GLOSSARY

Acceptable Quality Range - The interval between specified upper and lower limits of a sequence of values within which the values are considered to be satisfactory.

Acceptable Value - An observed or corrected value that falls within the acceptable range.

Accepted Reference Value - A numerical quantity that serves as an agreed-upon basis for comparison and which is derived as: 1) a theoretical or established quantity based on scientific principles, 2) an assigned value, based on experimental work of some recognized organization, or 3) a consensus quantity based on collaborative experimental work under the auspices of a scientific or engineering group.

Accreditation - A formal recognition that a laboratory is competent to carry out specific tests or specific types of tests.

Accreditation Criterion - A requirement that a laboratory must meet to receive authorization and approval to perform a specified task.

Accredited Laboratory - Laboratory that has been evaluated and given approval to perform a specified measurement or task, usually for a specific parameter and a specified period of time.

Accuracy - The degree of agreement between individual measurements and an accepted reference value. Accuracy includes a combination of random and systematic error or bias components that are due to sampling and analytical operations; a data quality indicator.

Adjacent Property - Refers to a property near a permitted site that might be impacted by the site's presence and operation (e.g., litter, landfill gas, or leachate migration, etc.).

Aliqant - A subsample derived by a divisor that divides a sample into a number of equal parts but leaves a remainder; a subsample resulting from such a divisor. In analytical chemistry, the term aliquot is preferred regardless of whether a remainder is left or not.

Aliquot - A subsample derived by a divisor that divides a sample into a number of equal parts and leaves no remainder; a subsample resulting from such a division. In analytical chemistry, the term aliquot is generally used to define any representative portion of the sample, regardless of whether a remainder is left or not.

Alpha error - see "Type I Error"

Analyte Spike Recovery - Recovery of analyte spike added to sample prior to sample preparation. Determination of spike recovery is based on results provided by spiked and unspiked sample. Used to estimate matrix effects and sample preparation losses.

Annular Space - For a groundwater well, the space between the borehole wall and the well casing, or the spacing between a casing pipe and a liner pipe.

Aquifer - Includes any soil or rock formation that has sufficient porosity and water yielding ability to permit the extraction or injection of water at reasonably useful rates, as defined by the Manager.

Archives - Controlled access storage for all records, reports, and raw data necessary to reconstruct a study in retrospect.

Area Control Sites - Sites in the same area (e.g., a city or district) as the sampling site but not adjacent to it. In general, local control sites are preferable to area control sites because they are physically closer.

Attenuation - A process whereby contaminants are managed, removed, or reduced in concentration. Attenuation may be accomplished naturally under certain conditions.

Attribute - A quality of samples or a population. Homogeneity, heterogeneity, and practical homogeneity are population attributes. Representativeness and intersample variance are sample attributes.

Audit - see "Study Audit"

Audit Report - A factual report containing the results of an audit or inspection for a specified date.

Audit Team - Personnel trained to audit, inspect, and report on laboratory operations.

Background Sample see "Baseline Sample" and "Control Site Sample"

Baseline Sample - Also known as a Background Sample. A sample taken from a location on or proximate to the site of interest. This is taken to document baseline or historical information.

Batch-Lot - The samples collected under sufficiently uniform conditions to be processed as a group. Sometimes the abbreviated term "batch" is used as a synonym for "batch-lot".

Batch-Sample - One of the samples drawn from a batch-lot.

Batch-Size - The number of samples in a batch-lot.

Beta Error - see "Type II Error"

Bias - Systematic error manifested as a consistent positive or negative deviation from the know or true value. It differs from random error that shows a random deviation from run or true value.

Blank Sample - A clean sample or sample of matrix processed so as to measure artifacts in the measurement (sampling and analysis) process.

Blind Samples - A sample submitted to evaluate performance with concentration and identity unknown to the analyst. Blind samples that have features (e.g., DI water, freeze-dried sediments) distinguishing them from genuine samples should not be considered truly blind.

Bulk Sample - A sample taken from a larger quantity (lot) for analysis or recording purposes.

Calibrant - see "Calibration Standard"

Calibration - The set of operations that establish, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system, and the corresponding known values. The result of a calibration is sometimes expressed as a calibration factor, or as a series of calibration factors in the form of a calibration curve.

Calibration Check Standard - A standard independently prepared (different source, different analyst) from the calibration standards and run after the original calibration to verify the original calibration. There is usually at least one calibration check standard per batch.

Calibration Curve - Defines the relation between analyte concentration and analytical response. Normally at least 3 - 5 appropriately placed calibration standards are needed to adequately define the curve. The curve should incorporate a low standard not exceeding 10 times the detection limit. Analytical response, where appropriate, is zeroed using a reagent blank. Either a linear or other curve fit, as appropriate, may be used. Standards and samples must have equivalent reagent backgrounds (e.g., solvent, acid content, etc.) at the point of analysis.

Calibration Drift - The difference between the instrument response and a reference value after a period of operation without recalibration.

Calibration Method - Defined technical procedure for performing a calibration.

Calibration Standard - A substance or reference material used to calibrate an instrument.

Carrying-Agent - Any diluent or matrix used to entrain, dilute or to act as a vehicle for a compound of interest.

Certification - A formal recognition that a laboratory is competent to carry out specific tests or specific types of tests.

Certified Reference Material (CRM) - A reference material having one or more property values that are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation that is issued by a certifying authority.

Certified Reference Samples - Reference samples with concentration values certified by a recognized standards authority. See "Certified Reference Material"

Characteristic - A property of items, a sample or population that can be measured, counted, or otherwise observed.

Clean Matrix Spike - Sample with no detectable analyte concentration to which an analyte spike has been added.

Co-located Sample - Two or more independent samples collected so that each is equally representative for a given variable at a given space and time (i.e., the collocated samples are meant to be identical).

Co-located Samplers - Two or more identical instruments usually operated simultaneously, to supply a series of duplicate or replicate samples for estimating precision.

Comparability - A measure of the degree to which different methods, data sets and/or decisions can be represented as similar; a data quality indicator.

Completeness - The amount of valid data obtained compared to the planned amount, and usually expressed as a percentage; a data quality indicator.

Component of Variance - A part of the total variance associated with a specified source of variation.

Composite Sample - Is a combination of multiple individual samples taken at pre-selected times to represent the integrated composition of the wastewater being sampled. Usually all samples added to the composites are equal in size, but flow-proportional composite samples collect amounts proportional to flow.

Confidence Coefficient - The probability, expressed as a percentage, that a measurement result will reside in the confidence interval (between the confidence limits).

Confidence Interval - The set of possible values within which the true value will reside with a stated probability (i.e., confidence level).

Confidence Level - The probability, usually expressed as a percentage, that a confidence interval will include a specific population parameter; confidence levels usually range from 90 to 99 percent.

Confidence Limit - Upper or lower boundary values delineating the confidence interval.

Contaminant - A compound, element, or physical parameter, resulting from human activity, or found at elevated concentrations, that may have a harmful effect on public health or the environment.

Control Chart - A graph of some measurement plotted over time or sequence of sampling, together with control limit(s) and, usually, a central line. Control charts may be used to monitor ongoing performance as assessed by method blanks, verification standards, control standards, spike recoveries, duplicates, and references samples.

Control Limit - A specified boundary on a control chart that, if exceeded, indicates a process is out of statistical control, and the process must be stopped, and corrective action taken before proceeding. These limits may be defined statistically or based on protocol requirements. Control limits may be assigned to methods blanks, verification/control standards, spiked recoveries, duplicates and reference samples.

Control Sample - A sample with pre-determined characteristics which undergoes sample processing identical to that carried out for test samples and that is used as a basis for comparison with test samples. Examples of control samples include reference materials, spiked test samples, method blanks, dilution water (as used in toxicological testing), and control cultures (i.e., samples of known biological composition).

Control Site Sample - Also known as "Background Sample". These are samples of the media similar to the test sample matrix and are taken near to the time and place where the analytes of interest may exist at background levels. Usually the frequency of their analysis should be equivalent to that of the reagent blank. They are used to demonstrate whether the site is contaminated or truly different from the norm. Some sort of background sample is always necessary for a valid scientific comparison of samples suspected of containing environmental contaminants. Control site samples may further be differentiated as "local control site" and "area control sites" samples. See "Local Control Site" and "Area Control Sites".

Control Standard - Standard prepared independently of and run with the calibration and used to verify the accuracy of the calibration. See "Calibration-check Standard".

Corrected Value - The observed value after correction for values of a blank. (Blank correction should only be performed when specifically part of a method procedure.)

Corrective Action - The process, when failure occurs, of investigation, correction and institution of preventative measures to preclude the recurrence of failure. An important component of corrective action is documentation of both problem and remedial measures taken.

Correlation - A measure of association between two variables.

Data Audit - see "Study Audit"

Data Quality Objectives (DQO) - DQOs are qualitative and quantitative statements derived from the DQO process describing the decision rules and the uncertainties of the decision(s) within the context of the problem(s).

Data Quality Objective Process - A quality management tool that enables planners to focus their planning efforts by specifying the use of the data (the decision), the decision criteria (action level) and the decision maker's acceptable decision error rates. The products of the DQO Process are the DQOs. See "Data Quality Objectives".

Detection Capability - A quantity defined in terms of characteristics of the analytical response provided at zero or near zero analyte concentration and often expressed in terms of specific detection probabilities. See " Detection Limit", "Method Detection Limit", and "Reliable Detection Limit".

Detection Limit - Smallest analyte concentration for which there is a stated probability (usually 95% or 99%) of detection. See "Instrument Detection Limit", "Lower Limit of Detection", "Method Detection Limit", and "Reliable Detection Limit".

Discharge - Any pollutant or combination of pollutants added to the environment from any point or area source.

Document Control - A systematic procedure for indexing documents by number, date and revision number.

Duplicate - Least case of replicates (two). While any portion of the analytical protocol can be duplicated, the term duplicate is usually applied to duplicate samples (i.e., two samples taken at the same time from the same location). See "Duplicate Analysis" and "Duplicate Sample".

Duplicate Analysis or Measurement - The analysis or measurement of the variable of interest performed as identically as possible on two subsamples of a sample. Duplicate analysis is used to evaluate analytical or measurement variance.

Duplicate Sample - One of two samples taken from the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis. See "Split Sample" and "Replicate Sample".

Dynamic Blank - A sample collection material or device (e.g., filter or reagent solution) that is not exposed to the material to be selectively captured but is transported and processed in the same manner as the sample. See " Field Blank", "Instrumental Blank", and "Equipment Blank".

Dynamic Calibration - Standardization of both the measurement and collection systems using a reference material similar to the unknown. For example, a series of air-mixture standards containing sulfur dioxide of know concentrations could be used to calibrate a sulfur dioxide bubbler system.

Environmental Data Generation Activity - Tasks associated with the production of environmental data, including planning, sampling, and analysis.

Environmental Sample - A sample of any material that is collected from an environmental source.

Environmentally Related Measurement - Any assessment of environmental concern generated through or for field, laboratory, or modeling processes; the value obtained from such an assessment.

Equipment Blanks (Rinsate Blanks) - Are samples of analyte-free media that have been used to rinse the sampling equipment. They are collected after equipment decontamination and prior to resampling.

Equipment Rinsate (Equipment Blank) - A sample of analyte-free media that has been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment.

Equivalent Method - Any method of sampling and/or analysis demonstrated to have a consistent and quantitatively known relationship to a reference method under specified conditions.

Error - Any discrepancy between a computed, observed, or measured quantity and the true, specified, or theoretically correct value of that quantity. See "Type I Error" and "Type II Error".

Field Blanks - Blanks are defined as matrices that have negligible or unmeasurable amounts of the substance of interest. They are prepared by transferring the analyte-free media from one vessel to another or by exposing the media to the sampling environment at the sampling site. Capped and cleaned containers are taken to the sample collection site. Usually each sampling team should collect one field blank a day per collection apparatus; the field blank matrix should be comparable to the sample of interest. Field blank water samples usually consist of deionized water that is carried to the sampling site and exposed to the air there so that any contamination from the air can be measured and accounted for.

Field Duplicates - Collocated samples that are analyzed independently. These duplicates are useful in documenting the precision of the sampling and analytical process.

Field Reference Sample - Similar to Field Blanks except the bottles contain media of known analyte concentration. More costly than Field Blanks, but have more informational content.

Field Spike - Samples are selected field sample to which a known amount of the analytes of interest are added during their collection in the field. They are used to identify field, transportation, and matrix effects. It is important that field spike samples be prepared by experienced personnel so that interpretation of analytical results are not complicated by human errors. Due to the inherent variability in analyses near the method detection limit, spiking with a certified reference material at >10 times the detection limit established by the method is recommended.

Flume – Flumes are specially shaped channel restrictions, that change the channel area, and slope. This change increases both the velocity and the level of the liquid flowing through the flume. They can be made from various construction materials such as fiberglass and concrete.

Grab Sample - Are samples taken from the environment or from an effluent or other waste on a one-time basis. A grab sample should lbe collected over a short period of time, not to exceed 15 minutes.

Groundwater - Water below the ground surface in a zone of saturation.

Heterogeneity - Not homogeneous. See "Homogeneity".

Holding Time - Elapsed time between sample collection and either sample preparation or analyses, as appropriate.

Homogeneity - Homogeneity is a word that has two different meanings. Statisticians often refer to a population as being homogeneous when it has a uniform distribution (i.e., items that constitute the population can be very different in composition, but if they are distributed in a similar manner through-out the population, the population would be considered homogeneous). A population containing different strata would not have a uniform distribution throughout and would be considered by the statistician to be heterogeneous. However, the terms "homogeneity" and heterogeneity" as used in this manual, reflect the understanding more common to chemists, geologists and engineers, that a population that has dissimilar items would be considered heterogeneous regardless of the type of distribution. See "Practical Homogeneity".

Hydraulic Gradient - For groundwater, the change in static head per unit of distance in a given direction.

In-Control - A condition indicating that performance of the quality control system is within the specified control limits (i.e., that a stable system of chance is operating and resulting in statistical control). See "Control Chart".

Infiltration - The entry of water into soil or contaminants into soil and underlying geological units.

In-Situ Testing - Testing in the field of materials or naturally occurring substances in their found state.

Inspection - Observation by the QA Officer or QA Auditor of the laboratory operations performed to produce the data.

Instrument Blank - A clean sample processed through the instrumental steps of the measurement process; used to determine the instrument component of the measurement error. See "Dynamic Blank".

Instrument Detection Limit (IDL) - The analyte concentration that produces a response n times greater than the signal/noise ratio of the instrument where n is defined in a formal methodology procedure.

Interference - A positive or negative effect on a measurement caused by a variable other than the one being investigated.

Interference Equivalent - The mass or concentration of a foreign substance that gives the same measurement response as one unit of mass or concentration of the substance being measured.

Interlaboratory Calibration - The process, procedures, and activities for standardizing a given measurement system to ensure that laboratories participating in the same program can produce comparable data.

Interlaboratory Precision - A measure of the variation among laboratories participating in the same test; usually the standard deviation of the data sets.

Interlaboratory Test - A test performed by two or more laboratories on the same material for the purpose of assessing the capabilities of an analytical method or for comparing different methods.

Internal Quality Control - see "Intralaboratory Quality Control"

Internal Standard - A standard added to samples in known amount and carried through the procedure as a reference for calibration and controlling instrumental and analytical precision and bias.

Internal Standard (Type I) - Has chemical characteristics similar to those of analyte. Provides analytical response that is distinct from the analyte and not subject to interference. Added to the sample immediately prior to analyses. Internal standards are used to adjust for: 1) variations in analytical response due to instrumental and/or matrix effects and, 2) variations in the amount of sample provided for analyses due to variable injection volumes. See "Recovery Standard".

Internal Standard (Type II) - Special case when internal standard is added to sample prior to sample preparation. Used to adjust for: 1) variations in analytical response due to instrumental and/or matrix effects and, 2) variation in the amount of sample provided for analyses due to sample preparation losses, variations in final sample volume and variable injection volumes. The essential difference between the two types of internal standard is that type II adjust for sample preparation losses and variations in final sample volume. Proportionate analyte/internal standard sample preparation losses are assumed. See "Surrogate".

Intralaboratory Precision - A measure of the method/sample specific analytical variation within a laboratory; usually the standard deviation of a data set. See "Standard Deviation" and "Variance".

Intralaboratory Quality Control - The routine activities and checks, such as periodic calibrations, duplicate analyses and spiked samples, included in normal internal procedures to control the accuracy and precision of measurements.

Laboratory - Any facility that conducts scientific tests using established methodology. It can encompass many disciplines, or cover a narrower field, such as toxicological testing.

Laboratory Control Sample - A known matrix spiked with compound(s) representative of the target analytes. This is used to document laboratory performance.

Laboratory Control Standard - A standard, optimally certified by an outside authority, used to measure method bias. Optimally a Certified Reference Material (CRM) should be used for this purpose.

Landfill Gas - Gas produced by the decomposition of solid and liquid wastes, and includes primarily methane and carbon dioxide, with lesser amounts of other gasses such as hydrogen sulphide, and numerous volatile organic compounds.

Leachate - Any liquid and associated suspended materials that it contains, that has percolated through or drained from a waste disposal facility.

Leachate Plume - Groundwater that has been contaminated by leachate from the landfill site.

Limit of Quantitation (LOQ) - Smallest analyte concentration for which the variability (95% confidence limit) does not exceed approximately 30% of the analyte concentration. Some agencies define the LOQ to be n times the detection limit.

Lithology - For a well, the nature and composition of the material encountered while drilling.

Local Control Sites - Are usually adjacent or very near the test sample sites. They are generally upwind or upstream of the sampling site. Whenever possible, local control site samples should be taken first, to avoid contamination from the sample site.

Lower Explosive Limit - The minimum percent concentration (by volume) of a substance in air that will explode or produce a flash of fire when an ignition source is present, measured at 25 degrees Celsius and at atmospheric pressure.

Lower Limit of Detection (LLD) - Also called "detection limit" (DL) and "limit of detection" (LOD), the analyte concentration that produces a maximum probability of both Type I and Type II errors at 5%, provided the sample matrix is identical to that of calibrating solution.

Material Blanks - Are samples of construction materials such as those used in groundwater wells, pump and flow testing, etc. These materials are analyzed to measure potential contamination derived from use of these materials.

Matrix - A type of medium (e.g., seawater) in which the analyte of interest may be contained.

Matrix Duplicate - An intralaboratory split sample that is used to document the precision of a method in a given sample matrix.

Matrix Spike - An aliquot of sample spike with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Maximum Holding Time - The duration for which a sample can be kept under specified conditions without significant degradation of the analyte(s) or property of interest.

Measure of Central Tendency - A statistic that describes the grouping of values in a data set around some common value (e.g., the median, arithmetic mean, or geometric mean.)

Measure of Dispersion - A statistic that describes the variation of values in a data set around some common value. See "Variance" and "Standard Deviation".

Measurement Error - The difference between an observed or corrected value of a variable and a specified, theoretically correct, or true value.

Measurement Range - The range over which the precision and/or recovery of a measurement method are regarded as acceptable. See "Acceptable Quality Range".

Median - The middle value for an ordered set of n values; represented by the central value when n is odd or by the mean of the two most central values when n is even.

Method - A body of procedures and techniques for performing a task (e.g., sampling, characterization, quantification) systematically presented in the order in which they are to be executed.

Method Blank - An analyte-free sample to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank must be carried through the complete sample preparation and analytical procedure. The method blank is used to assess contamination resulting from the analytical process.

Method Check Sample - see "Spiked Reagent Blank"

Method Detection Limit (MDL) - In a specified matrix analyzed by a specified procedure, the measured response at which there is a stated probability (usually 99 or 95%) that the analyte is present.

Monitoring Well - A water well used to monitor groundwater and occasionally gaseous conditions in the vicinity of an actual or potential contaminant source.

NMOCs - Non-methane organic compounds, primarily composed of VOCs, that contribute to ground level ozone formation. Also known as non-methane hydrocarbons.

Nonconformity - The nonfulfillment of specified requirements.

Normalization Standard - Standard run subsequently to the original calibration and used to update the original calibration.

Piezometer - A small diameter, monitoring well used to measure the elevation of the water table and to sample groundwater.

Population - The totality of items or units under consideration.

Practical Homogeneity - The condition of the population under which all items of the population are not identical, however, for the characteristic of interest the differences between individual physical samples are not measurable or significant.

Precision - The degree of agreement among independent replicate analyses of a sample, usually expressed as the standard deviation.

Primary Standard - A substance or device, with a property or value that is unquestionably accepted (within specified limits) in establishing the value of the same or related property of another substance or device.

Probability - A numerical estimate of the chance that a particular event will occur. Its value can range from 0 (impossible) up to 1 (certain).

Procedure - A set of systematic instructions for performing an operation

Proficiency Testing - A systematic program in which one or more standardized samples is analyzed by one or more laboratories to determine the capability of each participant.

Project - Single or multiple data collection activities that are related through the same planning sequence.

Project Planning Documents - All documents related to the definition of the environmental data collection activities associated with a project.

Property - A quality or trait belonging and peculiar to a thing; a response variable is a measure of a property. Synonym: "Characteristic"

Protocol - A detailed written procedure for a field and/or laboratory operation (e.g., sampling, analysis).

Pseudo-Replicate - A redundant sample that does not contribute to the degrees of freedom because it is not independent of some other sample.
Purging - The removal of stagnant water from a monitoring well casing.

Quality - The sum of features and properties/characteristics of a product or service that bear on its ability to satisfy stated needs.

Quality Assessment - Procedure for determining the quality of laboratory data using internal and external quality control measures.

Quality Assurance (QA) - An integrated system of activities involving quality planning, quality control, quality assessment, quality reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

Quality Assurance Manual (QA Manual) - A document stating in precise detail the quality policy, quality system and quality practices of an organization. See "Quality Assurance Program Plan".

Quality Assurance Objectives - The upper and lower limiting values of the data quality indicators as defined by the data user's acceptable error bounds.

Quality Assurance Officer (QA Officer) - Person primarily responsible for ensuring that the QA Plan and QA Manual are rigorously adhered to through the course of a study or project.

Quality Assurance Plan (QA Plan) - A description of the quality assurance and quality control activities to be followed for a research project. See "Quality Management Plan" and "Quality Assurance Project Plan".

Quality Assurance Program Plan - Use synonymous term Quality Management Plan (QMP) so as to avoid confusion with term Quality Assurance Project Plan (also QAPP).

Quality Assurance Project Plan (QAPP) - A formal document describing the detailed quality control procedures by which the data quality requirements defined for the data and decisions in a specific project are to be achieved.

Quality Circle - A small group of individuals from an organization or unit who have related interests and meet regularly to consider problems or other matters related to the quality of the product or process.

Quality Control (QC) - The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. The aim is to provide quality that is satisfactory, adequate, dependable, and economical. For analytical chemistry, QC is a set of procedures applied to an analytical methodology to demonstrate that the analysis is in control.

Quality Control Sample - A sample (i.e., test sample or control sample/standard) used either singly or in replicate, as appropriate, to monitor method performance characteristics.

Quality Management Plan (QMP) - A formal document describing the management policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an agency, organization or laboratory for ensuring quality in its products and utility to its users.

Quality Manual - A document stating the quality policy, quality system and quality practices of an organization.

Quality System - The organizational structure, responsibilities, procedures, processes and resources for implementing quality management.

Quantitation (Type I) - Occurs when the external standard or internal standard is not carried through the sample preparation step.

Quantitation (Type II) - May apply to quantitation by External Standard, Internal Standard or Method of Standard Additions. Occurs when the external standard, internal standard or standard addition is carried through the sample preparation step. Used to adjust for sample preparation losses. Proportionate analyte/standard sample preparation losses are assumed.

Quantitation by External Standard - Analyte response reference directly to calibration curve. Standard and samples must have equivalent reagent backgrounds (e.g., solvent or acid contents, etc.)

Quantitation by Internal Standard - Analyte (and internal standard) response reference to Relative Response Factor. Unless otherwise specified, the use of Type I Internal Standards is assumed.

Quantitation by Method of Standard Additions - Determination of analyte concentration by adding analyte spike to sample prior to analysis. Determination is based on results provided by spiked and unspiked samples. Analytical response must be linear. Used to correct for matrix effects.

Random - The word "random" has two different but related meanings. In relation to sampling, random means that all items of a population have an equal probability of being sampled. In relation to the distribution of a population characteristic, random means that the characteristic has an equal probability of occurring in any and all items of the population.

Random Error - The non-systematic deviation experienced in any step of an analytical procedure that can be estimated by standard statistical techniques.

Raw Data - The first recording of observations or findings of a study. These data should be neither left- censored nor truncated to significant digits.

Reagent Blank - A blank that undergoes processing identical to that carried out for calibration standards.

Reagents - All materials of a chemical nature used in the performance of a test. Reagents include all supplied or laboratory prepared reagents, chemicals, solvents, media, stock solutions, compressed gases, permeation devices or other such materials of a chemical nature. Laboratory prepared reagents include reagent water, dilution water (as used in toxicological testing) and zero air (as used in air testing).

Records System (or Records Plan) - A written, documented group of procedures describing required records, steps for producing them, storage conditions, retention period and circumstances for their destruction or other disposition.

Recovery - That portion of an analyte, or surrogate, added to a sample that is recovered by testing.

Recovery Efficiency - In an analytical method, the fraction or percentage of a target analyte extracted from a sample containing a known amount of the analyte.

Recovery Standard - see "Internal Standard Type I"

Reference Material - A material containing known quantities of target analytes in solution or in a homogeneous matrix. It is used to document the bias of the analytical process.

Reference Method - A sampling and/or measurement method that has been officially specified by an organization as meeting its data quality requirements.

Reference Samples - Samples, including clean matrix spikes, with known analyte concentration. Used to assess analytical accuracy.

Reference Standard - A standard, generally of the highest quality available at a given location, from which measurements made at that location are derived. See "Calibration Standard".

Relative Response Factor - Ratio of slopes provided by calibration curves for analyte and corresponding internal standard (or surrogate and corresponding internal standard). Calibration curves may be determined by two precisely determined calibration points. Analytical responses must be demonstrated to be linear.

Reliability - The likelihood that an instrument or device will function under defined conditions for a specified period of time.
Reliable Detection Limit (RDL) - The lowest analyte concentration that can be detected (i.e., provides a response that exceeds the MDL) with a stated probability (usually 99 or 95%). The RDL at 95 and 99% probability may be expressed as 2(1.64)s and 2(2.33)s respectively where s is the standard deviation of the method blank (or low level sample). The statistical numbers 1.64 and 2.33 correspond to infinite observations and, in actual practice, are replaced by the f statistic corresponding to the actual number of observations used to calculate s.

Repeatability - The capability of a method, test or instrumental procedure to replicate a result under specified conditions (e.g., by a single analyte and/or instrument over a specified period of time.)

Replicability - see "Repeatability"

Replicate - An adjective referring to the taking of more than one sample or performance of more than one analysis. Incorrectly used as a noun in place of replicate analysis. Replicate is to be used when referring to more than two items. Duplicate is to be used when there are only two. See "Duplicate".

Replicate Analysis or Measurement - The analysis or measurement of the variable of interest performed as identically as possible on two or more subsamples of a sample. Replicate analyses are used to assess analytical or measurement variance. Replicate analysis is to be used when there are more than two and duplicate analysis if there are only two.

Replicate Samples - Multiple samples taken within each combination of time, location, and any other controlled variables. The purpose of collecting replicate samples is to obtain precision (i.e., the spacial and temporal variations, plus variance introduced by sampling and analytical procedures). If the area sampled has a large-scale environmental pattern, it should be broken up into relatively homogeneous sub-areas, and sample collections should be proportioned according to the size of each sub-area.

Representative Sample - A sample taken so as to reflect the frequency distribution of the variable of interest in the population as accurately and precisely as specified. To ensure representativeness, the sample may be either completely random or stratified depending upon the conceptualized population and the objective (i.e., upon the decision to be made).

Requirement - A translation of the needs into a set of individual quantified or descriptive specifications for the characteristics of an entity in order to enable its realization and examination.

Rinsate Blanks - see "Equipment Blank"

Sample - A portion of material that is taken for testing. The word "sample" is a term with numerous meanings. The scientist collecting physical samples or analyzing samples considers a sample to be that unit of the population collected and placed in a container. A statistician considers a sample to be a subset of the population and this subset may consist of one or more physical samples. To minimize confusion the term "physical sample" is a reference to the sample held in a sample container or that portion of the population that is subjected to in-situ measurements.

Sample Analyses - All procedures carried out on samples and standards subsequent to sample preparation. Includes any chemical alteration to sample as well as subsequent measurement.

Sample Collection - All procedures carried out on a sample at the time of sample collection, including filtration and addition of chemical preservatives.

Sample History Requirements - Includes requirements for sample collection, chemical preservation, sample container, storage conditions, holding time, and sample pre-treatment.

Sample Pre-treatment - All pre-treatment procedures carried out on a sample prior to sample preparation or analysis, including removal of unwanted material, removal of moisture, sub-sampling and homogenization. See "Sample Preparations".

Sample Preparation - All procedures such as purging, extraction, digestion, distillation, etc., carried out on samples (or standards)prior to analyses.

Selectivity (analytical chemistry) - The capability of a method or instrument to respond to a target substance or constituent in the presence of nontarget substances.

Sensitivity - Capability of method or instrument to discriminate between measurement responses of a variable of interest.

Significant Digit - Any of the digits 0 through 9, excepting leading zeros and some trailing zeros, that is used with its place value to denote a numerical quantity to a desired rounded number.

Significant Figure - see "Significant Digit"

Single Operator Precision - The standard deviation of the results of a series of determinations by the same analyst or operator, all other conditions being equal.

Site - The area within a boundaries established for a defined activity.

Span-Drift - The change in the output of a continuous monitoring instrument over a stated time period during which the instrument is not recalibrated.

Span-Gas - A gas of known concentration that is used routinely to calibrate the output level of an analyzer. See "Calibration Check Standard".

Spike - A known mass of target analyte added to a blank sample or subsample; used to determine recovery efficiency of for other quality control purposes.

Spike Recovery - see "Analyte Spike Recovery" and "Clean Matrix Spike"

Spiked Laboratory Blank - see "Spiked Reagent Blank"

Spiked Method Blank - Spiked blank that undergoes processing identical to that carried out for samples. Monitors method recovery.

Spiked Reagent Blank - A reagent blank fortified with a known mass of the target analyte; usually used to determine the recovery efficiency of the method.

Spiked Sample - A sample prepared by adding target or nontarget material to a matrix sample; used, for example, in an analytical method to determine the effect of the matrix on the recovery efficiency.

Spiked Sample Duplicate Analysis - see "Duplicate Analysis" and "Spiked Sample"

Spiking Solution - The solution in which one or more spikes are dissolved (along with any necessary preservatives). This solution acts as a carrier to provide rapid and thorough mixing of the spike into the sample, as compared to adding the spike as a pure compound.

Split Samples - Split samples are obtained by dividing one sample into two or more identical sub-samples. If analyzed at the same laboratory, they are used to check on the reproducibility of the method or the laboratory performing the analyses. If analyzed at different laboratories they are used to ensure units from the two laboratories are comparable. Obtaining accurate splits from non-homogeneous or multi-layered samples is often very difficult and must be done with great care to ensure splits of equal composition.

Standard (measurement) - A substance or material with a property quantified with sufficient accuracy to permit its use to evaluate the same property in a similar substance or material. Standards are generally prepared by placing a reference material in a matrix. See "Reference Material".

Standard Addition - The practice of adding a known amount of an analyte to a sample immediately prior to analysis. It is typically used to evaluate matrix effects.
Standard Deviation - Statistical term: square root of the variance.

Standard Operating Procedures (SOPs) - The established written procedures of a given organization. Special project plans may require different procedures than the established SOPs.

Static Head - The distance from a standard datum (arbitrarily defined reference point) of the surface of a column of water that can be supported by the static pressure at a given time. Three static head measurements are frequently used to calculate groundwater flow direction.

Storage Conditions - Includes both sample transport and sample storage at the laboratory.

Stratified Populations - Consist of such a number of strata. Highly-stratified populations consist of such a large number of strata that is not practical or effective to employ conventional sampling approaches. Nor would the mean concentration of a highly-stratified population be a useful predictor (i.e., the level of uncertainty is too great) for an individual subset that may be subjected to evaluation, handling, storage, treatment or disposal. Highly Stratified is a relative term used to identify certain types of non-random heterogeneous populations. Classifying a population according to its level of stratification is a relative issue. It is relative to the persons planning and performing the sampling, their experience, available equipment, budgets and sampling objectives. (That is, under one set of circumstances, a population could be considered highly stratified, while under a different context the same population could be considered stratified.)

Stratum - Is a subgroup of a population separated in space and/or time from the remainder of the population, being internally consistent with respect to a target constituent or property of interest, and different from adjacent portion of the population.

Study Audit - Reviewing the data produced during a study for completeness, accuracy and precision. Sometimes called a "data audit".

Sub-Sample - see "Test Portion"

Surface Water - Lakes, bays, sounds, ponds, impounding reservoirs, perennial or ephemeral streams and springs, rivers, creeks, estuaries, marshes, inlets, canals, oceans, and all other perennial or ephemeral bodies of water, natural or artificial, inland or coastal, fresh or salt, public or private, but excludes groundwater or leachate collection channels or works.

Surrogate (or Surrogate Standard) - A pure compound different from, but similar enough to, the analyte that, when added at a known concentration to the sample prior to processing, provides a measure of the overall efficiency of the method (recovery). Surrogates have chemical characteristics that are similar to that of the analyte and must provide an analytical response that is distinct from that of the analyte. See "Internal Standard Type II".

Surrogate Analyte - A pure substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.

Surrogate Spike Recovery - Recovery of surrogate spike added to sample prior to sample preparation. Used to account for matrix effects and sample preparation losses.

Surveillance - The act of maintaining supervision of or vigilance over a well-specified portion of the environment so that detailed information is provided concerning the state of that portion.

Synthetic Sample - see "Quality Control Sample"

Systematic Error - A consistent deviation in the results of sampling and/or analytical processes from the expected or known value. Such error is caused by human and methodological bias.

Target - The chosen object of investigation for which qualitative and/or quantitative data or information is desired (i.e., the analyte of interest).

Technical Systems Audit - A thorough, systematic on-site, qualitative review of facilities, equipment, personnel, training, procedures, recordkeeping, data validation, data management, and reporting aspects of a total measurement system.

Technique - A principle and/or the procedure of its application for performing an operation.

Test - A technical procedure that determines one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. See "Method".

Test Data - Results from a test.

Test Determination - The process of obtaining an observed value of a property for a single sample. Also, the observed value obtained (i.e., the test result.) See "Test Result".

Test Method - Defined technical procedure for performing a test. see "Method"

Test Portion - A subsample of the proper amount for analysis and measurement of the property of interest. A test portion may be taken from the bulk sample directly, but often preliminary operations, such as mixing or further reduction in particle size, are necessary.

Test Result - A product obtained from performing a test determination. See "Test Determination".

Test Sample - see "Test Portion"

Test Specimen - see "Test Portion"

Test Unit - see "Test Portion"

Traceability - The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

Trip Blanks - Trip blanks or transport blanks are test samples of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. They are used to measure cross-contamination from the container and preservative during transport, field handling, and storage. Usually, at least one trip blank should be prepared for each sample type per trip.

Trip Reference Samples - Trip Reference Samples or transport reference samples are test samples of "media having known analyte concentration" taken from the laboratory to the sampling site and returned to the laboratory unopened. They are used to measure cross-contamination from the container and preservative during transport, field handling, and storage. Usually at least one trip reference sample should be prepared each sample type per trip.

Type I Error - Also called alpha error, is the probability of deciding an analyte is present when it is actually absent.

Type II Error - Also called beta error, is the probability of deciding an analyte is absent when it is actually present.

Vadose Zone - A subsurface zone above the water table in which the interstices of a porous medium are only partially filled with water.

Validated Method - A method that has been determined to meet certain performance criteria for sampling and/or measurement operations.
Validation - The process of substantiating specified performance criteria.

Value - The magnitude of a quantity. A single piece of factual information obtained by observation or measurement and used as a basis of calculation.

Variable - The ability to be proven or substantiated.

Variance (statistical definition) - A measure of the dispersion of a set. The sum of the squares of the difference between the individual values of a set and the arithmetic mean of the set, divided by one less than the number of values in the set. (The square of the standard deviation) see also "Measure of Dispersion"

Verifiable - The ability to be proven or substantiated.

Verification - Confirmation by examination and provision of evidence that specified requirements have been met.

Verification Standard - Standard run subsequently to the original calibration and used to verify the suitability of the original calibration. This standard is usually prepared from material obtained from a different source than the original calibration standard material, to provide an independent check on the accuracy of the standard materials.

VOCs - Volatile organic compounds that participate in atmospheric photochemical reactions, related to the generation of ground level ozone. VOCs are a subset of NMOCs.

Warning Limit - A specified boundary on a control chart that indicates a process may be going out of statistical control and that certain precautions are required. The boundary specified is usually two standard deviations (i.e., the 95% confidence level.)

Weir – A weir is a calibrated obstruction or dam built across an open channel over which the liquid flows, often through a specially shaped opening or notch. Weirs are the simplest, least expensive, and most common form of primary measuring device for measuring flow. They are typically made of aluminum or fiberglass.

Well Development - Improving the efficiency of hydraulic conditions in the vicinity of a screen in a monitoring well after drilling. It is accomplished by removing any silt or sand-sized particles from the filter pack and surrounding formation.

Well Nest - A closely spaced group of piezometers, screened at different depths, used to measure vertical hydraulic gradients and to sample groundwater at different depths in an aquifer.

Within-Laboratory Standard Deviation - see "Intralaboratory Precision"

Work Instructions - Instructions used for the accomplishment of specific tasks associated with the operation of the quality system. Work instructions include test methods, related procedures necessary to ensure sample or test organism integrity, equipment operating instructions, calibration procedures, worksheets and instructions relating any other aspect of the quality system.

Zero Drift - The change in instrument output over a stated time period of nonrecalibrated, continuous operation, when the initial input concentration is zero; usually expressed as a percentage of the full scale response.

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