



Central Valley Regional Data Center

Chemistry Template Entry Manual

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LIST OF ACRONYMS

BR	Business Rule
BR(CVRDC)	Business Rule: Central Valley Regional Data Center (specific to CV RDC and differs from the SWAMP Business Rule)
CEDEN	California Environmental Data Exchange Network
CVRDC	Central Valley Regional Data Center
ILRP	Irrigated Lands Regulatory Program
LABQA	Laboratory Quality Assurance
LCS	Laboratory Control Spike
MDL	Method Detection Limit
MLML RDC	Moss Landing Marine Laboratory Regional Data Center
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PR	Percent Recovery
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
SWAMP	Surface Water Ambient Monitoring Program



LIST OF TERMS

EquipBlank	Clean water pumped through new equipment, cleaned equipment after contamination, equipment for non-surface water, new lot of filters (metals), preserved (if appl.) and analyzed.
FieldBlank	Clean water taken to field, transferred to container, preserved (if appropriate) and treated same as corresponding sample type during the sampling event.
FilterBlank	Clean water that is filtered in the same manner and through the same filter apparatus used for the sample.
LookUp lists	Tables that contain specific CV RDC codes found in the CV RDC or CEDEN database. Current LookUp lists can be found at: http://checker.cv.mpsl.mlml.calstate.edu/CVRDC/CVRDC_LookUpLists.php http://ceden.waterboards.ca.gov/Metadata/ControlledVocab.php
TravelBlank	Clean water transported to site, handled like sample (never opened), and returned to lab for analysis.
Data Checker	Web-based automated tool that assists data submitters in examining their data sets against the required LookUp lists, formats and business rules.



AMENDMENTS

Date of Amendment	Document Section	Page Number	Amendment to CEDEN Chemistry Documentation
November 11, 2011	Appendix A: Table 1; Template Column Header = QAcode	48	Original Wording: When flagging a sample only put the flag on the appropriate sample i.e. not the whole batch. E.g. for 'IP' put this only on the blank sample, and for 'FDP' put this on the Normal and the duplicate sample. (Note that the whole batch will be flagged by the LabSubmissionCode with explanations)
			Amended To: When flagging a sample only put the flag on the appropriate sample i.e. not the whole batch e.g. for 'IP' put this only on the blank sample that is outside QC limits. If the QAcode affects the results of the other samples in the batch, it may be applied to multiple samples. For example, when an RPD is calculated between two samples resulting in a flag indicating that the RPD is greater than the data quality objective (i.e. FDP), both samples should be flagged.
March 15, 2012	Section 1	3-7	Replaced whole section with new CEDEN tables from new CEDEN documentation. Reorganized table to fit CVRDC template format.
March 30, 2012	Appendix B	47	Added Appendix B: Applying Specific QAcodes
March 30, 2012	Appendix A: Table 1; Template Column Header = QAcode	40	Added <i>"See Appendix B for more details."</i> to business rules.



Date of Amendment	Document Section	Page Number	Amendment to CEDEN Chemistry Documentation
April 27, 2012	Table 6: Example Non-Project Matrix Spike and Duplicate Samples (000NONPJ)		Added: "'Not Recorded' is also used for the original 000NONPJ sample that is accompanying the laboratory duplicate and MS/MSD"
May 18,2012	Table 6 and Table 3 for SampleDate	14 and 20	Original Wording: BR (CV RDC): Use sample PreparationPreservationDate. If there is no PreparationPreservationDate the SampleDate should equal the date that the sample was digested/extracted. When no digestion/extraction was performed, the SampleDate should be equal to the analysis date.
			Amended To: BR (CV RDC): Suggested date would be the earliest date of manipulation. For example, use sample PreparationPreservationDate. If there is no PreparationPreservationDate the SampleDate would equal the date that the sample was digested/extracted. When no digestion/extraction was performed, the SampleDate would be equal to the analysis date.
March 8,2013	Section 6	31	Updated data checker link.
June 18, 2015	All Sections	All pages	Revised language to reflect new CEDEN template and process.
August 11, 2015	Appendix A	45	Revised Result business rule for non-detects (ND).
October 28, 2015	Section 3.3	27	Revised instructions for calculating percent recoveries (PR).
January 8, 2016	Appendix A	40	Revised CollectionDeviceName for default value.
October 20, 2016	Appendix A	39-40	Updated CollectionTime business rule description for Results



i. INTRODUCTION

This document is designed to provide guidance on the necessary data reporting requirements for electronic data to be submitted to the Central Valley Regional Data Center (CV RDC) data base that will eventually be loaded into the California Environmental Data Exchange Network (CEDEN). For information about the CV RDC, see online at <http://mlj-llc.com/Home/CVRDC> and CEDEN at <http://www.ceden.org/>. This document details the content, required format and current business rules specifically for chemistry data, including analysis for sediment, water and bacteria. This document should be used in conjunction with the individual program's Quality Assurance Project Plan (QAPP) to assess compliance with the required quality assurance (QA) samples.

Two templates are currently available for use to submit data, the CV RDC chemistry data template and CEDEN chemistry data template. The CV RDC template will expire in June 2016. Both Excel Templates can be found at: http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/water_quality/electronic_data_submission/index.shtml

The following documentation is specific to the CEDEN data templates. However, the business rules and definitions detailed within can be used across all templates.

This document has been divided in to six subsections. A brief description of each is provided below:

- Section 1. Water and Sediment Quality (Chemistry and Bacteria) Data Template
- Section 2. Laboratory QA Entry
- Section 3. Field Generated QA Samples
- Section 4. Unique Business Rules
- Section 5. Data Checker
- Section 6. Batch Verification Codes and Compliance Codes

Section 1, Water and Sediment Quality (Chemistry and Bacteria) Data Template, includes two sections that briefly define/describe the data elements needed for data entry into the CEDEN chemistry template. This section is designed to provide users with an idea of what type of data are needed for entry into the CEDEN chemistry templates, with minimum data requirements for the CEDEN template noted. Appendix A contains more detailed definitions of the data elements and describes the business rules for each column header within the chemistry template.

Section 2, Laboratory QA Entry, describes the business rules for entering laboratory QA into the chemistry template such as laboratory blanks, laboratory control spikes, laboratory duplicates and matrix spikes.

Section 3, Field Generated QA Samples, describes how to enter results for field generated QA including equipment and travel blanks for station specific sample collection and non-station specific sample collection.

Section 4, Unique Business Rules, describes analyte/analysis specific rules that differ from the overall business rules described in the previous sections.



Section 5, Data Checker, details a web-based automated tool provided to assist data submitters in examining their data sets against the required LookUp lists, formats and business rules.

Section 6, Batch Verification Codes and Compliance Codes, describes the batch verification and compliance codes used by the ILRP. This process is completed by the ILRP while transferring a program's submitted data to the CV RDC database.



1. WATER AND SEDIMENT QUALITY (CHEMISTRY AND BACTERIA) DATA

There are two worksheets within the excel template that must be completed for the submitted data package. The first, Chemistry Results Worksheet, includes all chemistry, bacteria, and QA results data. This Excel worksheet should be named **ChemResults**. The second worksheet, Chemistry Lab Batch Worksheet, documents information specific to the laboratory batch in which data are analyzed. This worksheet should be named **LabBatch**.

The tables below provide a brief description for each of the column headers in the chemistry results and lab batch worksheet (**ChemResults** and **LabBatch**). This table includes information about the data type, minimum data requirements, size, and provides the appropriate LookUp list if applicable for each column. This section is designed to provide users with an idea of what types of data are needed for entry into the CEDEN chemistry templates. Table 1 and 2 within Appendix A provide more detailed descriptions and business rules for each column in the template. Current LookUp lists can be found at http://checker.cv.mpsl.mlml.calstate.edu/CVRDC/CVRDC_LookUpLists.php. For information on how to add new LookUp list values please visit <http://mlj-llc.com/Home/CVRDC> , or download the [Lookup Request Forms](#) and submit them to the CV RDC at: Victoria Bowles (vbowles@mlj-llc.com).

1.1 CHEMISTRY RESULTS WORKSHEET

Each record in the chemistry results worksheet represents a result from a specific analysis for a particular parameter at a single station or a single QA sample. Please note that all fields are strongly encouraged to be populated with information but the minimum data requirements are noted within the required column. Examples of special types of samples, e.g. laboratory QA, are listed in sections 2-4.

Table 1: Chemistry result template header definitions, cell requirements and LookUp list availability.

* Primary Key, required for record uniqueness.

ChemResults HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
StationCode*	Text	Yes	25	Station LookUp	A code representing the StationName and site and should be unique within a study design.
SampleDate*	Date/ Time	Yes			Refers to the date the sample was collected in the field. Formatted as dd/mmm/yyyy.
ProjectCode	Text	Yes	25	Project LookUp	References the project that is associated with the sample.



ChemResults HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
EventCode	Text	Desired	20	Event LookUp	Represents the primary reason, i.e. water quality, tissue or bioassessment sampling, of the sampling event at a particular station and date.
ProtocolCode	Text	Desired	50	Protocol LookUp	Represents the sampling protocol used, which includes the set of methods, methodology and/or specifications, such as MPSSL-DFG_Field_v1.0. Established protocols may be used or Regions may document their own sampling protocols.
AgencyCode	Text	Desired	20	Agency LookUp	Refers to the organization or agency that collected the sample. This should be listed on the Chain of Custody (COC) document that accompanies the samples from the field.
SampleComments	Text	No	255		The comments field should be used for any notes or comments specifically related to the sample collection.
LocationCode	Text	Desired	50	Location LookUp	Describes the physical location in the waterbody where the sample was collected. One sampling event may have a single or multiple locations.
GeometryShape	Text	No	50	Variable Code Lookup	Physical shape of the Station. Example values are Line, Point, or Polygon.
CollectionTime*	Date/Time	Yes	20		Refers to the time when the first sample of a sampling event at a specific station was collected in the field.
CollectionMethod Code	Text	Yes	50	Collection Method LookUp	Refers to the general method of collection such as Sed_Grab, Sed_Core, Water_Grab, Autosampler24h, Autosampler7d.
SampleTypeCode*	Text	Yes	20	Sample Type LookUp	Refers to the type of sample collected or analyzed.



ChemResults HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
Replicate*	Integer	Yes			Used to distinguish between replicates created at a single collection in the field. Default value is 1. Replicate samples are collected at the same station and date. Therefore, samples collected on different dates from the same station should both have a value of 1 for FieldReplicate.
CollectionDeviceName	Text	Desired	50		Unique name of the CollectionDevice. Refers to the specific device used in the collection of the sample.
CollectionDepth	Decimal	Yes			Records the depth or penetration, from the surface in the water or sediment column, at which the sample was collected.
UnitCollectionDepth	Text	Yes	50	VariableCodes LookUp	Refers to the units used in the CollectionDepth including cm (centimeters) and m (meters).
PositionWaterColumn	Text	Desired	20	VariableCodes LookUp	Position in water column where sample was taken.
LabCollection Comments	Text	No	255		Comments related to the LabCollection.
LabBatch*	Text	Yes	35		The LabBatch is a unique code, provided by the laboratory, which represents a group of samples processed together. It groups all environmental samples with their supporting QC samples and will be used to verify completeness. A unique identifier for each batch, generated by the lab. This field is the primary key to ensure record uniqueness. Please use a standard format to construct a composite Lab Batch. See the CV RDC File and Batch Naming Convention for guidelines on assigning laboratory batch codes



ChemResults HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
AnalysisDate	Date/ Time	Yes			Date and time the sample was processed on the analytical instrument. Formatted as dd/mmm/yyyy hh:mm.
MatrixName*	Text	Yes	50	Matrix LookUp	Refers to the sample matrix, e.g. samplewater.
MethodName*	Text	Yes	50	Method LookUp	Refers to the analysis method used by the laboratory to analyze the sample.
AnalyteName*	Text	Yes	100	Analyte LookUp	Name of the analyte or parameter for which the analysis is conducted and result is reported. The LookUp list includes the acceptable abbreviation or name of the variable used by the database, enabling consistency across reporting.
FractionName*	Text	Yes	50	Fraction LookUp	Specific descriptor of the Analyte. For example, metals are often expressed as total or dissolved; this description should be used within the fraction field.
UnitName*	Text	Yes	50	Unit LookUp	Refers to how the chemistry result is measured or expressed.
LabReplicate*	Integer	Yes			Used to distinguish between replicates created in the laboratory. Differentiates the original field sample that was analyzed from all subsequent laboratory duplicates. Default is 1.
Result	Text	Yes	50		Final numeric result of a given analyte. The result should be reported with the appropriate number of significant figures.
ResQualCode	Text	Yes	10	ResQual LookUp	Qualifies the analytical result of the sample.



ChemResults HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
MDL	Decimal	Yes			The MDL (method detection limit) is the lowest possible calculated detection limit associated with a given method and analyte. The MDL should be reported on the lab summary sheet with the associated measured result. If an MDL is not listed on the lab summary sheet, then the default value should be '-88' with a QACode of 'NMDL'.
RL	Decimal	Yes			The RL (reporting limit) is the minimum value below which data are documented as non-quantifiable, determined by the laboratory.
QACode	Text	Yes	30	QA LookUp	Applied to the sample to describe any special conditions, situations or outliers that occurred during or prior to the analysis to achieve the result. The default code indicating no special conditions is "None". If more than one code should be applied to a record, the convention is to list them in alphabetical order separated by commas with no spaces.
ComplianceCode	Text	Desired		DataCom pliance Lookup	Unique code referencing the Compliance with the associated QAPP.
DilutionFactor	Integer	Desired			Factor by which the sample was diluted; reported as a whole number. DilutionFactor is the final volume divided by the initial volume of solution, or $DF = V_f \div V_i$. If no dilution performed, the default value is "1".
ExpectedValue	Decimal	No			Concentration of the analyte in a reference standard, laboratory control sample or matrix spike sample or the value expected to obtain from analysis of the QC Sample. This consists of the native sample result concentration plus the spike amount. For surrogate samples, the expected value should be 100, representing 100%.



ChemResults HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
PrepPreservationName	Text	Desired	50	PrepPreservation LookUp	References the preparation or preservation method performed on the samples prior to analysis.
PrepPreservationDate	Date Time	Desired			Date and time the preparation or preservation was started.
DigestExtractMethod	Text	Desired	50	DigestExtract LookUp	References the digestion or extraction method performed on the sample prior to analysis.
DigestExtractDate	Date Time	Desired			Date and time the digestion or extraction was started.
SampleID	Text	No	40		Unique identifier supplied by the organization directing the sampling or sampling agency; used to track the sample throughout the sampling and analysis processes.
LabSampleID	Text	No	35		Intended to provide lab specific identification for an analyzed sample.
LabResultComments	Text	No	130		Holds any comments related to the lab result or analysis of the sample.

1.2 CHEMISTRY LABBATCH WORKSHEET

Table 2: Chemistry LabBatch template header definitions, cell requirements and LookUp list availability.

* Primary Key, required for record uniqueness.

LabBatch HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
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LabBatch HEADER	DATA TYPE	REQUIRED	SIZE	LOOKUP LIST	DEFINITION
LabBatch*	Text	Yes	35		The LabBatch is a unique code, provided by the laboratory, which represents a group of samples processed together. It groups all environmental samples with their supporting QC samples and will be used to verify completeness. A unique identifier for each batch, generated by the lab. This field is the primary key to ensure record uniqueness. Please use a standard format to construct a composite Lab Batch. See the CV RDC File and Batch Naming Convention for guidelines on assigning laboratory batch codes.
LabAgencyCode*	Text	Desired	20	Agency LookUp	LabAgencyCode refers to the organization, agency or laboratory that performed the analysis on the sample.
LabSubmissionCode	Text	Desired	10	Lab Submission Lookup	The LabSubmissionCode is a unique batch qualifier code assigned to the LabBatch as a whole by the analyzing laboratory which references the quality of the data in the LabBatch. The LabSubmissionCode should be reviewed by the Project Manager or other appropriate person to ensure that the code has been applied based on project specific data quality objectives and criteria.
BatchVerificationCode	Text	Desired	10	Batch Verification Lookup	Unique code referencing the Verification of a Batch. If the Batch Verification used is not found in the lookup list please contact your Regional Data Center for assistance.
SubmittingAgencyCode	Text	No	20	Agency LookUp	Organization or agency that is responsible for submission of the data. This agency may be different from LabAgencyCode if the analytical data were subcontracted to another agency.
LabBatchComments	Text	No	255		LabBatchComments records any comments relating to the LabBatch as a whole. Comments should explain any irregularities in sample processing.



The sections below provide examples for entering, 1) samples that are generated or created by the laboratory (LABQA) and 2) environmental samples that are modified by the laboratory for QA purposes (e.g. matrix spikes).

1.3 LABORATORY GENERATED QA SAMPLES (LABQA)

All samples generated from within the laboratory, such as a LabBlank, Laboratory Control Spike (LCS), or Certified Reference Material (CRM), are entered into the chemistry template according to specific business rules. For example, Table 3 lists the values that should be entered for laboratory generated QA (LABQA) samples within the chemistry template columns. Descriptions are included in Table 3 (Description & Business Rules) to further address formatting specifications.

Table 3: Business rule example values to be used for laboratory generated QA samples (LABQA) for a subset of chemistry template columns.

Chemistry Template Column Names	Value	Description & Business Rules
<i>StationCode</i>	LABQA	LABQA is used as the station code for any sample generated in the lab, including LabBlank, LCS and CRMs.
<i>SampleDate</i>		SampleDate must be equal to or before AnalysisDate and expressed as dd/mmm/yyyy. Suggested date would be the earliest date of manipulation. For example, if PrepPreservationDate is given, the SampleDate would be the same date. If there is no PrepPreservationDate, the SampleDate would equal the date of digestion/extraction. When no digestion/extraction was performed, the SampleDate would be equal to the analysis date.
<i>ProjectCode</i>	Not Applicable	
<i>EventCode</i>	WQ	For water and sediment chemistry use 'WQ'. See the EventCode LookUp list for additional EventCodes. The EventCode should be consistent with the environmental samples in the same batch.
<i>ProtocolCode</i>	Not Applicable	LABQA samples are generated in the laboratory and are associated with the ProtocolCode of 'Not Applicable'.



Chemistry Template Column Names	Value	Description & Business Rules
<i>AgencyCode</i>		Organization or agency that analyzed the sample. Select from Agency LookUp list.
<i>LocationCode</i>	Not Applicable	LABQA samples are generated in the laboratory and therefore are associated with a LocationCode of 'Not Applicable'.
<i>CollectionTime</i>	0:00	LABQA are associated with 00:00 time for collection since they are generated in the laboratory. There are situations within a batch when two identical sample types are used for QA reasons and the only way to differentiate between them is to give them each a different CollectionTime. For example, when more than one LabBlank, CRM, or LCS is digested, extracted, or analyzed in the same batch on the same day but are not replicates of each other, one CollectionTime should be 0:00 and the other 0:15, increasing the time by 15 minutes for each additional sample.
<i>CollectionMethodCode</i>	Not Applicable	LABQA samples are generated in the laboratory and therefore are not associated with a LocationCode.
<i>SampleTypeCode</i>		Select from SampleTypeLookUp List – LabBlank, LCS and CRM are listed as the most common LABQA sample types.
<i>Replicate</i>	1	
<i>CollectionDepth</i>	-88	'-88' is used as a null value for LABQA samples. This field must be populated with a number and cannot be left blank.
<i>UnitCollectionDepth</i>	m	For water, use 'm' for meter.
	cm	For sediment, use 'cm' for centimeter.
<i>Matrix</i>	labwater	Labwater is used for LABQA samples created with laboratory tap water.
	blankwater	Blankwater is used for LABQA samples created with



Chemistry Template Column Names	Value	Description & Business Rules
		laboratory Type II water.
	blankmatrix	Blankmatrix is used for LABQA sediment samples created with a commercially generated product.
	sediment	Sediment is used for LABQA sediment samples created with naturally occurring sediment from a known 'clean' source.
<i>LabReplicate</i>	1	LabReplicate '1' is associated with the original LABQA sample.
	2	LabReplicate '2' is associated with a duplicate LABQA sample.
<i>LabSampleID</i>		Recommended - provide lab specific identification for an analyzed sample

1.4 LABORATORY MODIFIED QA SAMPLES

There are several types of samples discussed in this section that are generated or modified within the laboratory. The first is a matrix spike, which is a modified, or analyte-spiked, field sample. The second is a laboratory generated duplicate of a field sample. At times, laboratories use samples not generated through the data generator's project to satisfy project specific batch QA requirements. This third type is a non-project sample.

1.4.1 MATRIX SPIKE AND LABORATORY DUPLICATE SAMPLES

For matrix spike samples (collected by the project) and laboratory duplicate samples performed on project sample (native field sample), all fields describing the sample (StationCode, EventCode, ProtocolCode, LocationCode, SampleDate, CollectionTime, CollectionMethodCode, CollectionDepth, UnitCollectionDepth, ProjectCode, AgencyCode) remain the same as the native sample. For matrix spike samples, the only fields that are different than the native field sample are SampleTypeCode and potentially the Replicate. For laboratory generated duplicate samples, the only field that is different than the native field sample is the LabReplicate. Table 4 lists the column headers in the chemistry template that describe the sample and give example values and associated descriptions/business rules to aid the data generator in populating those fields for their own data.

Table 4: Business rule example values to be used for matrix spike and laboratory duplicate samples created from project specific samples (native field sample).



Chemistry Template Column Names	Value	Description & Business Rules
<i>StationCode</i>		Same as native field sample
<i>SampleDate</i>		Same as native field sample
<i>ProjectCode</i>		Same as native field sample
<i>EventCode</i>		Same as native field sample
<i>ProtocolCode</i>		Same as native field sample
<i>AgencyCode</i>		Same as native field sample
<i>LocationCode</i>		Same as native field sample
<i>CollectionTime</i>		Same as native field sample
<i>CollectionMethodCode</i>		Same as native field sample
<i>SampleTypeCode</i>	MS1 MS2 MSBLDup	<p>For laboratory generated duplicates, the SampleTypeCode is the same as the native field sample.</p> <p>Matrix Spike performed on a Grab or Integrated sample</p> <p>Matrix Spike performed on a field duplicate sample (native field sample will have a SampleTypeCode of Grab or Integrated with a Replicate of 2).</p> <p>Matrix Spike performed on a field blind duplicate (FieldBLDup).</p>



Chemistry Template Column Names	Value	Description & Business Rules
		There are situations when a Matrix Spike was unintentionally performed on a blank sample such as a FieldBlank, TravelBlank, EquipBlank, DIBlack or FilterBlank. A batch may include two or more of these types of native samples where the only difference between them is the environmental sample's SampleTypeCode. The only way to differentiate between them is to give each a different CollectionTime. For example, when a batch contains both a DIBlack and an EquipBlank (both with an original time of 0:00) and a Matrix Spike was performed on the EquipBlank, one CollectionTime should be 0:00 and the other 0:15. Then the associated native sample CollectionTime should correspond to the MS1 sample times. For example, the EquipBlank would have a native sample time of 00:00 and an MS1 time of 00:00 and the DIBlack would have a native sample time of 00:15 (updated from 00:00).
<i>Replicate</i>	1	
<i>CollectionDepth</i>		Same as native field sample
<i>UnitCollectionDepth</i>		Same as native field sample
<i>Matrix</i>		Same as native field sample
<i>LabReplicate</i>	1	Native field sample or Matrix Spike
	2	Laboratory generated duplicate or Matrix Spike duplicate
<i>LabSampleID</i>		Recommended - provide lab specific identification for an analyzed sample. It is preferable to add -Dup, -MS, -MSD to the end of the Lab ID to help confirm the SampleTypeCode and the LabSampleID of the native sample.



1.4.1.1 Matrix Spike Samples performed on Field Duplicates

Table 5 describes the way to format matrix spike samples performed on field duplicates (Replicate = 2), field blind duplicates (FieldBLDup), and composite blind duplicates (CompBLDup) as well as coding duplicate samples.

Table 5: Formatting Field Duplicates and Matrix Spikes

	Descriptions	Template Column Heading		
		SampleTypeCode	Replicate	Lab Replicate
1	One environmental sample: sampled or split in triplicate			
	Single environmental sample	Grab	1	1
	Field duplicate of single environmental sample	Grab	2	1
	Second field duplicate of single environmental sample	Grab	3	1
2	One environmental sample: sampled or split in triplicate and submitted to the laboratory blind (unknown to the laboratory)			
	Single environmental sample	Grab	1	1
	Field blind duplicate of single environmental sample	FieldBLDup or CompBLDup	1	1
	Second field blind duplicate of single environmental sample	FieldBLDup or CompBLDup	2	1
3	One pair of MS/MSD: associated to one grab			
	Single environmental sample	Grab	1	1
	Matrix spike of single environmental sample	MS1	1	1
	Matrix spike duplicate of single environmental sample	MS1	1	2
4	One pair of MS/MSD: associated to one grab with field duplicate present			
	Single environmental sample	Grab	1	1
	Field duplicate of single environmental sample	Grab	2	1
	Matrix spike of single environmental sample	MS1	1	1
	Matrix spike duplicate of single environmental sample	MS1	1	2
5	One pair of MS/MSD: associated to one field duplicate			
	Single environmental sample	Grab	1	1
	Field duplicate of single environmental sample	Grab	2	1
	Matrix spike of field duplicate sample	MS2	1	1
	Matrix spike duplicate of field duplicate sample	MS2	1	2
6	One pair of MS/MSD: associated to one field blind duplicate			
	Single environmental sample	Grab	1	1
	Field blind duplicate of single environmental sample	FieldBLDup or CompBLDup	1	1
	Matrix spike of field blind duplicate sample	MSBLDup	1	1



	Descriptions	Template Column Heading		
		SampleTypeCode	Replicate	Lab Replicate
	Matrix spike duplicate of field blind duplicate sample	MSBLDup	1	2
7	Two pairs of MS/MSD: one associated to the grab and one associated to the field duplicate			
	Single environmental sample	Grab	1	1
	Field duplicate of single environmental sample	Grab	2	1
	Matrix spike of single environmental sample	MS1	1	1
	Matrix spike duplicate of single environmental sample	MS1	1	2
	Matrix spike of field duplicate sample	MS2	1	1
	Matrix spike duplicate of field duplicate sample	MS2	1	2

1.4.2 NON-PROJECT MATRIX SPIKE AND DUPLICATE SAMPLES (000NONPJ)

At times, laboratories use samples not generated through the project to satisfy batch QA requirements. These samples have different formatting rules, which are displayed in Table 6. In most cases, non-project samples have no sample collection information since they are used only to satisfy batch QA requirements.

Table 6: Example Non-Project Matrix Spike and Duplicate Samples (000NONPJ)

Chemistry Template Column Names	Value	Description & Business Rules
<i>StationCode</i>	000NONPJ	'000NONPJ' is the StationCode associated with an environmental sample that was collected by a different project but used for laboratory quality assurance purposes (i.e. duplicate or matrix spike).
<i>SampleDate</i>		SampleDate must be equal to or before AnalysisDate and expressed as dd/mmm/yyyy. Suggested date would be the earliest date of manipulation. If PrepPreservationDate is given, the SampleDate would be the same date. If there is no PrepPreservationDate, the SampleDate would equal the date of digestion/extraction. When no digestion/extraction was performed, the SampleDate would be equal to the analysis date.
<i>ProjectCode</i>	Not Applicable	000NONPJ samples are not associated with the same project as the analyzed environmental samples, therefore 000NONPJ receive a ProjectCode of 'Not Applicable'.
<i>EventCode</i>	WQ	For water and sediment chemistry, use 'WQ'. See the EventCode LookUp list for additional EventCodes and associated definitions. The EventCode should be consistent with the environmental samples in the same batch.



Chemistry Template Column Names	Value	Description & Business Rules
<i>ProtocolCode</i>	Not Applicable	000NONPJ samples are not associated with the same project as the analyzed environmental samples, therefore 000NONPJ receive a ProtocolCode of 'Not Applicable'.
<i>AgencyCode</i>	Not Recorded	000NONPJ samples are not associated with the same project as the analyzed environmental samples, therefore 000NONPJ receive an AgencyCode of 'Not Recorded'.
<i>LocationCode</i>	Not Recorded	000NONPJ samples are not associated with the same project as the analyzed environmental samples, therefore 000NONPJ receive a LocationCode of 'Not Recorded'.
<i>CollectionTime</i>	0:00	000NONPJ samples are associated with 00:00 time for collection since they are being used for laboratory quality assurance purposes.
		There are situations within a batch when two identical sample types are used for QA reasons and the only way to differentiate between them is to give them each a different CollectionTime. For example, when more than one LabBlank, CRM, or LCS is digested, extracted, or analyzed in the same batch on the same day but are not replicates of each other, one CollectionTime should be 0:00 and the other 0:15, increasing the time by 15 minutes for each additional sample.
<i>CollectionMethodCode</i>	Not Recorded	000NONPJ samples are not associated with the same project as the analyzed environmental samples, therefore 000NONPJ receive a CollectionMethodCode of 'Not Recorded'.
<i>SampleTypeCode</i>	Not Recorded	'Not Recorded' is used for laboratory duplicates created with 000NONPJ samples. 'Not Recorded' is also used for the original 000NONPJ sample that is accompanying the laboratory duplicate and MS/MSD.
	MS1	'MS1' is used for laboratory matrix spikes created with 000NONPJ samples. See Table 4: Formatting field duplicated and matrix spikes for additional business rules regarding matrix spikes.
<i>Replicate</i>		1
<i>CollectionDepth</i>	-88	'-88' is used as a null value for 000NONPJ samples. This field must be populated with a number and cannot be left blank.
<i>UnitCollectionDepth</i>	m	For water, use 'm' for meter.
	cm	For sediment, use 'cm' for centimeter.
<i>Matrix</i>	samplewater	000NONPJ water samples use Matrix of 'samplewater'.
	sediment	000NONPJ sediment samples use Matrix of 'sediment'.
<i>LabReplicate</i>	1	Original 000NONPJ samples and original 000NONPJ matrix spike samples use a LabReplicate of '1'.
	2	Matrix spike duplicates and laboratory duplicates use a



Chemistry Template Column Names	Value	Description & Business Rules
		LabReplicate of '2'.
<i>QACode</i>	QAX	'QAX' is associated with 000NONPJ samples when the native sample is not included in the batch reported.
<i>PrepPreservation Name</i>		Actual preparation or preservation performed. This should be the same as the other samples in the batch.
<i>PrepPreservationDate</i>		Actual preparation or preservation date and time expressed as dd/mmm/yyyy hh:mm
<i>SampleID</i>		The <i>LabSampleID</i> or <i>Source ID</i> may be used here as the <i>SampleID</i> to identify the native sample.
<i>LabSampleID</i>		Recommended to provide lab specific identification for an analyzed sample. It is preferable to add -Dup, -MS, -MSD to the end of the Lab ID to help confirm the SampleTypeCode and the LabSampleID of the native sample.



2. FIELD GENERATED QA SAMPLES

There are two types of blank samples discussed in this section that are generated as field quality assurance samples. The first is when a field generated QA sample is created at a specific station and that station information is important to record. For example, some projects may allow a certain amount to be detected in the blank provided it is less than five times the native (environmental) sample. For those situations it would be important to have similar sample information between the blank and the native sample to evaluate quality assurance criteria. The second example is when a field generated QA sample is created for a sampling trip or if the station information is not recorded.

Field duplicate samples should have identical sample information as its native sample (StationCode, CollectionTime, etc.) but with a Replicate of '2'. The following section is specific to field generated blanks.

2.1 FIELD GENERATED BLANK SAMPLES - STATION SPECIFIC

For analyses that require an EquipBlank, TravelBlank, FieldBlank, or FilterBlank to accompany a sampling event, the data are entered in the same manner as the native samples collected at that station. Table 7 lists the chemistry template column names and associated descriptions and business rules for guidance.

Table 7: Example values to be used for field generated blank samples associated with station specific details

Chemistry Template Column Names	Value	Description & Business Rules
<i>StationCode</i>		Station where sample was created. For EquipBlanks, TravelBlanks or FilterBlanks that may be created at a laboratory or agency prior to sampling, a StationCode may still be applied to the sample if it serves the purpose of the project to associate all field and laboratory QA samples together (i.e. via the same sample entry information).
<i>SampleDate</i>		Same as native sample.
<i>ProjectCode</i>		Same as native sample
<i>EventCode</i>	WQ	Same as native sample. For water and sediment chemistry use 'WQ'.
<i>ProtocolCode</i>		Same as native sample.
<i>AgencyCode</i>		Same as native sample



Chemistry Template Column Names	Value	Description & Business Rules
<i>LocationCode</i>		Same as native sample.
<i>CollectionTime</i>		Time sample was created (same as native sample time) or 00:00. There are situations within a batch when two identical sample types are used for QA reasons and the only way to differentiate between them is to give them each a different <i>CollectionTime</i> . For example, when more than one EquipBlank, FieldBlank, or FilterBlank is created on the same day but are not replicates of each other, one <i>CollectionTime</i> should be 00:00 and the other 00:15, increasing the time by 15 minutes for each additional sample.
<i>CollectionMethodCode</i>	Not Applicable	Field generated blanks have CollectionMethodCode of 'Not Applicable'.
<i>SampleTypeCode</i>	EquipBlank, TravelBlank, FieldBlank, FilterBlank	See the SampleTypeCode lookup list for definitions of the various field generated QA SampleTypeCodes.
<i>Replicate</i>	1	Field generated blanks should have a replicate of '1'.
<i>CollectionDepth</i>	-88	Field generated blanks are not generated using environmental water and therefore have a null value (-88) for CollectionDepth.
<i>UnitCollectionDepth</i>	m	For water, use 'm' for meter.
<i>LabCollection Comment</i>		It is recommended that when an equipment blank (EquipBlank) is generated, a comment details the type of equipment cleaned and its location (lab or field). A value is not required for this field and may be left blank.
<i>Matrix</i>	Labwater or blankwater	See MatrixLookup for definitions.
<i>LabSampleID</i>		Recommended - provide lab specific identification for an analyzed sample.

2.2 FIELD GENERATED BLANK SAMPLES (FIELDQA) – NON STATION SPECIFIC



Some analyses require an EquipBlank, FieldBlank, FilterBlank, TravelBlank or DIBLank to accompany a sampling event while not requiring the blank to have identical station and collection information as the sample. Table 8 lists example values that are used for generic blank samples generated in the field, as well as descriptions and business rules that can be used for data entry.

Table 8: Example values to be used for field generated blank samples that are not associated with station specific details (FIELDQA).

Chemistry Template Column Names	Value	Description & Business Rules
<i>StationCode</i>	FIELDQA	Field generated blanks not associated with a specific station have StationCode of 'FIELDQA'.
<i>SampleDate</i>		Date sample was created
		TravelBlank should be entered as the date the TravelBlank becomes part of the sample group (i.e., leaves the lab for the sampling event).
<i>ProjectCode</i>		Project associated with the sample
<i>EventCode</i>	WQ	Same as native sample. For Water and sediment chemistry use 'WQ'.
<i>ProtocolCode</i>		Protocol used or 'Not Recorded'.
<i>AgencyCode</i>		Organization or agency that created the sample
<i>LocationCode</i>	Not Applicable	Since the FIELDQA blank sample is not associated with a specific station, the LocationCode is 'Not Applicable'.
<i>CollectionTime</i>		Time sample was created or 00:00
		There are situations within a batch when two identical sample types are used for QA reasons and the only way to differentiate between them is to give them each a different CollectionTime. For example, when more than one EquipBlank, FieldBlank, FilterBlank, TravelBlank, or DIBLank is created on the same day but are not replicates of each other, one CollectionTime should be 00:00 and the other 00:15, increasing the time by 15 minutes for each additional sample.
<i>CollectionMethodCode</i>	Not Applicable	Field generated blanks including FIELDQA are associated with the CollectionMethodCode of 'Not Applicable'.



Chemistry Template Column Names	Value	Description & Business Rules
<i>SampleTypeCode</i>	EquipBlank, TravelBlank, FieldBlank, FilterBlank or DIBLank	See the SampleTypeCode lookup list for definitions of the various field generated QA SampleTypeCodes.
<i>Replicate</i>	1	Field generated blanks including FIELDQA should have a replicate of '1'.
<i>CollectionDepth</i>	-88	Field generated blanks including FIELDQA are not generated using environmental water and therefore are associated with a null value (-88) for CollectionDepth.
<i>UnitCollectionDepth</i>	m	For water use 'm' for meter.
<i>LabCollection Comments</i>		It is recommended that when an equipment blank (EquipBlank) is generated, a comment is recorded that lists the type of equipment cleaned and location (lab or field). A value is not required for this field and can be left blank.
<i>Matrix</i>	Labwater or blankwater	See MatrixLookup for definitions.
<i>LabSampleID</i>		Recommended - provide lab specific identification for an analyzed sample



3. CALCULATING AND FORMATTING PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE

Calculations for percent recovery (PR) and relative percent difference (RPD) are displayed in sections 3.1-3.3. Projects can report the PR or RPD within the LabResultComments column. The correct format for recording percent recoveries and relative percent difference is as follows:

Table 9: Formatting Percent Recovery and Relative Percent Difference

Descriptions	Template Column
	LabResultsComments
Laboratory control spikes, Matrix Spikes etc	PR ##
Matrix spike or Laboratory control spike duplicates	PR ##, RPD ##
Laboratory Duplicates	RPD ##
Field Duplicates	RPD ##

= Calculated numeric value.

3.1 CALCULATING LABORATORY CONTROL SPIKE PERCENT RECOVERY

The lab control spike *Result* is the value gathered from the instrument and is the concentration recovered from the sample. The *ExpectedValue* is the spiked concentration. Percent recovery is the lab control spike value divided by the spike concentration value. To illustrate:

$$\% \text{ Recovery} = \left(\frac{V_{LCS}}{V_{Spike}} \right) \times 100$$

V_{LCS} = is the measured concentration of the lab control spike sample.

V_{Spike} = is the expected spike concentration

3.2 CALCULATING RELATIVE PERCENT DIFFERENCE

The lab control spike *Result* and the lab control spike duplicate *Result* are the values gathered from the instrument and is the concentration recovered from the sample. Relative percent difference is calculated by taking the absolute value from dividing the LCS minus the LCSD by the mean of the LCS and LCSD. To illustrate:

$$RPD = \left| \frac{V_{LCS} - V_{LCSD}}{\text{Mean}} \right| \times 100$$

Mean is the average between the two LCS and LCSD samples, calculated as follows:



$$\text{Mean} = \left[\frac{(V_{LCS} + V_{LCSD})}{2} \right]$$

V_{LCS} = is the measured concentration of the lab control spike sample.

V_{LCSD} = is the measured concentration of the lab control spike duplicate sample.

3.3 CALCULATING MATRIX SPIKE PERCENT RECOVERY

The reported matrix spike *Result* is the value gathered from the instrument and is the net amount recovered from the sample including the spike concentration. For a MS, native water is spiked with a known concentration of a target analyte and the PR is reported. Matrix Spike Percent Recovery is calculated by subtracting the native result from the MS lab *Result*, then dividing that value by the spike concentration and multiplying by 100, with the spike concentration as the expected value minus the native result. To illustrate:

$$\% \text{ Recovery} = \left(\frac{V_{MS} - V_{Native}}{V_{Spike}} \right) \times 100$$

V_{MS} = is the measured concentration of the spiked sample matrix

V_{Native} = is the measured concentration of the original (unspiked) sample matrix

V_{Spike} = is the concentration of the spike added.

If the native result is a non-detect (ND), use zero for the result. If the sample being used for the matrix spike requires a dilution, then the reported values for the MS and the native sample are the dilution corrected values, not the actual values from the instrument.

Percent recoveries can only be calculated if the spike concentration or expected value is reported. Spiked samples that do not report percent recoveries will be rejected (QA Code 'R').



4. UNIQUE BUSINESS RULES

There are two types of samples discussed in this section that have special circumstances. The first is when a sample is collected and the pore water is analyzed. The second is when a sample is collected and an analysis is performed for bacteria.

4.1 INTERSTITIAL WATER (PORE WATER) ANALYSIS

Certain sampling events create a special set of rules that apply for some entry fields in the database. One of these would be the collection of sediment from which interstitial (pore) water is extracted and then analyzed. Below are the fields that differentiate these samples from the norm and how those fields should be completed. Any fields not listed should be completed under the normal business rules.

Table 10: Example Interstitial Water (Pore Water) Analysis

Chemistry Template Column Names	Value	Description & Business Rules
<i>CollectionMethodCode</i>	Sed_Grab	
<i>SampleTypeCode</i>	Integrated	
<i>CollectionDepth</i>	-88	
<i>UnitCollectionDepth</i>	cm	
<i>Matrix</i>	sediment, interstitialwater	
<i>Unit</i>		The units for pore water analysis should be consistent with units used for the analysis of water, NOT sediment.
<i>PrepPreservationName</i>		Centrifuged plus any additional preparation done at the lab (Centrifuged, X).
<i>PrepPreservationDate</i>		If no preparation was performed at the analyzing lab, enter the centrifuge date for <i>PrepPreservationDate</i> . If a preparation or preservation was performed at the analyzing laboratory, enter the preparation date and time and include the date of centrifuge in the <i>CollectionComments</i> .



4.2 BACTERIA SAMPLES

4.2.1 BACTERIA/PATHOGEN EXCEPTIONS

Bacteria/pathogen samples are generally recorded in the same way as chemistry samples, except as follows:

Table 11: Bacteria/Pathogen Exceptions

Chemistry Template Column Names	Value	Description & Business Rules
<i>AnalysisDate</i>		Include the analysis time in the <i>AnalysisDate</i> field as dd/mmm/yyyy hh:mm
		The <i>AnalysisDate</i> for bacteria/pathogen samples are the date and time that the samples are prepped and put into the incubator NOT when counts are made. The <i>AnalysisDate</i> and associated time will be used to assess hold times.
<i>ResultQualCode</i>	>, ND	This field records the ">" or "ND" as related to the results. Please note that if the result is less than the reporting limit and the lab is confident in reporting 'Non Detect', this should be entered as "ND" in the ResultQualCode with a value of -MDL in Result field.



4.2.2 BACTERIA SAMPLES WITH PRESENCE/ABSENCE RESULTS

For bacteria results that are represented as present/absent please follow the below rules:

Table 12: Bacteria Samples with Presence/Absence Results

Chemistry Template Column Names	Value	Description & Business Rules
<i>Unit</i>	MPN/100 ml	Use same unit as if results were being recorded e.g. MPN/100 ml
<i>Result</i>	-88	'-88' is used as a null value.
<i>ResultQualCode</i>	P	P - Present
	A	A - Absent



5. DATA CHECKER

When the chemistry data template is complete please utilize the online Data Checker to verify entry against current LookUp lists, business rules and formatting. The Data Checker can be found at: http://ceden.org/CEDEN_checker/Checker/CEDENUUpload.php. Directions on how to use this tool are described below:

1. Choose 'Chemistry' for the data category.
2. Enter your Name, Email Address and select your Agency.
3. Browse for your file.
4. Uncheck 'Check for existing samples'.
5. Click 'Check Excel File'.

NOTE: Do not insert Microsoft Excel comments into the data set (comments in headers are allowed).

Please be patient while the Data Checker processes your data. The Data Checker will then provide a report through the website and to the given email address with the errors found within the data template. Files may be checked more than once to ensure errors have been corrected successfully.

Once the chemistry template has been verified through the Data Checker and all applicable errors have been addressed, submit the data to the Central Valley Water Board ILRP liaison. (Please note that the checker is used as a tool to help catch errors and some errors might not be applicable to your program/project. If this happens please note that you can still submit your data and the errors can be addressed if needed).

For more information on the Data Checker and submitting data, see online at http://ceden.org/CEDEN_checker/Checker/index.htm



6. BATCH VERIFICATION CODES AND COMPLIANCE CODES

The following codes are applied by the ILRP while transferring the programs submitted data into the database.

6.1 BATCH VERIFICATION CODES

The BatchVerificationCode indicates the level of verification/validation performed on the data within the batch. This code should be consistent within a project. Before transferring a project's data, the Central Valley Water Board and CV RDC will verify which batch verification code the program wants to apply. See current CV RDC LookUp lists for current batch verification codes. http://checker.cv.mpsl.mlml.calstate.edu/CVRDC/CVRDC_LookUpLists.php

6.2 COMPLIANCE CODES

The data provider will use "Not Recorded" for all laboratory results compliance codes. Habitat and field results will have a compliance code of "Not Applicable".



7. REFERENCES

Surface Water Ambient Monitoring Program, 2009. SWAMP Data Management Plan: Chemistry Template. April 13, 2009



Appendix A: Water and Sediment Quality (Chemistry and Bacteria) Data Descriptions/Business Rules



A.1 CHEMISTRY RESULTS WORKSHEET

Valid LookUp lists can be found online at the CV RDC data checker webpage (http://checker.cv.mpsl.mlml.calstate.edu/CVRDC/CVRDC_LookUpLists.php). All fields are strongly encouraged to be populated with information, but the minimum data requirements for CEDEN are noted with (Required) or (Not Required) after the column name.

Table 1: Chemistry Results Worksheet

Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
StationCode (Required)	<u>StationLookUp</u>	<p>StationCode represents a unique sampling site in a sampling design. A single water body may have multiple stations.</p> <ul style="list-style-type: none"> • The format for the unique alphanumeric description of the station is ###ABC123, where ### is the hydrologic unit number and ABC123 is an alphanumeric description of the station. An example is 111EELBRN, which is hydrologic unit 111 and an abbreviated code to indicate 'Eel River - South Fork near Branscomb'. • Use 'LABQA' for samples created in the lab for QA/QC. See Lab QA section for details. • Use 'FIELDQA' for non-station specific field generated QA such as equipment blanks and travel blanks. See Field-Generated QA Samples section for details. • Use '000NONPJ' for laboratory modified QA samples such as MS, MSD's, and laboratory duplicates that are not generated through the project. See laboratory modified QA samples section for details.
SampleDate (Required)		SampleDate refers to the date the sample was collected in the field.



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<ul style="list-style-type: none"> • The date format is dd/mmm/yyyy, such as 10/Nov/2007. For samples with collection times that last longer than one day, i.e. autosamplers, the sample date is the date the last sample was collected. • For transplanted bivalves, the SampleDate is the date when the bivalves were deployed in the field.
ProjectCode (Required)	<u>ProjectLookUp</u>	ProjectCode references the project that is associated with the sample.
EventCode (Not Required)	<u>EventLookUp</u>	EventCode represents the primary reason for the sampling event at a particular station and date. <ul style="list-style-type: none"> • The EventCode will be in a hierarchical order as follows: <ul style="list-style-type: none"> 'BA' – If the primary reason for sampling is for Bioassessment (Tissue and/or WaterQuality samples may or may not also be collected) 'TI' – If the primary reason for sampling is for Tissue (WaterQuality samples may or may not also be collected; no associated Bioassessment samples collected) 'WQ' – If the primary reason for sampling is for WaterQuality (no associated Bioassessment or Tissue samples collected) <p>For example, if the initial intent of sampling on Day 1 was for Tissue and WaterQuality, the EventCode would be 'TI'. If for some reason the WaterQuality had to be re-sampled the next day, on Day 2, the event for the re-sampling would still be 'TI' because Tissue was the initial intent of sampling on Day 1 even though the WaterQuality was sampled on Day 2.</p>



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
ProtocolCode (Not Required)	<u>ProtocolLookUp</u>	<p>ProtocolCode represents the sampling protocol used which includes the set of methods, methodology and/or specifications such as MPSL-DFG_Field SOP_v1.0. Established protocols may be used or Regions may document their own sampling protocols.</p> <ul style="list-style-type: none"> • It is preferable to combine protocols per StationCode and date so that all WaterQuality, Bioassessment, Tissue data are combined under the same EventCode. For example, if Tissue and WaterQuality are sampled at a station, the EventCode would be TI. If the protocols are different for Tissue and WaterQuality, the Tissue protocol would be used and the WaterQuality protocol would be listed in the SampleComments. If that is not preferable, separate EventCodes may be used with each individual protocol. • Use 'Not Recorded' for samples with unknown sampling protocols.
AgencyCode (Not Required)	<u>AgencyLookUp</u>	<p>AgencyCode refers to the organization or agency that collected the sample.</p> <ul style="list-style-type: none"> • If an environmental sample is used to perform laboratory QC, i.e. a matrix spike or lab duplicate, the AgencyCode still refers to the agency that collected the native sample, not the agency that created the QC sample. See Laboratory QA section for details.
SampleComments (Not Required)		<p>The SampleComments should be used for any notes or comments specifically related to the sample collection.</p>
LocationCode (Not Required)	<u>LocationLookUp</u>	<p>LocationCode describes the physical location in the water or sediment where the sample was collected. One sampling event may have a single or multiple locations.</p>



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<ul style="list-style-type: none"> • For a single point of sampling, the physical location in the water body can be used such as 'Bank', 'Thalweg', 'Midchannel', 'OpenWater'. • The LocationCode for field results should be the same as the location for the WaterQuality collection method. • For TI EventType sampling, the physical location plus the CollectionMethod is used such as 'BankNet1', 'BankShock1', 'OpenWaterTrawl1', 'OpenWaterNet1'. For resident mussel or clam collections, the LocationCode would be the physical location in the water body plus the generic CollectionMethod, e.g. 'BankTissue_Grab'. • OpenWater sampling with multiple sub-locations within a single water body or station could have locations of 'OpenWaterTrawl1', 'OpenWaterTrawl2' describing one large location with two smaller areas of sampling within the OpenWater Location. • Multiple physical locations within a single station could consist of a LocationCode such as 'BankShock1', 'BankNet1', 'OpenWaterHook1'. • If recording specific locations within a station are necessary for the project, a LocationCode such as 'Location1Net1', 'Location1Net2', 'Location2Shock1' may be used.
GeometryShape (Not Required)	<u>VariableCodeLookup</u>	Physical shape of the Station. Example values are Line, Point, or Polygon.
CollectionTime (Required)		CollectionTime refers to the time when the first field sample of a sampling event was collected in the field.



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<ul style="list-style-type: none"> • If the sampling crew collects multiple bottles at a single station, the CollectionTime for each bottle will equal the first bottle collection time. By doing so, the samples can easily be linked and any holding time issues will be consistent, and conservative. • The CollectionTime format should be expressed as hh:mm in Excel 24 hour time, such as 13:30 for 1:30 pm.
CollectionMethodCode (Required)		CollectionMethodCode refers to the method of collection such as 'Water_Grab', 'Autosampler24h', 'Autosampler7d', etc. <ul style="list-style-type: none"> • The water default is 'Water_Grab' and the sediment default is 'Sed_Grab'.
SampleTypeCode (Required)	<u>SampleTypeLookUp</u>	SampleTypeCode refers to the type of sample collected or analyzed. <p>For example, some commonly used SampleTypeCode choices include 'Grab', 'Integrated', 'MS1', 'CRM', 'LCS', 'LabBlank', 'CNEG'.</p> <ul style="list-style-type: none"> • The primary SampleTypeCode choices are as follows and the rest can be found in the LookUp list: <p>'Grab' - A single environmental sample.</p> <p>'Integrated' - An environmental sample composed of multiple samples; depth-integrated, time-integrated or integrated from different locations across a waterbody, or any combination of the three; a composite.</p> <p>'MS1' - A Matrix Spike or Matrix Spike Duplicate laboratory QA sample.</p>



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<p>'CRM' - Certified Reference Material or Standard Reference Material; Homogeneous matrix that closely matches samples being analyzed with certified concentrations of analytes of interest purchased by the laboratory.</p> <p>'LCS' - Laboratory Control Spike or Blank Spike; Blank matrix or solvent spiked with analytes of interest, created in the laboratory.</p> <p>'LabBlank' - A blank sample which is processed through the entire analytical procedure in a manner identical to the samples and is analyzed in the laboratory.</p>
Replicate (Required)		<p>The Replicate number is used to distinguish between replicates created at a single collection in the field.</p> <ul style="list-style-type: none"> • The default is '1'. Field duplicates will be identified by a replicate of '2'. Field blind duplicates will be identified with a different SampleTypeCode of 'FieldBLDup', not a collection replicate, because they are collected blind. Laboratory replicates will be identified by a replicate of '2' in the LabReplicate field, not a collection replicate.
CollectionDeviceName (Not Required)	<u>CollectionDevice</u> <u>Lookup</u>	<p>The CollectionDeviceName is the specific device used in the collection of the sample.</p> <ul style="list-style-type: none"> • Cell must be filled. The default value is 'None' or 'Not Recorded'.
CollectionDepth (Required)		<p>CollectionDepth records the level, from the surface in the water or sediment column, at which the sample was collected.</p>



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<ul style="list-style-type: none"> • CollectionDepth for water samples would be measured from the water surface and recorded in meters ('m') while depth collected for sediment would be measured from the sediment surface and recorded in centimeters ('cm'). • Since depths for ambient monitoring Grab samples are generally 'subsurface', defaults have been established to indicate this. For water samples the default value is '0.1' m and for sediment samples the default value is '2' cm. • For Integrated samples collected from the same depth at different points across a waterbody or for samples collected at multiple times, i.e. an autosampler, the actual sample depth should be recorded. This applies to both water and sediment samples. Integrated samples collected at multiple depths, i.e. samples integrated from the water column or sediment cores, should receive a depth of '-88' and the actual depths of collection should be recorded in the CollectionComments field.
UnitCollectionDepth (Required)		UnitCollectionDepth refers to the units used in the collection depth including 'cm' (centimeters) and 'm' (meters).
PositionWaterColumn (Not Required)	VariableCodes Lookup	Position in water column where sample was taken.
LabCollectionComments (Not Required)		LabCollectionComments records any comments relating to the collection of the field sample for laboratory analysis. <ul style="list-style-type: none"> • This field can also be used for laboratory QC samples, e.g. 'Matrix Spike was performed on a



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		FieldBlank.'
LabBatch (Required)		<p>The LabBatch is a unique code, provided by the laboratory, which represents a group of samples processed together. It groups all environmental samples with their supporting QA samples and will be used to verify completeness based on the projects QAPP.</p> <ul style="list-style-type: none"> • All lab batches listed in the Results worksheet need to be listed one time only in the LabBatch worksheet. • The LabBatch is assigned to and identifies all samples digested or extracted together in one batch. When a digestion or extraction is not performed as part of the method, the LabBatch represents all samples within a unique analysis run. Please see the File and Batch Naming Convention to correctly format the LabBatch name.
AnalysisDate (Required)		<p>AnalysisDate is the date and time the sample was processed on the analytical instrument.</p> <ul style="list-style-type: none"> • This date/time should be expressed as dd/mmm/yyyy hh:mm.
MatrixName (Required)	<u>MatrixLookUp</u>	<p>MatrixName refers to the sample matrix.</p> <ul style="list-style-type: none"> • Water - For field-generated water samples, the MatrixName is 'samplewater'. For lab-generated QA samples, the matrix should be the type of water that was used for the analysis of the sample, either 'labwater' or 'blankwater'. Labwater is water directly from the tap in the laboratory or purchased spring water. Blankwater is laboratory Type I or Type II water, purchased reagent water or water that is run through a filtration process in a



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<p>laboratory, such as Deionized (DI) or Milli-Q (MQ) water.</p> <ul style="list-style-type: none"> • Sediment - For field-generated sediment samples, the MatrixName is 'sediment'. For lab-generated QC samples, 'blankmatrix' could be used as the MatrixName which is a matrix used to identify a commercial- or lab-produced medium in tissue or sediment QC samples. If this is not the case then the MatrixName for lab-generated QC samples would be 'sediment' which would include samples where water, solvent or nothing was used as a matrix. • Tissue - For field-generated tissue samples, the MatrixName is 'tissue'. For lab-generated QC samples, 'blankmatrix' could be used as the MatrixName which is a matrix used to identify a commercial- or lab-produced medium in tissue or sediment QC samples. If this is not the case then the MatrixName for lab-generated QC samples would be 'tissue' which would include samples where water, solvent or nothing was used as a matrix.
MethodName (Required)	<u>MethodLookUp</u>	<p>MethodName refers to the analysis method used by the laboratory to analyze the sample.</p> <ul style="list-style-type: none"> • Methods are expressed with a MethodName such as 'SM 4500-NH3 C' or 'EPA 600/R-99-064' and must be fully described in the Method LookUp list and in the laboratory records. If a laboratory has modified an EPA or Standard Method, the laboratory agency needs to add 'mod' to end of the MethodName. In such situations, the modification should be documented and communicated to the CV RDC for notation in the database. For instance, a lab would report a modified EPA 600/R-99-064



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		as EPA 600/R-99-064 mod accompanied by a description of the modification made. Any method which is not in the current LookUp list must be approved by the CV RDC prior to being added to the database.
AnalyteName (Required)	<u>AnalyteLookUp</u>	The AnalyteName is the name of the analyte or parameter for which the analysis is conducted and result is reported. The LookUp list includes the acceptable abbreviation or name of the variable used by the database, enabling consistency across reporting.
FractionName (Required)	<u>FractionLookUp</u>	FractionName is a specific descriptor of the Analyte. <ul style="list-style-type: none"> • For example, metals are often expressed as 'Total' or 'Dissolved' for their Fraction, distinguishing the appropriate Analyte. If there is no need for further description of the analyte, type 'None' in this field.
UnitName (Required)	<u>UnitLookUp</u>	UnitName refers to how the chemistry result is measured or expressed. <ul style="list-style-type: none"> • Water units are indicated by weight/volume, i.e. 'ng/L'. Sediment and tissue units are indicated by weight/weight and includes whether the sample result is reported as wet weight ('ww') or dry weight ('dw'). For example, 'ng/g ww' for ng/g wet weight. Surrogate recovery will use unit '% recovery'.
LabReplicate (Required)		The LabReplicate number is used to distinguish between replicates created in the laboratory. It differentiates the original field sample that was analyzed from all subsequent laboratory duplicates.



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<ul style="list-style-type: none"> • The default is '1' for the first sample and increases by one for each successive replicate analyzed in the laboratory.
Result (Required)		<p>Result is the numerical value from the analytical instrument.</p> <ul style="list-style-type: none"> • The chemistry Result is expressed as a real number rather than a calculation. The result should be reported with appropriate number of significant figures. <p>Example: A result of 3.7266945 with 3 significant figures should be reported as 3.73.</p> <p>Example: A result of 1.350 with 4 significant figures must display 1.350 in the Excel file. If you only see 1.35, that is the result that will be loaded to the database and the 4th significant figure will be dropped.</p> <ul style="list-style-type: none"> • If the result is non-detect, use the default '-88' and 'ND' for the ResQualCode. • If the result is below the MDL, enter the Result as -MDL (minus MDL) and 'ND' for the ResQualCode.
ResQualCode (Required)	<u>ResQualLookUp</u>	<p>The Result Qualifier Code or ResQualCode qualifies the analytical result of the sample.</p> <ul style="list-style-type: none"> • This field may be left blank for results that are considered detected. The database will be populated with an equal sign ('=') when the data are loaded. When a result is Not Detected ('ND') or Detected Not Quantified ('DNQ') a ResultQualCode is required. • When the result is '-88', a ResultQualCode is required. If the ResultQualCode value is 'NR' for Not Recorded, then a reason for this code must be written into the LabResultComments field and/or an appropriate QACode would be



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		applied. <ul style="list-style-type: none"> • Use 'DNQ' if the Result is between the MDL and RL i.e. MDL < Result < RL. • Use 'PR' if the lab returns a percent recovery with no result or expected value. The Result will be '-88' and the ExpectedValue will be blank.
MDL (Required)		Method Detection Limit (MDL) is the minimum concentration of an analyte that undergoes the entire measurement process and can be reported with a stated level of confidence that the analyte concentration is greater than zero. It is the detection limit associated with the method used to analyze the analyte, or parameter, in the sample. <ul style="list-style-type: none"> • If no MDL is used, enter '-88'. A value other than '-88' must be used for either the MDL or the RL.
RL (Required)		Reporting Limit (RL) is the minimum value below which data are documented as nonquantifiable. It is the reporting limit for the sample analyzed, as determined by the laboratory. <ul style="list-style-type: none"> • If no RL is used, enter '-88'. A value other than -88 must be used for either the MDL or the RL.
QACode (Required)	<u>QALookUp</u>	QACode is applied to the sample to describe any special conditions, situations or outliers that occurred during or prior to the analysis to achieve the result.



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<ul style="list-style-type: none"> • The default code, indicating no special conditions, is 'None'. If more than one code should be applied to a record, the convention is to list them in alphabetical order separated by commas with no spaces; i.e. 'GB,SC' • A comment must be entered if there is any QA Code used besides the default ('None'). • If the data was reanalyzed and the results changed then use 'PJM', otherwise use 'None'. • If a laboratory does not analyze a particular constituent due to laboratory over site this can be documented by applying a QACode of 'NR' (for not recorded), a result of '-88', a ResQualCode of 'NR' (for not recorded) and an explanation in the LabResultsColumn for the missing result. <p>Example: Use 'IP' when Analyte detected in method, trip, or equipment blank</p> <p>Example: Use 'CQA' when concentration not reported for QA sample only % Recovery or RPD reported</p> <ul style="list-style-type: none"> • Use 'FDP' for Field duplicate RPD above QC limit • When flagging a sample only put the flag on the appropriate sample i.e. not the whole batch e.g. for 'IP' put this only on the blank sample that is outside QC limits. If the QACode affects the results of the other samples in the batch, it may be applied to multiple samples. For example, when an RPD is calculated between two samples resulting in a flag indicating that the RPD is greater than the data quality objective (i.e. FDP), both samples



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		should be flagged. See Appendix B for more details.
ComplianceCode	<u>DataCompliance</u> <u>LookUp</u>	ComplianceCode is the Unique code referencing the Compliance with the associated QAPP. • Default value is 'NR'.
DilutionFactor (Not Required)		DilutionFactor is equal to the final volume divided by the initial volume of solution, or $DF = V_f \div V_i$. {(Final Volume) / (Initial Volume)} • Default value is '1'. A dilution other than 1 is recorded when a sample requires an additional dilution to fit into the standard curve of the instrument. It does not apply to dilutions that are standard in the method being used for analysis. • Final reported results must be corrected for dilution that was carried out during the process of analysis. Example: 1 part sample plus 9 parts blank is a DilutionFactor of 10. A 50% dilution is equivalent to a DilutionFactor of '2'. • When a sample requires a dilution, the MDL and RL must also be raised by that DilutionFactor. • A QACode of 'D' is required when a dilution is performed on the sample.
ExpectedValue (Not Required)		The ExpectedValue is the concentration of the analyte in a reference standard, matrix spike sample, or the value expected to obtain from analysis of the QA Sample. This consists of the



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<p>native sample result concentration plus the spike amount.</p> <ul style="list-style-type: none"> • For surrogate samples, the expected value should be '100', representing 100%. This field is required for SampleTypeCodes of MS1, MS2, CRM and LCS.
PrepPreservationName (Not Required)	<u>PrepPreservation</u> <u>LookUp</u>	<p>PrepPreservationCode references the preparation or preservation method performed on the samples prior to analysis.</p> <ul style="list-style-type: none"> • If no preparation or preservation method was performed the default value is 'None'.
PrepPreservationDate (Not Required)		<p>PrepPreservationDate is the date and time the preparation or preservation was started.</p> <ul style="list-style-type: none"> • The format is dd/mmm/yyyy hh:mm. If there is no preparation or preservation method performed ('None') then the PreparationPreservationDate should be listed as '01/Jan/1950 00:00' (the default value for none).
DigestExtractMethod (Not Required)	<u>DigestExtractLookUp</u>	<p>DigestExtractMethod references the digestion or extraction method performed on the sample prior to analysis.</p> <ul style="list-style-type: none"> • If no digestion or extraction method was performed the default value is 'None'.
DigestExtractDate (Not Required)		<p>DigestExtractDate is the date and time the digestion or extraction was started.</p> <ul style="list-style-type: none"> • The format is 'dd/mmm/yyyy hh:mm'. If there is no digestion or extraction performed on the sample ('None') then the DigestExtractDate should be listed as



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		'01/Jan/1950 00:00' (the default value for none).
SampleID (Not Required)		SampleID is a unique identifier supplied by the organization directing the sampling or sampling agency and is used to track the sample throughout the sampling and analysis processes. This field can be used to tie a result to the sample. <ul style="list-style-type: none"> • This ID, which is different from the StationCode, will likely be on the sample container the laboratory receives from the field crew or on the COC. If there is no number, leave this field blank.
LabSampleID (Not Required)		The LabSampleID is a recommended field intended to provide lab specific identification for an analyzed sample. <ul style="list-style-type: none"> • The format and content is determined by the lab. It is recommended to add -Dup, -MS, -MSD to the end of the ID to help confirm the SampleType and the LabSampleID of the native sample. • For LABQA one can use BLANK, LCS, CRM, etc to identify the sample when no LabSampleID is clearly specified.
LabResultComments (Not Required)		The LabResultComments field holds any comments related to the lab result or analysis of the sample. <ul style="list-style-type: none"> • These could be comments needed to clarify any portion of the analysis or a comment that is not accommodated by any other field, i.e. Percent Recovery or Relative Percent Difference. For reference standards and matrix spikes, it is recommended to include the



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
		<p>Percent Recovery as 'PR ##' and the Relative Percent Difference as 'RPD ##'. When used in combination, as in Matrix Spike Duplicate samples, the convention would be 'PR ##, RPD ##'.</p> <ul style="list-style-type: none"> • It is recommended to use the format 'RPD' if the RPD is applied to a field duplicate. • It is recommended to use the format 'RPD NA' if the RPD is not able to be calculated due to Non-Detect samples etc. • Do not need to put PR or RPD on Surrogate samples. • Comments are required for any QACode other than the default ('None').



A.2 CHEMISTRY LABBATCH WORKSHEET

The fields in this sheet are and should be completed as follows:

Table 2: LabBatch Worksheet

Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
LabBatch (Required)		<p>The LabBatch is a unique code, provided by the laboratory, which represents a group of samples processed together. It groups all environmental samples with their supporting QC samples.</p> <ul style="list-style-type: none"> • All lab batches listed in the Results worksheet need to be listed one time only in the LabBatch worksheet. • The LabBatch is assigned to and identifies all samples digested or extracted together in one batch. When a digestion or extraction is not performed as part of the method, the LabBatch represents all samples within a unique analysis run. Please see the File and Batch Naming Convention to correctly format the LabBatch name.
LabAgencyCode (Required)	AgencyLookUp	LabAgencyCode refers to the organization, agency or laboratory that performed the analysis on the sample.
LabSubmissionCode (Not Required)	LabSubmissionLookUp	<p>The LabSubmissionCode is a unique batch qualifier code assigned to the LabBatch as a whole by the analyzing laboratory which references the quality of the data in the LabBatch.</p> <ul style="list-style-type: none"> • If the LabSubmissionCode of 'A' is used, meaning Acceptable, the laboratory is ensuring that all QAQC protocols were met for the lab batch. If anything other than 'A' is used, a LabBatchComment is required.
BatchVerificationCode (Not Required)	BatchVerificationLookUp	Unique code referencing the Verification of a Batch. If the Batch Verification used is not found in the lookup list please contact your Regional Data Center for assistance.



Template Column Name	LookUpList	Description & Business Rules Description in bold, business rules are noted with (•)
SubmittingAgencyCode (Not Required)	AgencyLookUp	SubmittingAgencyCode is the organization or agency that is responsible for submission of the data to the database. This agency may be different from LabAgencyCode if the analytical data were subcontracted to another agency.
LabBatchComment (Not Required)		<p>LabBatchComments records any comments relating to the LabBatch as a whole.</p> <ul style="list-style-type: none"> • If the LabSubmissionCode is anything other than 'A', a LabBatchComment is required. • Comments are required for detailing all QACodes (other than the default 'None') that are found within the batch. • Any comments related to the batch/QAPP can go here i.e. specific program comments and laboratory comments. • This column can only have 230 characters.



Appendix B: Applying Specific QACodes



B.1 APPLYING SPECIFIC QACODES

The business rules for applying specific QACodes is described below. Unless otherwise noted, when applying QACodes they need to be applied to the sample that is affected, not the whole batch. The below table discusses specific QA codes that are reviewed/verified when evaluating data against a project's QAPP and how to apply each code. For more business rules on applying QA codes see Appendix A, Table 1, QACode section in the table.

Table 1: Applying Specific QACodes

Type		QACode	Code Description	Flagging Business Rules Business rules/notes are noted with (•)
Holding Time		H	A holding time violation has occurred.	Apply to each result row that holding times were exceeded • Note QACode H8 or H24 can also be applied to bacteria analyses if applicable
Laboratory QC Samples	LabBlank	IP	Analyte detected in method, trip, or equipment blank	Apply to LabBlanks that did not meet QC limits.
	MS/MSD	GB	Matrix spike recovery not within control limits	Apply to MS or MSD when the percent recovery does not meet projects QC limits.
	CRM	GBC	CRM analyte recovery not within control limits	Apply to CRM when the Percent Recovery does not meet projects QC limits.
	LCS	EUM	LCS is outside of control limits	Apply to LCS when the Percent Recovery does not meet projects QC limits.
	Laboratory Dup/MSD	IL	RPD exceeds laboratory control limit	Apply to both the normal/parent sample as well as the duplicate sample



Type		QA Code	Code Description	Flagging Business Rules Business rules/notes are noted with (•)
				where the RPD QC limits were not met.
Surrogates		GN	Surrogate recovery is outside of control limits	Apply to both the surrogate that did not meet QC limits and to the analytes/sample associated to that surrogate. • If there are two surrogates performed for a sample and one is outside QC limits and one is inside QC limits GN is applied to all analytes for that sample except the surrogate that was inside QC limits.
Field QC Samples	Field Blanks	IP	Analyte detected in method, trip, or equipment blank	Apply to FieldBlanks that did not meet QC limits.
	Field Duplicates	FDP	Field duplicate RPD above QC limit	Apply to both the normal/parent sample as well as the duplicate sample where the RPD QC limits were not met.
Dilutions performed		D	EPA Flag - Analytes analyzed at a secondary dilution	Apply to samples that have a dilution greater than 1.
000NONPJ samples		QAX	When the native sample for the MS/MSD or DUP is not included in the batch reported	Apply to 000NONPJ samples when the native sample is not included in the batch reported.

