download the bidding documents will be available from Dt.03/03/2014 to Dt. 12/05/2014 up to 17.00Hrs.</p> <table border="0"> <tr> <td>(a)</td> <td>Price of bidding document (non-refundable)</td> <td>Rs. 2,100.00 (Including VAT)</td> </tr> <tr> <td>(b)</td> <td>Postal charges, inland</td> <td>Rs. 500.00</td> </tr> <tr> <td>(c)</td> <td>Postal charges, overseas</td> <td>Rs. 2,000.00</td> </tr> <tr> <td>(d)</td> <td>Date of commencement of sale of bidding document</td> <td>03/03/2014</td> </tr> <tr> <td>(e)</td> <td>Last date for sale of bidding document</td> <td>12/05/2014</td> </tr> <tr> <td>(f)</td> <td>Last date and time for receipt of bids</td> <td>13/05/2014 up to 10.00 Hrs</td> </tr> <tr> <td>(g)</td> <td>Date and Time of opening of bids</td> <td>13/05/2014 at 10.30 Hrs</td> </tr> <tr> <td>(h)</td> <td>Place of opening of bids</td> <td>National Centre for Sustainable Coastal Management, Ministry of Environment and Forests, Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India</td> </tr> <tr> <td>(i)</td> <td>Address for Communication</td> <td>National Centre for Sustainable Coastal Management, Ministry of Environment and Forests,</td> </tr> </table>	(a)	Price of bidding document (non-refundable)	Rs. 2,100.00 (Including VAT)	(b)	Postal charges, inland	Rs. 500.00	(c)	Postal charges, overseas	Rs. 2,000.00	(d)	Date of commencement of sale of bidding document	03/03/2014	(e)	Last date for sale of bidding document	12/05/2014	(f)	Last date and time for receipt of bids	13/05/2014 up to 10.00 Hrs	(g)	Date and Time of opening of bids	13/05/2014 at 10.30 Hrs	(h)	Place of opening of bids	National Centre for Sustainable Coastal Management, Ministry of Environment and Forests, Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India	(i)	Address for Communication	National Centre for Sustainable Coastal Management, Ministry of Environment and Forests,
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	Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India Phone:914422300108 Fax: 9144 22200158
	Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India Phone: 914422300108 Fax: 91 44 2220 0158

B.)

Section II- Bidding Data Sheet (BDS)

Sl. No	Provisions as at Section II - Bidding Data Sheet of published bid document	Modification now made (Blue)
1.	ITB 24.1	
	<p>For bid submission purposes, the Purchaser's address is: National Centre for Sustainable Coastal Management Ministry of Environment and Forests Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India Phone: +91 44 22300108, Fax: 91 44 2220 0158 The deadline for the submission of bids is: Date: 24/04/2014 Time: 10:00 A.M. Add at the end of ITB Clause 24.1 the following: "In the event of the specified date for the submission of bids, being declared a holiday for the Purchaser, the bids will be received upto the appointed time on the next working day."</p>	<p>For bid submission purposes, the Purchaser's address is: National Centre for Sustainable Coastal Management Ministry of Environment and Forests Koodal Building, Anna University Campus, Chennai-600025, Tamil Nadu, India Phone: +91 44 22300108, Fax: 91 44 2220 0158 The deadline for the submission of bids is: Date: 13/05/2014 Time: 10:00 A.M. Add at the end of ITB Clause 24.1 the following: "In the event of the specified date for the submission of bids, being declared a holiday for the Purchaser, the bids will be received upto the appointed time on the next working day."</p>
2.	ITB 27.1	
	<p>The bid opening shall take place at: In The office of :- The Director National Centre for Sustainable Coastal Management Ministry of Environment and Forests Koodal Building, Anna University Campus Chennai-600025, Tamil Nadu, India Phone: +91 44 22300108, Fax: 91 44 2220 0158 Date: 24/04/2014 Time: 10.30A.M. Add at the end of ITB Clause 27.1 the following: "In the event of the specified date of the bid opening being declared a holiday for the Purchaser, the bids shall be opened at the appointed time and location on the next working day."</p>	<p>The bid opening shall take place at: In The office of :- The Director National Centre for Sustainable Coastal Management Ministry of Environment and Forests Koodal Building, Anna University Campus Chennai-600025, Tamil Nadu, India Phone: +91 44 22300108, Fax: 91 44 2220 0158 Date: 13/05/2014 Time: 10.30A.M. Add at the end of ITB Clause 27.1 the following: "In the event of the specified date of the bid opening being declared a holiday for the Purchaser, the bids shall be opened at the appointed time and location on the next working day."</p>

C.) Section VI. Schedule of Requirements: Technical Specifications

Lot 1. Environmental Scanning Electron Microscope

Specification as at Section VI - Schedule of Requirements-Lot 1. Technical Specifications			Modification now made (Blue)		
S.No.	Particulars	Specifications	Sl. No.	Particulars	Specifications
		<p>Lot 1: Environmental Scanning Electron Microscope A scanning electron microscope capable of excellent topographical and depth of field images with good contrast and high resolution details in high vacuum, low vacuum and environmental modes is required. The microscope should be capable of imaging applications and composition analysis with high sensitivity for conducting or non-conducting as well as hydrated specimens and wet specimens in their natural environ, without need for preparation. The detailed specification requirements are:</p>			<p>Lot 1: Environmental Scanning Electron Microscope A scanning electron microscope capable of excellent topographical and depth of field images with good contrast and high resolution details in high vacuum, low vacuum and environmental modes is required. The microscope should be capable of imaging applications and composition analysis with high sensitivity for conducting or non-conducting as well as hydrated specimens and wet specimens in their natural environ, without need for preparation. The detailed specification requirements are:</p>
1	Resolution(SE)	2.0 nm or better in High Vacuum mode at 30kV, 3.0 nm or better in low vacuum mode for observation of samples without coating and 8nm or better @1kv.	1	Resolution(SE)	3.0 nm or better in High Vacuum mode at 30kV, or better in low vacuum mode for observation of samples without coating.
2	Accelerating Voltage	From ≤ 200V to 30kV, continuously variable or if in steps step size of 10V or smaller	2	Accelerating Voltage	From ≤ 200V to 30kV, continuously variable or if in steps step size of 10V or smaller
3	Probe Current	1uA or more for better imaging in low vacuum mode.	3	Probe Current	1uA or more for better imaging in low vacuum mode.
4	Magnification	Minimum 10x to 10,00,000 x or better .	4	Magnification	Minimum 10x to 10,00,000 x or better .
5	Electron Source	High resolution Thermionic emission type. Capable of providing very high brightness in its class to facilitate good low voltage imaging needed for our applications	5	Electron Source	High resolution Thermionic emission type. Capable of providing very high brightness in its class to facilitate good low voltage imaging needed for our applications
6	Vacuum System	Should give ultra clean dry fast vacuum using air cooled Turbo Molecular Pump backed by Rotary pump without a need for additional water circulation unit. Equipped	6	Vacuum System	Should give ultra clean dry fast vacuum using air cooled Turbo Molecular Pump backed by Rotary pump without a need for additional water

		with fully automated valves, vacuum gauges with read out. Failsafe vacuum; Safety measures for electron column against any vacuum failure.			circulation unit. Equipped with fully automated valves, vacuum gauges with read out. Failsafe vacuum; Safety measures for electron column against any vacuum failure.
7	Pressure range	1. High vacuum mode Vacuum level < 5 x 10 ⁻⁴ Pa or less. Standard provision for pumping through the lens system 2.Variable pressure range for chamber must be at least 350 Pa or more 3. High pressure mode at least 2800pa with water vapor system suitable for observation of Hydrated sample.	7	Pressure range	1. High vacuum mode Vacuum level < 5 x 10 ⁻⁴ Pa or less. Standard provision for pumping through the lens system 2.Variable pressure range for chamber must be at least 350 Pa or more 3. High pressure mode at least 2800pa with water vapor system suitable for observation of Hydrated sample.
8	Stage Specification	5 axis motorized stage with movement facility for X = 120 mm or higher, Y = 120 mm or higher, Z = 5 – 50 mm or higher, Tilt = 0 to 70°, Rotation = 360° (continuous) .Facility of stage co-ordinate and recall must be provided. Stage navigation software must be provided.	8	Stage Specification	5 axis motorized stage or Equivalent movement facility for X = 120 mm or higher, Y = 120 mm or higher, Z = 5 – 50 mm or higher, Tilt = 0 to 70°, Rotation = 360° (continuous) .Facility of stage co-ordinate and recall must be provided. Stage navigation software must be provided.
9	Detectors	1. Secondary Electron Detector for use in high vacuum mode. 2. Solid state Back Scattered Electron Detector in all modes (High & low vacuum mode). Should be capable of providing excellent topographic and depth of field images in the BSE mode. 3. STEM detector for imaging ultra thin section sample. 4. Ionization based secondary electron detector for use in low vacuum mode. 5. Cathode luminescence detector .	9	Detectors	1. Secondary Electron Detector for use in high vacuum mode. 2. Solid state Back Scattered Electron Detector in all modes (High & low vacuum mode). Should be capable of providing excellent topographic and depth of field images in the BSE mode. 3. STEM detector for imaging ultra thin section sample. 4. Ionization based secondary electron detector for use in low vacuum mode. 5. Cathode luminescence detector .
10	X-ray Analytical working distance	9 mm or better to get High resolution imaging & Micro analysis in same working distance. Design should ensure only a very small interaction path (in VP mode) of 2mm or better for the electron beam in the ambient environment of the chamber in both imaging and elemental analysis applications.	10	X-ray Analytical working distance	9 mm or better to get High resolution imaging & Micro analysis in same working distance. Design should ensure only a very small interaction path (in VP mode) of 2mm or better for the electron beam in the ambient environment of the chamber in both imaging and elemental analysis applications.
11	Anti vibration air	Pneumatic vibration isolation system for better vibration	11	Anti vibration air	Pneumatic vibration isolation system for better

	table	isolation.		table	vibration isolation.
12	Image display & Processing	<p>1.Resolution: equal to or better than 3072 x 2304 pixels</p> <p>2. Should provide a range of integration and averaging modes to reduce the noise.</p> <p>3. Should enable saving of images to files of the following types: TIFF (8 or 16-bit, selectable by user) and/or BMP</p> <p>3. Image area selection – full frame, reduced raster, line X, line Y and spot modes, with independent setting of operational parameters such as line scan times, number of lines/frame etc.</p> <p>4.19-inch LCD</p> <p>5. Image from different detectors could be viewed simultaneously in a split-up view area of the monitor.</p> <p>6. Should provide simultaneous viewing capability of the images from more than one detector for comparison</p>	12	Image display & Processing	<p>1.Resolution: equal to or better than 3072 x 2304 pixels</p> <p>2. Should provide a range of integration and averaging modes to reduce the noise.</p> <p>3. Should enable saving of images to files of the following types: TIFF (8 or 16-bit, selectable by user) and/or BMP</p> <p>3. Image area selection – full frame, reduced raster, line X, line Y and spot modes, with independent setting of operational parameters such as line scan times, number of lines/frame etc.</p> <p>4.19-inch LCD</p> <p>5. Image from different detectors could be viewed simultaneously in a split-up view area of the monitor.</p> <p>6. Should provide simultaneous viewing capability of the images from more than one detector for comparison</p>
13	X-ray Analytical working distance	<p>9 mm or better to get High resolution imaging & Micro analysis in same working distance.</p> <p>Design should ensure only a very small interaction path (in VP mode) of 2mm or better for the electron beam in the ambient environment of the chamber in both imaging and elemental analysis applications.</p>	13	X-ray Analytical working distance	<p>9 mm or better to get High resolution imaging & Micro analysis in same working distance.</p> <p>Design should ensure only a very small interaction path (in VP mode) of 2mm or better for the electron beam in the ambient environment of the chamber in both imaging and elemental analysis applications.</p>
14	Anti vibration air table	Pneumatic vibration isolation system for better vibration isolation.	14	Anti vibration air table	Pneumatic vibration isolation system for better vibration isolation.
15	Image display & Processing	<p>1.Resolution: equal to or better than 3072 x 2304 pixels</p> <p>2. Should provide a range of integration and averaging modes to reduce the noise.</p> <p>3. Should enable saving of images to files of the following types: TIFF (8 or 16-bit, selectable by user) and/or BMP</p> <p>3. Image area selection – full frame, reduced raster, line X, line Y and spot modes, with independent setting of operational parameters such as line scan times, number of lines/frame etc.</p> <p>4.19-inch LCD</p>	15	Image display & Processing	<p>1.Resolution: equal to or better than 3072 x 2304 pixels</p> <p>2. Should provide a range of integration and averaging modes to reduce the noise.</p> <p>3. Should enable saving of images to files of the following types: TIFF (8 or 16-bit, selectable by user) and/or BMP</p> <p>3. Image area selection – full frame, reduced raster, line X, line Y and spot modes, with independent setting of operational parameters such as line scan times, number of lines/frame etc.</p>

		<p>5. Image from different detectors could be viewed simultaneously in a split-up view area of the monitor.</p> <p>6. Should provide simultaneous viewing capability of the images from more than one detector for comparison</p>			<p>4.19-inch LCD</p> <p>5. Image from different detectors could be viewed simultaneously in a split-up view area of the monitor.</p> <p>6. Should provide simultaneous viewing capability of the images from more than one detector for comparison</p>
16	Chamber	<p>1. Should be big enough to accommodate 250mm diameter or more sample size.</p> <p>2. IRCCD camera for observing stage and specimens Within the chamber without interfering with EM detectors.</p> <p>3. Should have minimum number of 11 chamber & door ports for accommodating various detectors & accessories.</p> <p>4. Should facilitate rapid specimen exchange</p>	16	Chamber	<p>1. Should be big enough to accommodate 250mm diameter or more sample size.</p> <p>2. IRCCD camera for observing stage and specimens Within the chamber without interfering with EM detectors.</p> <p>3. Should have minimum number of 11 chamber & door ports for accommodating various detectors & accessories.</p> <p>4. Should facilitate rapid specimen exchange</p>
17	Specimen type	Should give high quality images with good details and contrast for conducting or non conducting samples and for wet specimen or liquid suspended specimen without any artifacts in its native condition.	17	Specimen type	Should give high quality images with good details and contrast for conducting or non conducting samples and for wet specimen or liquid suspended specimen without any artifacts in its native condition.
18	Image Output / Recording Systems	Digital storage (in Tiff and/or other common image storage formats) through the control computer.	18	Image Output / Recording Systems	Digital storage (in Tiff and/or other common image storage formats) through the control computer.
19	Integrated Computer Environment Operating System	<p>a): Latest control computer with state of the art Intel processor (at least i7), compatible memory: at least 16GB, hard disc: 2x HDD SATA II at least 500GB 7.2k, DVD SuperMulti SATA, ATI Fire GL V8600 1GB, Gigabit Ethernet, , USB 2.0, More than 500 GB storage space. A high resolution large TFT screen with 19” diagonal, Windows operating system of latest version at the time of installation</p> <p>b) Control panel integrated to keyboard for easy adjustment of important microscope parameters like Focus, magnification ,Scan rate, Brightness & contrast, astigmatism, scan rotation, etc.</p> <p>c) Auto gun control and gun alignment, auto bias and</p>	19	Integrated Computer Environment Operating System	<p>a): Latest control computer with state of the art Intel processor (at least i7), compatible memory: at least 16GB, hard disc: 2x HDD SATA II at least 500GB 7.2k, DVD SuperMulti SATA, ATI Fire GL V8600 1GB, Gigabit Ethernet, , USB 2.0, More than 500 GB storage space. A high resolution large TFT screen with 19” diagonal, Windows operating system of latest version at the time of installation</p> <p>b) Control panel integrated to keyboard for easy adjustment of important microscope parameters like Focus, magnification ,Scan rate, Brightness & contrast, astigmatism, scan rotation, etc.</p>

		<p>auto saturation of gun condition.</p> <p>d)Automatic control of other features like focus, brightness and contrast etc.</p>			<p>c) Auto gun control and gun alignment, auto bias and auto saturation of gun condition.</p> <p>d)Automatic control of other features like focus, brightness and contrast etc.</p>
20	Accessories required for SEM	<ol style="list-style-type: none"> 1. Multipurpose Specimen holder for holding wide variety of samples. 2. Specimen preparation kit, 3. Cooling stage -20degree or lower to do in-situ experiments & for observation of Hydrated samples. 4. should have necessary EDS interface system to enable elemental mapping & integration to SEM (EXTIF) 5. Au Sputter coater for sample preparation. 	20	Accessories required for SEM	<ol style="list-style-type: none"> 1. Multipurpose Specimen holder for holding wide variety of samples. 2. Specimen preparation kit, 3. Cooling stage -20degree or lower to do in-situ experiments & for observation of Hydrated samples. 4. should have necessary EDS interface system to enable elemental mapping & integration to SEM (EXTIF) 5. Au Sputter coater for sample preparation.
21	EDS	<ol style="list-style-type: none"> 1. Capability to detect elements with atomic number ≥ 5 (i.e. from B onwards) 2. Totally Liquid Nitrogen free Silicon Drift Detector (SDD) 3. Resolution at Mn-Kα should be equal to 130eV or better (lower in magnitude) and < 60 eV for C Kα (conforming to ISO 15632:2002 specifications) 4. Acquisition and analysis software with the following features: <ul style="list-style-type: none"> ➤ Quantitative and qualitative analysis ➤ Dot mapping ➤ Elemental line scans ➤ Automatic spectrum acquisition at multiple pre-defined locations ➤ Elemental mapping and save mapped images in different colours ➤ Capability to add, subtract and otherwise manipulate elemental images 5. Detector area should be 10mm² 	21	EDS	<ol style="list-style-type: none"> 1. Capability to detect elements with atomic number ≥ 5 (i.e. from B onwards) 2. Totally Liquid Nitrogen free Silicon Drift Detector (SDD) 3. Resolution at Mn-Kα should be equal to 130eV or better (lower in magnitude) and < 60 eV for C Kα (conforming to ISO 15632:2002 specifications) 4. Acquisition and analysis software with the following features: <ul style="list-style-type: none"> ➤ Quantitative and qualitative analysis ➤ Dot mapping ➤ Elemental line scans ➤ Automatic spectrum acquisition at multiple pre-defined locations ➤ Elemental mapping and save mapped images in different colours ➤ Capability to add, subtract and otherwise manipulate elemental images 5. Detector area should be 10mm²
22	Accessories required for SEM	<ol style="list-style-type: none"> 1. Multipurpose Specimen holder for holding wide variety of samples. 2. Specimen preparation kit, 3. Cooling stage -20degree or lower to do in-situ 	22	Accessories required for SEM	<ol style="list-style-type: none"> 1. Multipurpose Specimen holder for holding wide variety of samples. 2. Specimen preparation kit, 3. Cooling stage -20degree or lower to do in-situ

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24	Correlative microscopy	<p>Equipment offered should provide capability for loading and using any available digital image of the specimen as a means of correlative examination / specimen navigation to select the useful imaging region quickly.</p> <p>Equipment supplier may optionally quote for facilities / attachments necessary for interfacing of optical microscope/Laser scanning microscopes with SEM for image acquisition and analysis.</p> <p>Software capability to image in epifluorescence and scanning electron microscope modes.</p>	24	Correlative microscopy	<p>Equipment offered should provide capability for loading and using any available digital image of the specimen as a means of correlative examination / specimen navigation to select the useful imaging region quickly.</p> <p>Equipment supplier may optionally quote for facilities / attachments necessary for interfacing of optical microscope/Laser scanning microscopes with SEM for image acquisition and analysis.</p> <p>Software capability to image in epifluorescence and</p>

					scanning electron microscope modes.
25	Other Standard Requirements	<ul style="list-style-type: none"> ❖ Uninterrupted power supply for 1 hour stand alone operation ❖ Up-gradation possibility with all advanced and future features offered ❖ Spares and consumables: to be included for five-year operation assuming a standard inflow of samples ❖ Standard tool kit to be provided ❖ Documentation: Complete detailed documentation regarding Operation and all service manuals and relevant instructions for proper upkeep to be provided <p>All relevant optional features other than the above requested may also be quoted</p>	25	Other Standard Requirements	<ul style="list-style-type: none"> ❖ Uninterrupted power supply for 1 hour stand alone operation ❖ Up-gradation possibility with all advanced and future features offered ❖ Spares and consumables: to be included for five-year operation assuming a standard inflow of samples ❖ Standard tool kit to be provided ❖ Documentation: Complete detailed documentation regarding Operation and all service manuals and relevant instructions for proper upkeep to be provided <p>All relevant optional features other than the above requested may also be quoted</p>

Lot 2. Portable Spectro-radiometer with accessories

Schedule of Requirements-Lot 2. Technical Specifications			Modification now made (Blue)		
S.No.	Particulars	Specifications	Sl. No.	Particulars	Specifications
		A. Standard specifications			A. Standard specifications
1		Portable Spectroradiometer with standard calibration certificates, that can measure spectral radiance, irradiance, reflectance in the wavelength range : 350-2500 nm			Portable Spectroradiometer with standard calibration certificates, that can measure spectral radiance, irradiance, reflectance in the wavelength range : 350-2500 nm
2		Spectral Resolution : 3 nm or less in 350-1000nm region and 8nm or less at 1400nm and 2100nm			Spectral Resolution : 3 nm or less in 350-1000nm region and 8nm or less at 1400nm and 2100nm
3		Bandwidth Sampling Interval : 2 nm or less for 350 – 2500 nm			Bandwidth Sampling Interval : 2 nm or less for 350 – 2500 nm
4		Light path input: fiber optic cable to channel directly the light to the instrument with 25 degree FOV			Light path input: fiber optic cable to channel directly the light to the instrument with 25 degree FOV
5		Digitization : Minimum 16 bit			Digitization : Minimum 16 bit
6		Channels : 2000 and above			Channels : 2000 and above
7		Stray light : 0.02 % or better in 350- 1000nm region and 0.01% or better in 1000-2500 nm region			Stray light : 0.02 % or better in 350- 1000nm region and 0.01% or better in 1000-2500 nm region
8		Wavelength Reproducibility: 0.1 nm or better			Wavelength Reproducibility: 0.1 nm or better

9		Wavelength accuracy: 0.5nm or better			Wavelength accuracy: 0.5nm or better
10		Calibrated white reference panel of 10" x 10" or more with the protective wooden case			Calibrated white reference panel of 10" x 10" or more with the protective wooden case
11		Data collection device for necessary of data acquisition, recording, processing and display of data			Device for necessary data acquisition, recording, processing and display of data.
12		Software			Software
		(a) Spectral acquisition software with a provision to view and save spectral data along			(a) Spectral acquisition software with a provision to view and save spectral data along
		with GPS co-ordinates and to save temperature, humidity from external detector.			with GPS co-ordinates and to save temperature, humidity from external detector.
		(b) Spectral acquisition software with a provision to view and save spectral data for			(b) Spectral acquisition software with a provision to view and save spectral data for
		creating spectral libraries and to predict the unknown spectra while acquiring the spectral data			creating spectral libraries and to predict the unknown spectra while acquiring the spectral data
		(c) Spectral processing software for exporting data in other formats (ASCII, ENVI, etc.) and provision for resolving the spectrum into spectral bands by averaging and integration.			(c) Spectral processing software for exporting data in other formats (ASCII, ENVI, etc.) and provision for resolving the spectrum into spectral bands by averaging and integration.
13		Communication Interface: wired and wireless Ethernet interface			Communication Interface: wired and wireless Ethernet interface
14		Diagnostics features: fiber optic cable checker			Diagnostics features: fiber optic cable checker
15		Provision for back pack arrangement			Provision for back pack arrangement
16		Calibration			Calibration
		Radiometric calibration for radiance measurements for each FOV and for irradiance measurements.			Radiometric calibration for radiance measurements for each FOV and for irradiance measurements.
17		Power Supply and Charging Facility			Power Supply and Charging Facility
		Battery 2 Nos. (1+1 spare) capable of 4hrs continuous functioning			Battery 2 Nos. (1+1 spare) capable of 4hrs continuous functioning
		Compatible Charger and charging cables 2 Nos. (1+1 spare)			Compatible Charger and charging cables 2 Nos. (1+1 spare)
		B. Required Accessories :			B. Required Accessories :
		1. FOV : 1°, 10° lens to attach with standard fibre optic cable for reflectance and radiance measurements			1. FOV : 1°, 2°, 4°, 5°, 8°, 14° lens to attach with standard fibre optic cable for reflectance and radiance measurements

		2. Remote Cosine Receptor for irradiance measurement			2. Remote Cosine Receptor for irradiance measurement
		3. Accessories for Contact reflectance measurements with different illumination source for mineral and vegetation samples with clip assembly			3. Accessories for Contact reflectance measurements with different illumination source for mineral and vegetation samples with clip assembly
		4. Spotting scope for optimal viewing			4. Spotting scope for optimal viewing
		5. Illumination source with suitable tripods for collecting spectral data in the lab			5. Illumination source with suitable tripods for collecting spectral data in the lab
		6. External detector to measure temperature, humidity, illumination etc in the field			6. External detector to measure temperature, humidity, illumination etc in the field
		7. Integrating sphere for total hemispherical reflectance and transmittance measurements along with suitable power supply and accessories			7. Integrating sphere for total hemispherical reflectance and transmittance measurements along with suitable power supply and accessories

LOT 3. In situ Infra-Red Gas Analyzer to measure CO₂ (Carbon-di-oxide) and Water Vapor in Atmosphere

Technical Specifications			Modification now made (Blue)		
Sl. No.	Particulars	Specifications	Sl. No.	Particulars	Specifications
	General	The instrument should be capable of high quality <i>in situ</i> CO ₂ & H ₂ O measurement by using Non-Dispersive Infrared principle	1	General	The instrument should be capable of high quality <i>in situ</i> CO₂ & H₂O measurement by using Non-Dispersive Infrared principle or any equivalent principle provided the accuracy and quality of the instrument remain as per our requirements or better.
1		a. CO₂	2		a. CO₂
	System specifications	· Measurement Range: 0- 18,000 ppm		System specifications	· Measurement Range: 0- 18,000 ppm
		· Accuracy: 1% of the reading or less			· Accuracy: 1% of the reading or less
		· Calibration Drift			· Calibration Drift
		o Zero Drift (change with temperature at 0 concentration): 0.15 ppm/°C or less			o Zero Drift (change with temperature at 0 concentration): 0.15 ppm/°C or less
		o Span Drift(residual error after re-zeroing following a temperature change): <0.05%/°C or less			o Span Drift(residual error after re-zeroing following a temperature change): <0.05%/°C or less
2		· Total Drift at 370 ppm(change with			· Total Drift at 370 ppm(change with

		temperature without re-zeroing or re-spanning): 0.5 ppm/ °C or less			temperature without re-zeroing or re-spanning): 0.5 ppm/ °C or less
		· Sensitivity to water vapor: 1.0 ppm CO ₂ /mmol/mol H ₂ O or less			· Sensitivity to water vapor: 1.0 ppm CO ₂ /mmol/mol H ₂ O or less
		· Noise: Less than 1 ppm at 370 ppm for CO ₂			· Noise: Less than 1 ppm at 370 ppm for CO ₂
		· Traceability: Traceable to gases to WMO standards for CO ₂ .			· Traceability: Traceable between 0-3000 ppm equivalent to WMO standards for CO₂.
3		· Pressure Compensation Range: 15 kPa-115 kPa			· Pressure Compensation : It should be capable of compensating any change in atmospheric pressure caused due to change in the altitude (from mean sea level to 6000 meter), without affecting the accuracy of CO₂ and H₂O measurements.
		· Maximum Gas Flow Rate: 1 liter/min			Deleted
		· Calibration: Zero and span calibration option should be there for CO ₂			· Calibration: Zero and span calibration option should be there for CO ₂
		b. H₂O			b. H₂O
		· Measurement Range: 0-50 mmol/mol			· Measurement Range: 0-50 mmol/mol
		· Accuracy: 1.5% of reading or less			· Accuracy: 1.5% of reading or less
		· Calibration drift			· Calibration drift
					Calibration should be possible by using a due point generator.
		o Zero Drift at 0 mmol/mol: 0.005 mmol/mol°C or less			o Zero Drift at 0 mmol/mol: 0.005 mmol/mol°C or less
		o Span Drift at 10 mmol/mol: 0.05%/°C or less			o Span Drift at 10 mmol/mol: 0.05%/°C or less
		o Total Drift at 10 mmol/mol: 0.01 mmol/mol/°C or less			o Total Drift at 10 mmol/mol: 0.01 mmol/mol/°C or less
		· Sensitivity to CO ₂ : 0.0001 mmol/mol H ₂ O/ppm CO ₂ or less			· Sensitivity to CO ₂ : 0.0001 mmol/mol H ₂ O/ppm CO ₂ or less
		· RMS Noise at 10 mmol/mol with 1 sec signal filtering: <0.01 mmol/mol			Deleted
	Accessories	Diaphragm pump (preferred Charles Austen Pumps / equivalent pumps with flow meter) for optimum <i>in-situ</i> measurement (<1 l/min;			Diaphragm pump (preferred Charles Austen Pumps / equivalent pumps with flow meter) for optimum <i>in-situ</i> measurement (<1 l/min;

		<700 gm) and other required accessories (battery charger etc.) should also be quoted			<700 gm) and other required accessories (battery charger etc.) should also be quoted
	Power Requirements	· ~Input Voltage 12-30 VDC		Power Requirements	· ~ Input Voltage 12-30 VDC
	Operating conditioned	· Operating Temperature Range: -5°C to +45°C		Operating conditioned	· Operating Temperature Range: -5°C to +45°C
		· Relative Humidity Range: 0 to 99% RH, Non-condensing			· Relative Humidity Range: 0 to 99% RH, Non-condensing

Lot 4. In situ Gas Analyzer to measure CH₄ (Methane) in Atmosphere

Schedule of Requirements-Lot 4. Technical Specifications			Modification now made (Blue)		
S.No.	Particulars	Specifications	Sl. No.	Particulars	Specifications
1	General	· The instrument should be capable of high quality continuous monitoring of <i>in situ</i> CH ₄	1	General	· The instrument should be capable of high quality continuous monitoring of <i>in situ</i> CH ₄
		a. CH ₄	2		a. CH ₄
2.	System specifications			System specifications	
		Resolution (RMS noise): 10 ppb at 10 Hz and 2000 ppb of CH ₄ concentration			Resolution (RMS noise): 10 ppb at 10 Hz and 2000 ppb of CH ₄ concentration
		Measurement Range: 0 to 25 ppm at -25 °C, 0 to 40 ppm at 25 °C			Measurement Range: 0 to 25 ppm at -25 °C, 0 to 40 ppm at 25 °C
		Communication: Ethernet (up to 40 Hz)			Communication: Ethernet (up to 40 Hz)
		Detection method: Wavelength Modulation Spectroscopy 2f detection or equivalent			Detection method: Wavelength Modulation Spectroscopy 2f detection or equivalent
		Linearity: Within 1% of reading or less			Linearity: Within 1% of reading or less
		Operating Pressure Range: within 50 to 110 kPa (Repeat as in CO ₂)			Operating Pressure : It should be capable of compensating any change in atmospheric pressure caused due to change in the altitude (from mean sea level to 6000 meter), without affecting the accuracy of CO₂ and H₂O measurements.
		Output Bandwidth: up to 20 Hz			Output Bandwidth: Selectable Band Width ~1, 2, 5, 10 or 20 Hz or better
		Operating Temperature Range: -25 to 50 °C			Operating Temperature Range: -25 to 50 °C
		Power Requirements: 10.5 to 30 VDC			Power Requirements: 10.5 to 30 VDC
		· Operating Temperature Range: -25° to 50° C, Humidity 5-95%			· Operating Temperature Range: -25° to 50° C, Humidity 5-95%

				Tripod	one (~10 ft) tripod for mounting the CH₄ analyser could be quoted separately
	User Interface:	Windows® based software supports all setup, configuration, and calibration functions through Ethernet connection		User Interface:	Windows® based software supports all setup, configuration, and calibration functions through Ethernet connection
	Power Consumption:	~12 W nominal, 16 W during cleaning cycle		Power Consumption:	~12 W nominal, 16 W during cleaning cycle
	Data Communication:	· Ethernet		Data Communication:	· Ethernet
		· Synchronous Devices for Measurement (SDM)			· Synchronous Devices for Measurement (SDM)
		· RS-232			· RS-232
		· DAC			· DAC
	Data Storage	· Removable USB Storage Device. 2 Gigabyte Provided (expandable with user supplied Industrial Grade USB Flash Drive)		Data Storage	· Removable USB Storage Device. 2 Gigabyte Provided (expandable with user supplied Industrial Grade USB Flash Drive)

Lot 5. Eddy Covariance System to measure CH₄/CO₂/H₂O Fluxes

Schedule of Requirements-Lot 5. Technical Specifications			Modification now made (Blue)		
S.No.	Particulars	Specifications	Sl. No.	Particulars	Specifications
1	General	The instrument should be capable of Synchronizing CO ₂ & H ₂ O; and CH ₄ data with sonic anemometer data.	1	General	The instrument should be capable of Synchronizing CO ₂ & H ₂ O; and CH ₄ data with sonic anemometer data.
		It include a micro- meteorological sensor for energy balance studies			It include a micro- meteorological sensor for energy balance studies
2		a. Three axis Sonic anemometer– (Independent instrument/unit) - 1 No.	2		a. Three axis Sonic anemometer– (Independent instrument/unit) - 1 No.
	System specifications	Baud Rate ~ 2400 – 115200; Format ASCII, RS-232		System specifications	Baud Rate ~ 2400 – 115200; Format ASCII, RS-232
		User selectable full scale wind speed			User selectable full scale wind speed
		Output Parameter: 1, 2, 4, 8, 10, 16, 20 & 32 Hz			Output Parameter: 1, 2, 4, 8, 10, 16, 20 & 32 Hz
		Should operate under Humidity < 5% to 99% RH and Precipitation Operation to 200 mm per hour			Should operate under Humidity < 5% to 99% RH and Precipitation Operation to 200 mm per hour
		Ambient Temperature Range: +5 °C to + 50 °C operating, -10 °C to + 50 °C storage			Ambient Temperature Range: +5 °C to + 50 °C operating, -10 °C to + 50 °C storage

		Cable for connecting the output of Sonic Anemometer to Analyzer Interface.			Cable for connecting the output of Sonic Anemometer to Analyzer Interface.
		Wind Speed: 0 to 40 m/s (0 to 90 mph)			Wind Speed: 0 to 40 m/s (0 to 90 mph)
		Resolution: 0.01 m/s			Resolution: 0.01 m/s
		Threshold: 0.01 m/s			Threshold: 0.01 m/s
		Accuracy: $\pm 1\% \pm 0.05\text{m/s}$ (30 m/s), $\pm 3\%$ (40 m/s)			Accuracy: $\pm 1\% \pm 0.05\text{m/s}$ (30 m/s), $\pm 3\%$ (40 m/s)
		Wind Direction: 0 to 360 degrees			Wind Direction: 0 to 360 degrees
		Elevation Range: ± 60 degrees			Elevation Range: ± 60 degrees
		Resolution: 0.1 degree			Resolution: 0.1 degree
		Accuracy: ± 2 degrees (30 m/s), ± 5 degrees (40 m/s)			Accuracy: ± 2 degrees (30 m/s), ± 5 degrees (40 m/s)
		Should include carrying case, anemometer mount and serial interface cable.			Should include carrying case, anemometer mount and serial interface cable.
		Analyzer interface: - 1 No.			Analyzer interface: - 1 No.
		For Data Storage: removable USB Storage Device – at least 16 GB			For Data Storage: removable USB Storage Device – at least 16 GB
		Data Communication: Ethernet, SDM, RS-232,			Data Communication: Ethernet, SDM, RS-232,
		Should be able to connect directly to local Area Network with Ethernet Connection.			Should be able to connect directly to local Area Network with Ethernet Connection.
		With built-in Pressure Sensor range: 0 to 1115 kPaA. Accuracy : 1%			With built-in Pressure Sensor range: 0 to 1115 kPaA. Accuracy : 1%
		b. Eddy covariance system for CH₄/CO₂/H₂O flux measurement- 1 No.			b. Eddy covariance system for CH₄/CO₂/H₂O flux measurement- 1 No.
	i. CH ₄ analyzer	Field installable for CH ₄ Measurement		i. CH ₄ analyzer	Field installable for CH ₄ Measurement
		Resolution (RMS Noise): 5 ppb @ 10 Hz.			Resolution (RMS Noise): 5 ppb @ 10 Hz.
		Measurement Range: 0 to 50 ppm			Measurement Range: 0 to 50 ppm
		Data Communication: Ethernet (up to 40Hz)			Data Communication: Ethernet (up to 40Hz)
		Accuracy: < 1% of reading.			Accuracy: < 1% of reading.
		Operating Temp. Range: - 25 deg C to + 50 deg C.			Operating Temp. Range: - 25 deg C to + 50 deg C.
		Power Requirement: ~ 10.5 to 30 VDC.			Power Requirement: ~ 10.5 to 30 VDC.
	ii. <u>CO₂/H₂O analyzer</u>	High Precision: 0.08ppm CO ₂ RMS @ 5Hz		ii. <u>CO₂/H₂O analyzer</u>	High Precision: 0.08ppm CO ₂ RMS @ 5Hz
		0.0034 ppt H ₂ O RMS @ 5Hz			0.0034 ppt H ₂ O RMS @ 5Hz
		Bandwidth: 5, 10, or 20 Hz, user-selectable.			Bandwidth: 5, 10, or 20 Hz, user-selectable.

	<u>CO₂</u> :	Calibration range 0-3000 ppm with 1% accuracy		<u>CO₂</u> :	Calibration range 0-3000 ppm with 1% accuracy
		Zero drift (per °C) ±0.1 ppm to ±0.3 ppm			Zero drift (per °C) ±0.1 ppm to ±0.3 ppm
		RMS noise @ 370 ppm CO ₂ and 10 mmol mol ⁻¹ H ₂ O:- 5 Hz 0.08 ppm ; 10 Hz 0.11 ; 20 Hz 0.16			RMS noise @ 370 ppm CO ₂ and 10 mmol mol ⁻¹ H ₂ O:- 5 Hz 0.08 ppm ; 10 Hz 0.11 ; 20 Hz 0.16
		Gain drift /°C: % of ±0.02% ±0.1% max. @ 370 ppm			Gain drift /°C: % of ±0.02% ±0.1% max. @ 370 ppm
		Direct sensitivity to H ₂ O : ±2.00E-05 to±4.00E-05 (mol CO ₂ /mol H ₂ O)			Direct sensitivity to H ₂ O : ±2.00E-05 to±4.00E-05 (mol CO ₂ /mol H ₂ O)
	<u>H₂O</u>	Calibration range 0 - 60 ppt with 2 % accuracy		<u>H₂O</u>	Calibration range 0 - 60 ppt with 2 % accuracy
		Zero drift (per °C) ±0.03 ppt to ±0.05 ppt			Zero drift (per °C) ±0.03 ppt to ±0.05 ppt
		RMS noise @ 370 ppm CO ₂ and 10 mmol mol ⁻¹			RMS noise @ 370 ppm CO ₂ and 10 mmol mol ⁻¹
		H ₂ O: 5 Hz 0.0034 ppt ; 10 Hz 0.0047ppt ; 20 Hz 0.0067 ppt			H ₂ O: 5 Hz 0.0034 ppt ; 10 Hz 0.0047ppt ; 20 Hz 0.0067 ppt
		Gain drift /°C: % of ±0.15% ±0.30% max. @ 20 ppt			Gain drift /°C: % of ±0.15% ±0.30% max. @ 20 ppt
		Direct sensitivity to CO ₂ : ±0.02 to ±0.05 (mol H ₂ O/mol CO ₂)			Direct sensitivity to CO ₂ : ±0.02 to ±0.05 (mol H ₂ O/mol CO ₂)
3	Slow response meteorological sensors:	(a) Air Temperature & RH Sensor	3	Slow response meteorological sensors:	(a) Air Temperature & RH Sensor
		Air Temp. sensor: Range: - 80 to + 60°C; Accuracy: +/- 0.2°			Air Temp. sensor: Range: - 80 to + 60°C; Accuracy: +/- 0.2°
		RH Sensor: Range: 0 to 100%; Accuracy: +/- 1%			RH Sensor: Range: 0 to 100%; Accuracy: +/- 1%
		(b) Barometric pressure sensor (In-built)			(b) Barometric pressure sensor (In-built)
		Range: 15kPa -115 kPa; Accuracy: +/- 1.5% VFss			Range: ~ 15kPa -115 kPa; Accuracy: +/- 1.5% VFss
		(c) Soil Temperature Sensor - 3 Nos.			(c) Soil Temperature Sensor - 3 Nos.
		Range: -40 to 100°C; Accuracy: +/- 0.2°C			Range: -40 to 100°C; Accuracy: +/- 0.2°C
		(d) Soil Moisture Sensor - 3 Nos.			(d) Soil Moisture Sensor - 3 Nos.
		Range: 0 to Saturation , or 0-1.5V on voltage range			Range: 0 to Saturation , or 0-1.5V on voltage range
		Accuracy: <5%; Response time: 5sec; Operating temperature range: -10 to 70°c			Accuracy: <5%; Response time: 5sec; Operating temperature range: -10 to 70°c
		(e) Soil Heat Flux Plate Sensor - 3 Nos.			(e) Soil Heat Flux Plate Sensor - 3 Nos.
		Range: +/-150 W/m ² ; Accuracy: +/- 3%			Range: +/-150 W/m ² ; Accuracy: +/- 3%
		Temp range: -30°C to 70°C			Temp range: -30°C to 70°C
		(f) Tipping Bucket Rain Gauge:			(f) Tipping Bucket Rain Gauge:
		Accuracy: 1.0% up to 50 mm/hr; Output resolution:			Accuracy: 1.0% up to 50 mm/hr; Output

		0.25mm			resolution: 0.25mm
		(g) 4 Component Net radiation sensor			(g) 4 Component Net radiation sensor
		Spectral range for shortwave sensor : 300 to 2800nm			Spectral range for shortwave sensor : 300 to 2800nm
		Spectral range for long wave sensors: 4.5 to 42 μm response time : < 18 s temperature dependence of sensitivity: < 5 %			Spectral range for long wave sensors: 4.5 to 42 μm response time : < 18 s temperature dependence of sensitivity: < 5 %
		(h) Data logger : Sutron or equivalent Data Logger			(h) Data logger : Sutron or equivalent Data Logger
		No. of channel: ~ 8 digital I/Os & 10 Analogue + 10 CH expanded are sufficient for above mention Weather Sensors.			No. of channel: ~ 8 digital I/Os & 10 Analogue + 10 CH expanded are sufficient for above mention Weather Sensors.
		Wide Operating Temperature (-40 to +60°C), Remote Access & Control (XTerm Software), Flexible Scheduling, Custom Programming (BASIC, C++), Battery Operated, Low Power (<3.0 mA quiescent), Secure access (user names & passwords).			Wide Operating Temperature (-40 to +60°C), Remote Access & Control (XTerm Software), Flexible Scheduling, Custom Programming (BASIC, C++), Battery Operated, Low Power (<3.0 mA quiescent), Secure access (user names & passwords).
5	Preconfigured Weather proof Enclosure	Should include: Enclosure, 2 circuit breakers, A relay, terminal strip, pre-tripped and pre-mounted wires, a metallic mounting plate, grounding lugs, hardware to mount, Data Logger, grommets & caps and assembly Tools etc.	5	Preconfigured Weather proof Enclosure	Should include: Enclosure, 2 circuit breakers, A relay, terminal strip, pre-tripped and pre-mounted wires, a metallic mounting plate, grounding lugs, hardware to mount, Data Logger, grommets & caps and assembly Tools etc.
6	Accessories	Diaphragm pump (preferred Charles Austen Pumps / equivalent pumps with flow meter) for optimum <i>in-situ</i> measurement (<1 l/min; <700 gms) and other required accessories (battery charger etc.) should also be quoted	6		All mandatory accessories (Diaphragm pump battery charger etc.) should be quoted.
7	Mounting Tower /Tripod ~10 ft.	Standard Cross Fitting; Swivel Cross Fitting; Cross Arm Kit & Nu-Rail; Criss Bar. Analyzer Mounting Kit; Radiation Sensor Bracket.	7	Tripod (~10 ft) and Mounting Tower (mobile) .	Standard Cross Fitting; Swivel Cross Fitting; Cross Arm Kit & Nu-Rail; Criss Bar. Analyzer Mounting Kit; Radiation Sensor Bracket. Canopy height ~10 m, The mounting tower (15 meters) should be quoted as optional item.
8	Data Communication	Logs Data to an internal removable storage device at upto 20 Hz.	8	Data Communication	Logs Data to an internal removable storage device at upto 20 Hz.
		Ethernet for world-wide connectivity and data transfer.			Ethernet for world-wide connectivity and data transfer.
		Data Storage: Removable Industrial Grade USB Drive. 16 GB Industrial Grade USB Drive to be supplied with basic system.			Data Storage: Removable Industrial Grade USB Drive. 16 GB Industrial Grade USB Drive to be supplied with basic system.

		Data Communication: Ethernet, Synchronous Device for Measurement, RS-232(115,200 baud rate)			Data Communication: Ethernet, Synchronous Device for Measurement, RS-232(115,200 baud rate)
		Input Ethernet, 4 Analogue input channels			Input Ethernet, 4 Analogue input channels
9	Software	Suitable software for Flux Calculations should be available with the System	9	Software	Suitable software for Flux Calculations should be available with the System
		Smart Flux Accessory for use in Interface for direct Flux Calculations			Smart Flux Accessory for use in Interface for direct Flux Calculations