



Form GSOP 1-PIN (04/98)

STATE OF CALIFORNIA
Department of General Services - Office of Procurement

PURCHASE ORDER

Purchase Order No.	Rev.	Date
62190		6/30/2008

Supplier No.	Solicitation No.	Delivery Date	FOB Point	Invoice Terms
755028	57009	45 Days ARO	Destination	

ALL BUSINESS MACHINES, INC.
2555 3RD. STREET S 100
SACRAMENTO, CA 95818
Attn: JIM PAGLUICA

Phone: 916-325-7800

S	CA DEPT OF PUBLIC HEALTH	C	CA DEPT PUBLIC HEALTH
h	SANITATION RADIATION LAB	h	SANITATION RADIATION LAB
i	850 MARINA BAY PKWY G-164	r	850 MARINA BAY PKWY G-16
o		o	
P	RICHMOND, CA 94804	e	RICHMOND, CA 94804

Agency Billing	Agency Purchase Estimate	Purchase Estimate	Revision
83644	22394-07-5680	67140	1

Agency Contact	Phone	Date Received
SAIRA HAMID	510-620-2914	

Item No.	Quantity	Unit	Commodity Code	Description	Unit Price	Extension
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THE GENERAL PROVISIONS FOR NON-IT COMMODITIES ARE HEREBY INCORPORATED BY REFERENCE. THESE GENERAL PROVISIONS CAN BE OBTAINED BY PHONING (916) 375-4400 OR BY ACCESSING OUR WEBSITE AT:

www.documents.dgs.ca.gov/pd/modellang/GPnonIT0407.pdf

THE FOLLOWING INFORMATION IS PROVIDED FOR AGENCY USE ONLY:

PRIME CONTRACTOR: SB

FOR THE PURPOSE OF THIS AWARD, ONLY F.O.B. Destination will be accepted.

This Purchase order has been registered into the state contact and procurement registration system (<https://www.scprs.dgs.ca.gov/>). The registration number is: 17600908333863.

1	1	EA	6650-566-0107-5	SPECTROMETER (AS DESCRIBED) Inductively Coupled Plasma-Mass Spectrometer in accordance to Specification #6630-0074 of (5) five pages, dated August 8, 2008. Training included for (2) two days onsite for (2) two operators.	135,705.3200	135,705.32
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Brand: AGILENT
Model: H2149A

Total Value: 135,705.32

Sales and/or use tax to be extra unless noted above

Buyer	Phone	BOC Number
GUS QUINTERO	916-375-4499	

PURCHASE ORDER CONTINUATION

<i>Purchase Order No.</i>	<i>Revision</i>	<i>Date</i>	<i>Supplier No.</i>	<i>Supplier Name</i>
62190		6/30/2008	755028	ALL BUSINESS MACHINES,INC.

<i>Item No.</i>	<i>Quantity</i>	<i>Unit</i>	<i>Commodity Code</i>	<i>Description</i>	<i>Unit Price</i>	<i>Extension</i>
<p><u>MANUALS:</u> Vendor shall provide, upon request by the State, a copy of necessary functional manuals, adjustment manuals, schematic diagrams and parts catalogues. Parts for equipment are to be available for each model and available for purchase by the State at no greater cost than published list prices.</p> <p><u>WARRANTY:</u> Equipment shall operate satisfactorily and have a minimum warranty period of one year from date of delivery to the State. Vendor shall bear all material, labor and transportation costs for repair of defects and failures occurring within the warranty period.</p> <p>This purchase order is being awarded on September 23, 2008 pursuant to Government Code Section 13332.17. Any encumbrances made pursuant to this purchase order shall be construed to have been made on the last day of the preceding fiscal year.</p> <p><u>CHANGE ORDERS:</u> This Purchase Order may be amended, modified or terminated at any time by mutual agreement of the parties in writing. Change orders amending, modifying or terminating the Purchase Order, including any modifications of the compensation payable, may be issued only by the State Procurement Officer. All such change orders shall be in writing and issued only upon written concurrence of the supplier. Termination, as that term is used in this section, does not include termination for default of the supplier.</p>						



1 SCOPE

This specification establishes the requirements for an Inductively-Coupled Plasma Mass Spectrometer (ICP/MS) used by the California Department of Public Health to analyze trace elements in a variety of matrices such as drinking water, waste water, sludges, soil digests and biological fluids (blood & urine).

2 APPLICABLE SPECIFICATIONS

Specifications and standards referenced in this document in effect on the opening of the Invitation for Bid form a part of this specification.

3 REQUIREMENTS

3.1 The ICP/MS shall be a fully integrated, computer-controlled system that shall include the following hardware and software components:

- 3.1.1 All equipment necessary to generate, maintain and monitor the high vacuum environment required for the mass spectrometer
- 3.1.2 Inductively coupled argon plasma source including solid-state RF generator
- 3.1.3 Mass spectrometer interface with nickel sampler and skimmer cones
- 3.1.4 Mass spectrometer with ion focusing system, quadrupole mass analyzer, and ion detector assembly
- 3.1.5 Water chiller/recirculator
- 3.1.6 Automated sampler
- 3.1.7 Sample introduction system including a multi-channel sample pump (3 channels minimum), nebulizer and Peltier-cooled spray chamber
- 3.1.8 Interference reduction system (IRS) based on collision and/or reaction technology to minimize or eliminate polyatomic interferences; regulators for collision or reaction gases shall be provided with the instrument
- 3.1.9 Standard tool kit and special tools needed for maintenance and minor repairs
- 3.1.10 If the ICP-MS instrument is a bench-top model (not floor-standing), it shall be supplied with a suitable instrument table, stationary or with lockable castors, that can support the mass spectrometer and autosampler. The table does not need to provide space for the data station.
- 3.1.11 Computer work station compatible with the ICP-MS system operation; complete with 19" or larger LCD flat panel display, laser printer and all required cables.
- 3.1.12 The ICP-MS software shall operate under Windows XP® and shall be capable of generating analytical reports, including all relevant data, in one or more of the following formats for transfer to a Laboratory Information Management System (LIMS): Text, CSV or XLS.

- 3.1.14 The ICP-MS software shall feature fully automated system startup and shut down capability, real time displays to monitor system performance, tuning, internal diagnostics, and error checking. It shall be capable of storing tune parameters, including the plasma torch position, for future recall.
- 3.1.15 System optimization (autotuning) shall be under computer control and performed automatically by the software, as required. Computer controlled optimization shall include mass calibration, mass resolution, ion lens focusing, plasma gas flows, and torch position. The torch position must be adjustable under computer control in all three dimensions (x,y,z).
- 3.1.16 Software shall be included for the acquisition and analysis of time-resolved data resulting from speciation studies in which a chromatograph is used for sample introduction to the ICP-MS. The chromatography software must have the capability to smooth chromatographic signal traces, perform peak searches within signal traces, locate baselines, perform background subtraction, determine peak areas and peak heights, and establish calibrations curves using peak area or peak height results from chromatographic analyses of a series of standards. It shall be able to correct analyte signal traces using intensities measured for continuously introduced mass spectrometric internal standards.

3.2 SYSTEM PERFORMANCE:

Sensitivity, Resolution, Dynamic Range, Stability

- 3.2.1 The system shall be capable of performing mass spectral analysis over the m/z range of 4 to 250, and determining concentrations of all major, minor and trace elements in the analysis solution. The latter requirement does not apply to hydrogen, oxygen, nitrogen, fluorine and chlorine.
- 3.2.2 The system shall be capable of routinely meeting, or exceeding, the performance criteria and detection limits specified in USEPA Method 200.8, Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry, Rev. 5.4, 1994.
- 3.2.3 The system shall be capable of achieving a mass resolution of 0.7 amu at 10% of peak height.
- 3.2.4 The system shall be capable of providing a linear dynamic range of analysis of nine (9) orders of magnitude, extending from 1 ppt to 1000 ppm for indium. The deviation from linearity shall be no more than 10% in the range 100 ppt to 1 ppm.
- 3.2.5 The abundance sensitivity shall be adjustable to better than 10^{-7} at 1 amu higher and to 10^{-6} at 1 amu lower than the mass of interest.
- 3.2.6 The ICP-MS system shall be capable of routinely achieving or exceeding the following sensitivity levels: 5000 cps/ppb for ${}^7\text{Li}$, 40,000 cps/ppb for ${}^{115}\text{In}$, and 20,000 cps/ppb for ${}^{238}\text{U}$. This shall be demonstrable using a single test solution, a single set of measurement conditions, and a standard sample introduction system with pneumatic nebulization.

- 3.2.7 Under routine operating conditions, the peak intensity of a multi-charged ion shall not exceed 3% of the peak intensity of the corresponding singly charged ion for all elements, including Ba. Under the same operating conditions, the CeO^+/Ce^+ peak intensity ratio shall not exceed 3%.
- 3.2.8 Random background shall be less than 10 cps at mass 220.
- 3.2.9 Mass calibration stability shall be better than 0.05 amu during an 8 hour time period, and better than 0.10 amu over a 7 day period.
- 3.2.10 The system shall be capable of achieving an isotope ratio precision of better than 0.2% for $^{107}Ag/^{109}Ag$, in a 2 min total acquisition time with a solution containing 10 ppb of silver.
- 3.2.11 Under routine operating conditions, the coefficient of variation for 10 consecutive, 3-second acquisitions for 10 $\mu g/L$ of Mg, Cu, Cd, and Pb shall be better than 4%.
- 3.2.12 Under routine conditions, and excluding elements associated with the plasma or water, the signal level for all non-volatile elements shall be less than 0.1% of the original level after a 60 second washout time with a 1% nitric acid solution. For mercury, the signal level shall be less than 0.5% of the original level after a 60 second washout time.
- 3.2.13 Contribution of nickel from sampler/skimmer cones constructed from nickel shall be low enough such that a 100 ng/L detection limit is achievable for nickel.

Data Acquisition and Analysis

- 3.2.14 The ICP-MS data acquisition system shall be capable of recording intensity readings at any given m/z value with a dwell time of 200 microseconds or less.
- 3.2.15 The achievable mass spectrometer scan speed shall be 2000 amu per second or greater.
- 3.2.16 The following modes of data acquisition shall be available:
- Scanning (spectrum) mode
 - Selected ion monitoring (peak jumping) mode
 - Chromatography mode (time-resolved analysis)
- 3.2.17 The following modes of data analysis shall be available:
- Quantitative analysis with external calibration (normal mode)
 - Quantitation by standard addition
 - Semi-quantitative analysis mode: Samples may be screened for all elements analyzable by ICP-MS without the need to calibrate for all elements measured
 - Isotopic Analysis Mode (used with isotope ratio and isotope dilution measurements)

Interference Reduction System (IRS)

- 3.2.18 The IRS shall provide for the simultaneous connection of a minimum of two collision/reaction gases.
- 3.2.19 Flow rates of all collision/reaction gases shall be under full software control.
- 3.2.20 The system shall provide sample analysis with or without the use of the IRS.
- 3.2.21 Use of the IRS shall not create new ion species that can interfere in the analysis of any element normally analyzable without the use of the IRS.
- 3.2.22 The IRS shall be able to remove argon-based and other interferences without resorting to cool or cold plasma conditions.
- 3.2.23 Specifically, the IRS must be capable of removing the following interferences:
- ArAr on ^{78}Se and ^{80}Se
 - ArO on ^{56}Fe
 - ArC on ^{52}Cr
 - ArCl on ^{75}As
 - ClO on ^{51}V and ^{53}Cr
 - ArNa on ^{63}Cu
 - CaO on ^{60}Ni
 - MoO on ^{111}Cd
- 3.2.24 The following detection limits shall be routinely achievable when using the IRS and when the ICP-MS is operated in an environment that does not result in significantly elevated blank levels:
- 10 ng/L for ^{78}Se or ^{80}Se ,
 - 50 ng/L for ^{56}Fe .
- 3.2.25 When analyzing a solution containing 1 ppb of arsenic in a 1% HCl matrix, the instrument and IRS shall be capable of producing a result in the range 1.0 ± 0.1 ppb without resorting to interference correction equations or using matrix-matched standards.
- 3.2.26 When analyzing a solution containing 1 ppb of vanadium and 1 ppb of chromium in a 1% HCl matrix, the instrument and IRS shall be capable of producing results in the range 1.0 ± 0.1 ppb for ^{51}V and ^{53}Cr without resorting to interference correction equations or using matrix-matched standards.
- 3.2.27 When analyzing a solution containing 1 ppb of chromium in the presence of 200 ppm of non-volatile carbon, the instrument and IRS shall be capable of producing a result in the range 1.0 ± 0.1 ppb for ^{52}Cr without resorting to interference correction equations or using matrix-matched standards.

3.3 SAFETY CONSIDERATIONS:

3.3.1 The RF generator design shall meet all FCC certification requirements for RF emission.

3.3.2 The operator must never be exposed to unshielded RF or stray UV emissions.

3.3.3 All plasma support gases shall be supported by safety interlocks.

3.3.4 The system shall automatically shut down and stay down in the event of electrical power failure, loss of argon pressure or flows, loss of vacuum, loss of cooling water, overheating, or exceeding normal operating limits, until the system is restored and brought up by the operator.

3.4 The following items shall be available as options:

- Platinum-tipped cones to replace the standard nickel sampler and skimmer cones
- A hydrofluoric acid (HF) resistant sample introduction system
- A continuous-flow hydride generation system



1 BIDDER QUALIFICATION

The bidder shall be either the manufacturer or an authorized distributor/reseller.

2 STANDARD COMMERCIAL PRODUCT

The System offered shall be in accordance with the requirements of Bid Specification 6630-0074. Features or components which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product or normally supplied, shall be included in the equipment being furnished. A standard commercial product is a product previously sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model. The system shall meet OSHA safety requirements for the workplace.

3 INSTALLATION

- 3.1 All installation and acceptance testing costs shall be included in the bid price.
- 3.2 Site preparation manuals/ instructions shall be provided prior to installation and shall include items such as operating environment (e.g. temp, humidity, etc.), power requirements, space requirements; and site preparation details.
- 3.3 Installation shall not occur until the complete ICP-MS system is delivered, including all software, peripherals and accessories.
- 3.4 Supplier shall provide on-site certified field representative(s) to install hardware and software.
- 3.5 Supplier shall unpack, install equipment and dispose/remove packing material from the premises.
- 3.6 Supplier shall conduct any calibration and installation tests required to ensure that the system is operational and ready for acceptance testing.

4 ACCEPTANCE TESTING

- 4.1 The State may require the supplier to conduct one or more tests to verify that the ICP-Mass Spectrometer meets the performance requirements specified in Section 3.2 of Bid Specification 6630-0074. The acceptance tests to be performed shall be at the discretion of the State.
- 4.2 The acceptance tests shall be performed under the following conditions:
 - 4.2.1 The Acceptance Test shall consist of one or more of the tests described in the document 67140AT, Acceptance Test.
 - 4.2.2 The Acceptance Test shall be a pass/fail test.
 - 4.2.3 Supplier shall provide all required test materials and solutions at no charge to the State. The State shall have the option to provide some of the test solutions.
- 4.3 Supplier shall provide a summary of the Acceptance Test results indicating the pass/fail status of each test to the CDPH representative for review.
- 4.4 The equipment will not be accepted by CDPH until all required tests have been successfully completed. The State may limit a retest to the failed portions of the initial Acceptance Test.

- 4.5 Upon successful completion of the Acceptance Test, CDPH will notify the supplier in writing of equipment acceptance.
- 4.6 DGS may witness the Acceptance Test and receive a copy of the Letter of Acceptance from CDPH to the supplier.

5 OPERATION AND MAINTENANCE MANUALS

- 5.1 A copy of the operating and service manual shall be furnished at the time of delivery. If there are any special tools required for normal operation, one set shall be provided.

6 TRAINING

- 6.1 The purchase price shall include at least 2 days of onsite training for two operators.

7 WARRANTY

- 7.1 The system shall be fully warranted to be free from defects in materials and workmanship for a minimum period of 1 year from date of acceptance, or for the manufacturer's standard warranty term, if longer. The warranty shall include all parts and labor incurred by the contractor to maintain the system in new condition.

8 DOCUMENTED PROCEDURES

- 8.1 At the time of installation, supplier shall provide a document containing recommended procedures to eliminate the potential molecular interferences listed in section 3.2.23 of Bid Specification 6630-0074.

9 CUSTOMER REFERENCES

- 9.1 The bidder shall provide a minimum of two references from ICP-Mass Spectrometer customers performing drinking water analysis with the bid or within 3 days after request by DGS. References shall include contact information, such as company, contact name, phone number, and address.



1 GENERAL

Upon completion of the ICP-MS system installation, supplier shall conduct the tests described in this document to demonstrate that the ICP-MS system meets the performance requirements described in the following sections of Bid Specification 6630-0074:

1.1 Section 3.2.3

Using a solution containing 10 ppb of indium, supplier shall scan over the ^{115}In peak and then measure the peak width at 10% of the peak height. The test shall be considered failed if three consecutive attempts do not show the required minimum resolution of 0.7 amu.

1.2 Section 3.2.4

Supplier shall analyze a series of standard solutions containing the following concentrations of indium: 1 ppt, 10 ppt, 100 ppt, 1 ppb, 10 ppb, 100 ppb, 1 ppm, 10 ppm, 100 ppm, and 1000 ppm. The results shall be evaluated by performing a linear regression of the measured intensities versus known concentration. Using the regression line as a calibration curve, the apparent concentrations of the standards with 100 ppt, 1 ppb, 10 ppb, 100 ppb, and 1 ppm of indium are then calculated based on this calibration curve. The calculated concentrations shall not deviate by more than 10% from the known concentrations. The test shall be considered failed if three consecutive attempts do not demonstrate the required linearity.

1.3 Section 3.2.5

Using a solution containing 1 ppm of indium, supplier shall scan over the ^{115}In peak and measure the abundance sensitivities at 114 and 116 amu. The test shall be considered failed if three consecutive attempts do not show the required abundance sensitivities of 10^{-7} at 116 amu and 10^{-6} at 114 amu.

1.4 Section 3.2.6

Supplier shall demonstrate the required signal intensity levels as stated in section 3.2.6, using a solution containing 1 ppb each of lithium, indium and uranium in 1% nitric acid. The test shall be considered failed if three consecutive attempts do not show the required signal intensity levels.

1.5 Section 3.2.7

Supplier shall demonstrate the peak intensity of the multi-charged ion shall not exceed 3% of the corresponding singly charged ion, using a solution containing 100 ppb each of barium and cerium in 1% nitric acid. The test shall be considered failed if three consecutive attempts cannot demonstrate $\text{Ba}^{2+}/\text{Ba}^{+}$ and $\text{CeO}^{+}/\text{Ce}^{+}$ ratios of less than 0.03.

1.6 Section 3.2.8

Supplier shall measure the background counts at 220 amu ten times. The test shall be considered failed if more than 5 of the 10 measurements show intensities above 10 cps.

1.7 Section 3.2.9

Using the manufacturer's standard test procedures, the supplier shall test the mass calibration stability over a minimum of an eight hour time interval. The mass stability shall be better than 0.05 amu. The test shall be considered failed if three consecutive attempts do not demonstrate the required stability. The supplier or user shall re-test mass calibration stability within seven to ten days of the initial test. Mass calibration stability shall be better than 0.1 amu.

1.8 Section 3.2.10

Supplier shall analyze a solution containing 10 ppb of silver in 1% nitric acid with ten repeat measurements of the $^{107}\text{Ag}/^{109}\text{Ag}$ ratio over a 2 minute data acquisition period. The test shall be considered failed if three consecutive attempts do not produce the required precision (relative standard deviation of the ten repeat measurements) of 0.2%.

1.9 Section 3.2.11

Supplier shall analyze a solution containing 10 ppb each of magnesium, copper, cadmium, and lead in 1% nitric acid and perform ten repeat measurements with 3 seconds of acquisition time per element. The test shall be considered failed if three consecutive attempts do not produce the required precision (relative standard deviation of the ten repeat measurements) of 4%.

1.10 Section 3.2.24

Supplier shall perform a minimum of seven replicate analyses of 1% nitric acid solutions containing 50 ng/L of selenium and 250 ng/L of iron respectively. The detection limits shall be calculated by multiplying the standard deviations of the seven results for each element by 3.14. The test shall be considered failed if three consecutive attempts do not produce the required detection limits.

1.11 Section 3.2.25

Supplier shall analyze a solution containing 1 ppb of arsenic in a 1% HCl matrix. The instrument and IRS results shall be in the range of 1.0 ± 0.1 ppb without resorting to interference correction equations or using matrix-matched standards. The test shall be considered failed if three consecutive attempts do not produce results within the required range.

1.12 Section 3.2.26

Supplier shall analyze a solution containing 1 ppb of vanadium and 1 ppb of chromium in a 1% HCl matrix. The instrument and IRS results shall be in the range of 1.0 ± 0.1 ppb for ^{51}V and ^{53}Cr without resorting to interference correction equations or using matrix-matched standards. The test shall be considered failed if three consecutive attempts do not produce results within the required range.

1.13 Section 3.2.27

Supplier shall analyze a solution containing 1 ppb of chromium in the presence of 200 ppm of non-volatile carbon. The instrument and IRS results shall be in the range of 1.0 ± 0.1 ppb for ^{52}Cr without resorting to interference correction equations or using matrix-matched standards. The test shall be considered failed if three consecutive attempts do not produce results within the required range.