California Sediment Quality Objectives Database User Guide

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Table of Contents

Section 1
Introduction to the California Sediment Quality Objectives Database

1.1 History of the Sediment Quality Objectives Database

The State Water Resources Control Board (SWRCB) initiated a process to develop and adopt sediment quality objectives (SQOs) for enclosed bays and estuaries in 2003. Much data describing the degree of sediment contamination and biological effects in California's enclosed bays and estuaries have been produced in the last 10 years as a result of regional monitoring and other assessment programs. These studies are critical to the development of SQOs, as their data are used to determine the relationships between contamination and biological effects and to document the accuracy and reliability of indicators for chemistry, toxicity, and benthic community composition. To fulfill these tasks, data from the entire State were compiled and integrated into a relational database to support SQO development and verification activities. The California Sediment Quality Objectives (CA SQO) database includes most of the relevant sediment quality data available. The collected studies contain information for chemistry, toxicity, bioaccumulation, and benthic community impacts for marine and estuarine areas in the State of California.

The structure of the database is based on the southern California sediment quality database developed by the Los Angeles Contaminated Sediments Task Force (LA CSTF). The database has been made available to the public in an effort to improve data analyses for uses such as regional assessments of sediment quality, temporal analysis of environmental quality, and TMDL activities. This CA SQO database user guide has been created to describe the CA SQO database structure and to provide instructions for exporting information and adding new records.

1.2 Criteria for Study Selection

Studies were selected for the CA SQO database in two phases. The first set of data was compiled for the LA CSTF sediment quality database as mentioned before. A series of studies were compiled by committee members, consisting of monitoring, research, and dredging-related projects. Each of these studies was reviewed using a specific set of criteria prior to selection (Table 1-1). The studies were prioritized based on the results of this review, and as many studies were included as possible using available resources.

Table 1-1. List of Criteria Used to Screen Reports

Criteria Code	Description	Mand
TENYEAR	Study conducted within last 10 years.	Yes
CALIFORNIA	Sampling stations are marine/estuarine sites located within California.	Yes
GEOCOORD	Geographic coordinates available/obtainable for each station.	Yes
FIELDMETHOD	Method of sediment sample collection/preparation documented.	Yes
SEDCHEM	Sediment chemistry data available for each station that includes analytes from at least two of the following general categories: trace metals, PAHs, PCBs, chlorinated pesticides (e.g., DDTs).	Yes
CHEMMETHOD	Chemical analysis methods described.	Yes
BIOEFFECTS	At least one measure of biological response (toxicity, bioaccumulation in lab, benthic infaunal abundance) reported for the sample	Yes
BIOMETHODS	Biological test methods described.	Yes
BIOSTATS	The biological response data were evaluated for the presence of statistically significant differences, relative to a (negative) control or reference sample.	Yes
STUDYLIST	The data are included in the list of priority studies or are included in electronic data files already identified for inclusion in the database.	Yes
CHEMREVIEW	A QA/QC review of the chemistry data was performed.	Yes
BIOREVIEW	A QA/QC review of the toxicity data was performed.	Yes
GRAINSZ	Sediment grain size reported.	No
TOXWQ	Toxicity test water quality documented.	No
CTRLREF	Control and reference sample data available.	No
TOXREPDATA	Data for toxicity test replicates available.	No
SEDDW	Is sediment data in dry weight?	No
SMPLFROZEN	Were sediments frozen before testing?	No
TOC	Sediment TOC reported.	No
CHEMHOLDING	Length of time sediment was held before conducting chemical analyses.	No
TOXHOLDING	Length of time sediment was held before conducting toxicity tests.	No
BIOPREP	Note the length of time toxicity test organisms were acclimated in lab.	No
TOX_DO	Did dissolved oxygen content stay above 60% throughout tox tests?	No
CTRLPASS	Did negative control/ref toxicity results pass survival requirements?	No
DATAQUAL	Final code to assign for data quality.	Yes

Studies meeting all mandatory ("Mand") criteria were classified as primary studies and included in the database. Selected studies not meeting all criteria (secondary studies) were also included.

1.2.1 CA SQO Database Original Candidate List

The CSTF studies as well as the database structure provided the foundation for the CA SQO database project. A second phase of compiling possible monitoring, research, and dredging studies was initiated with the project stakeholders. An inventory template was generated, posted on the SWRCB website, and circulated among committee members. All suggested studies were included on the original candidate list. A search for studies conducted in regions outside of southern California was emphasized.

Most of the research and monitoring studies were recommended by stakeholder input. Dredging-related studies for northern California were reviewed from files at the US Army Corps of Engineers; candidate studies were scanned into portable document format (PDF) for further screening.

1.2.2 Screening Criteria

For the CA SQO database, data that were already in digital format, or readily convertible to digital format, were given highest priority for the project. After the list of studies were compiled, a screening process similar to that of the CSTF was conducted, with emphasis on the variables that dictated the selection of appropriate studies for that project. There were three primary criteria from the screening process that dictated the bulk of the acceptance or rejection of studies. Studies that were accepted all had:

- Data less than ten years old;
- Samples with matching sediment chemistry and biological data;
- Sufficient documentation of geographic locations.

Additional criteria were used to select and prioritize studies for the CA SQO database, including:

- Habitat - Studies that were conducted in bays and estuaries were given highest priority;
- Geography – Studies that were conducted in under-represented areas were given higher priority, including the north and central coasts.

Following screening, a prioritization system was developed to rank the order of input of the studies. Accepted studies were classified as primary or secondary (all others were rejected for the reasons cited above). All primary studies were included. Secondary studies were given a second order prioritization based on the region and habitat criteria listed above. Studies were then compiled using this final prioritization schema. The final list of studies included in the CA SQO database is provided in Appendix A.

1.2.3 Study Types and Data Compilation Procedures

The CA SQO database contains dredging, monitoring, and research studies. Samples for monitoring and research studies were often collected using single grab samples, whereas dredging samples were often collected with cores composited over a wider area. Therefore, the database reflects this primary difference, thus studies are classified as one of the following:

- Dredged material characterization studies (D);
- Monitoring and/or research studies (M).

In addition to study purpose, each study was also classified by the types of data collected, including sediment chemistry toxicity, tissue bioaccumulation, elutriate chemistry, and benthic infaunal data. The list of possible study types, and the count of the studies of each type, is shown in Table 1-2.

Table 1-2. Study Types of the Database

Study Type Code	Study Type Description	Study Count
D1	Dredging study, sediment chemistry only	11
D2	Dredging study, sediment chemistry and toxicity only	35
D3	Dredging study, sed chem, tox, and lab bioaccumulation	48
D4	Dredging study, sed chem, tox, lab bioaccumulation, and elutriate chem	3
D5	Dredging study, sed chem, tox, and elutriate chem	1
D6	Dredging study, sediment and elutriate chem	6
M0	Monitoring study, sed chem, tox, field bioaccumulation and infauna	5
M1	Monitoring study, sediment chemistry only	17
M2	Monitoring study, sediment chemistry and toxicity only	9
M3	Monitoring study, sed chem, toxicity and lab bioaccumulation	4
M4	Monitoring study, sediment chemistry, toxicity and infauna	3
M5	Monitoring study, sed chem, toxicity and field bioaccumulation	2
M6	Monitoring study, sed chem, tox, lab and field bioaccumulation and infauna	3
M7	Monitoring study, sed chem, tox, lab bioaccumulation and infauna	1
M8	Monitoring study, sed chem and field bioaccumulation	1
M9	Monitoring sutdy, sediment chemistry and infauna	2
M9	Monitoring study, sed chem, tox, lab and field bioaccumulation	1

Monitoring and research studies were submitted in multiple electronic formats and converted into Access. Many of the hard-copy dredging reports were scanned as pdf files, and then converted into Excel using ReadIris™ Pro, an optical character reader- (OCR-) based program. Specific quality assurance/quality control (QA/QC) procedures were conducted based on the method of input of the studies.

1.2.4 Geographic Extent of the Data

The CA SQO database contains sediment quality information from all of coastal California to beyond the US border in Mexico (Figure 1-1). There are also limited inland data derived from EPA's NSI Database (USGS, Orange County).

Each station was classified based on a series of geographic regions, including California Regional Water Quality Control Board, and habitat codes (Section 4.2.3). The geographic classification scheme is hierarchal, with broader classifications (regional board, water bodies) to the more detailed category of locality. All collected samples had sediment chemistry data; most had toxicity, with the other data types less common (Table 1-3).

There were some data provided in the NSI Database that had no locations, but were classified as being in the state of California. The locations for these studies were obtained or estimated from the original reference material (generally studies related to the Palos Verdes shelf).

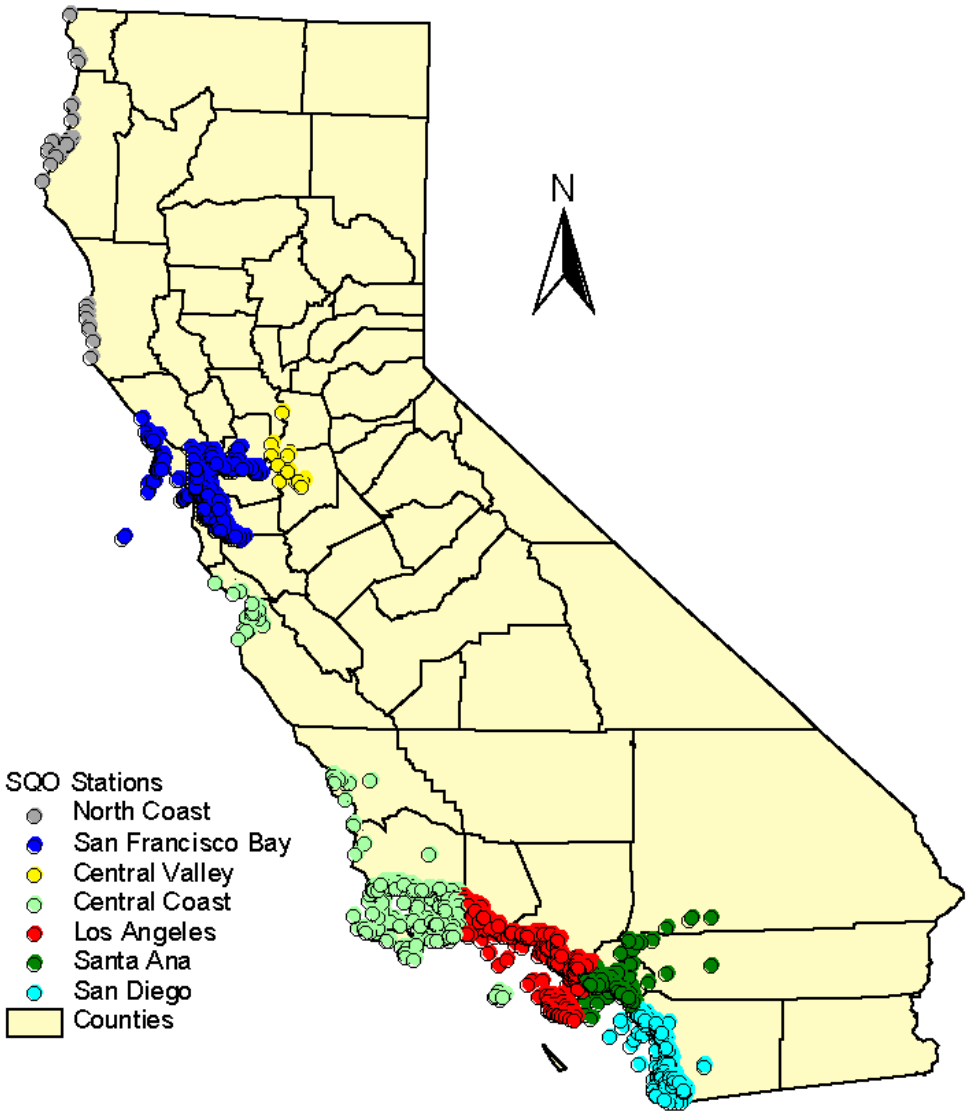


Figure 1-1. Map of station locations of the CA SQO database classified by California Regional Water Quality Control Board.

Table 1-3. Number of samples for each type of data in water bodies of California. Sample count does not include negative control samples.

Water Body	Number of Unique Samples by Data Type				
	Sediment Chemistry	Sediment Toxicity	Infauna	Laboratory Tissue Chem	Field Tissue Chemistry
Agua Hedionda Estuary	12	14	12	0	2
Alamitos Bay	24	25	18	0	3
Albion River	2	2	2	0	2
Alisal Slough	1	1	0	0	0
Aliso Creek	25	1	1	0	0
Anaheim Bay	106	106	70	0	0
Andrews Pond	5	5	0	0	0
Arcata Bay	9	8	4	2	4
Ballona Creek	19	9	5	0	0
Batiquitos Lagoon	2	2	2	0	0
Bear River	1	1	1	0	0
Bennett Slough	4	4	0	0	0
Big Lagoon	1	1	1	0	1
Big River	1	1	1	0	1
Bodega Bay	25	25	7	16	7
Bolinas Lagoon	4	4	0	0	0
Bolsa Bay	19	7	1	0	0
Carpinetria Creek	5	5	0	0	0
Caspar Creek	1	1	1	0	1
Channel Islands Harbor	15	13	8	0	2
Copano Bay	2	2	0	0	0
Corte Madera Creek	4	4	0	0	0
Dana Point Harbor	73	16	12	0	1
Delhi Channel	2	2	0	0	0
Deschecha Channel	3	0	0	0	0
Dominguez Channel	8	8	8	0	0
Drakes Bay	4	4	4	0	12
Eel River	2	2	2	0	3
Egret Landing	4	4	0	0	0
Elk Creek	1	1	1	0	0
Elkhorn Slough	8	8	0	0	0
Espinosa Slough	1	1	0	0	0
Estero Americano	4	4	1	0	3
Estero San Antonio	3	3	1	0	0
Garcia River	1	1	1	0	0
Goleta Slough	1	1	0	0	0
Hare Creek	2	2	2	0	0
Humboldt Bay	39	46	10	24	2
Huntington Harbor	125	85	72	0	0
King Harbor	3	4	3	0	0

Table 1-3, cont. Number of samples for each type of data in water bodies of California. Sample count does not include negative control samples.

Water Body	Number of Unique Samples by Data Type				
	Sediment Chemistry	Sediment Toxicity	Infauna	Laboratory Tissue Chem	Field Tissue Chemistry
Klamath River	2	2	2	0	2
Little River	2	2	2	0	2
Los Angeles River	5	5	5	0	0
Malibu Lagoon	6	6	0	0	0
Marina del Rey	221	28	29	10	4
McGrath Lake	5	5	0	0	0
Mission Bay	38	36	17	0	0
Monterey Bay	16	14	4	0	2
Monterey Harbor	9	6	4	0	0
Moro Cojo Slough	2	2	0	0	0
Morro Bay	7	7	2	0	1
Moss Landing Harbor	33	32	0	0	1
Mugu Lagoon	20	20	7	0	2
Napa River	50	32	8	17	8
Napa Sonoma Marsh	44	8	7	0	5
Newport Bay	172	96	54	0	2
Novato & Miller Creek	8	8	0	0	0
Oceanside Harbor	5	6	5	0	0
Oso Creek	12	0	0	0	0
Pacific Ocean	1222	395	576	114	224
Pajaro River	2	2	1	0	2
Penasquitos Lagoon	5	5	4	0	0
Petaluma River	40	10	18	17	4
Port Hueneme	4	4	0	0	0
Redwood City Sloughs	14	14	3	0	1
Russian River	3	3	2	0	2
Sacramento River	5	5	0	0	0
Sacramento San Joaquin Confluence	48	47	2	34	1
Salinas River	2	2	0	0	0
Salmon Creek	1	1	0	0	0
Salton Sea	2	0	0	0	0
San Antonio Creek	6	0	0	0	0
San Diego Bay	718	520	251	152	129
San Diego Creek	136	2	0	0	0
San Diego River	15	10	7	0	0
San Dieguito Lagoon	1	1	1	0	0
San Elijo Lagoon	5	5	5	0	0
San Gabriel River	7	7	6	0	0
San Jacinto River	2	0	0	0	0
San Joaquin River	10	10	0	0	0

Table 1-3, cont. Number of samples for each type of data in water bodies of California. Sample count does not include negative control samples.

Water Body	Number of Unique Samples by Data Type				
	Sediment Chemistry	Sediment Toxicity	Infauna	Laboratory Tissue Chem	Field Tissue Chemistry
San Juan Creek	24	0	0	0	0
San Luis Obispo Bay	4	4	2	0	2
San Luis Obispo Creeks	20	0	0	0	0
San Luis Rey	2	0	0	0	0
San Pedro Bay	1149	382	187	210	20
San Rafael Bay	9	9	2	0	5
San Rafael Creek	2	2	1	0	0
Santa Ana River	30	3	3	0	0
Santa Barbara Harbor	2	2	1	0	0
Santa Clara River	1	1	0	0	0
Santa Margarita River	8	5	5	0	0
Santa Maria River	15	1	0	0	0
Santa Monica Bay	152	56	126	0	26
Santa Ynez River	14	2	1	0	0
Scott Creek	1	1	0	0	0
SFB Carquinez Strait	40	31	2	2	0
SFB Central Bay	1147	778	198	594	414
SFB Lower South Bay	55	45	13	15	3
SFB San Pablo Bay	171	92	24	73	113
SFB South Bay	106	88	30	51	94
SFB Southern Sloughs	309	24	3	239	2
SFB Suisun Bay	160	60	21	12	7
Smith River	5	5	5	0	3
Soquel Lagoon	1	1	0	0	0
Suisun Bay Sloughs	15	15	5	0	0
Tembladero Slough	3	3	0	0	0
Tijuana River	18	18	0	0	0
Tolay Creek	1	1	0	0	0
Tomales Bay	20	11	1	51	2
Ventura Harbor	3	2	1	0	1
Ventura River	1	1	0	0	0
Wilson Creek	2	2	1	0	0

1.3 Organization and Conventions of the User Guide

This User Guide provides basic information on what data and documentation are available (Section 2), computer requirements to use the database (Section 3), and a description of the key features of the database (Section 4). Instructions are provided for accessing and viewing the metadata (Section 5). For users who are interested in collecting data to be added to the database, Section 6 provides assistance on what kinds of data and ancillary information should be collected. Finally, terms and definitions, references, as well as abbreviation descriptions, are

provided in Section 6 of this User Guide.

A complete study list is provided in Appendix A. Instructions are provided for extracting data from the database (Appendix B). Appendix C provides detailed, technical information regarding the structure of the database.

To optimize viewing of the electronic (pdf) version of this document, select 'Windows' and 'Show Bookmarks' to be able to navigate through the sections and figures. Several conventions are used for different types of information.

NOTE This notation is used to highlight specific comments or summary statements important to the user.

CONVENTION This notation is used to highlight conventions used when populating the database.

EXAMPLE This notation is used to show how a user of the database would set up a query (top half) to demonstrate features of the database, and the output (bottom half) of that query.

Tblstudy Database table names are italicized and underlined.

StationID Field names are italicized and bolded.

Section 2
Contents of the Database

This section describes the databases and documentation created for the CA SQO database, and where in the User Guide more information can be found.

2.1 Main CA SQO Database

This includes the main database, merging data from all of the studies described in Section 1. A description of the structure and field definitions of the database is provided in Section 4 of this document.

2.1.1 Composition of the Database

The database contains data from many different monitoring, research, and dredging studies (Appendix A). The type of information included within each study varies, depending upon the objectives of the project. There are samples from all coastal California Regional Water Quality Control Boards (Table 2-1), although some regions are better represented than others.

Table 2-1. Number of dredging and monitoring/research samples for each major data type classified by California Regional Water Quality Control Board (including negative control samples).

California Regional Water Quality Control Board	Number of Samples With Data in Category			
	Sediment Chemistry	Toxicity	Tissue Chemistry	Infauna
Dredging Studies				
Central Coast	16	20	0	0
Los Angeles	788	126	102	0
North Coast	17	17	4	0
San Francisco Bay	781	467	130	0
San Diego	0	0	0	0
Santa Ana	49	46	38	0
Total	1651	676	274	0
Monitoring / Research Studies				
Central Coast	538	217	98	219
Los Angeles	971	538	113	472
North Coast	60	63	41	35
San Francisco Bay	1768	937	1398	349
San Diego	1090	686	282	449
Santa Ana	1009	363	39	306
Total	5436	2804	1971	1830
Grand Total	7087	3480	2245	1830

Every sample (except for bioassay negative control samples) has sediment chemistry; it is the most common data type in the database (Table 2-2). The record count in Table 2-2 excludes laboratory duplicates or multiple batches. Both PCB congeners and aroclors are in the database, both sets of chemicals are included in Table 2-2.

Table 2-2. Number of sediment chemistry records for selected chemicals in regions of California (excluding control samples).

Chemial or Chemical Group	Dredging Studies			Monitoring Studies		
	North[1]	Central[2]	South[3]	North[1]	Central[2]	South[3]
Cd	758	15	702	1,425	365	2,664
Cu	758	15	676	1,573	385	2,637
Pb	758	15	766	1,466	389	2,665
Zn	758	15	752	1,588	385	2,640
PAHs	12,085	285	13,309	39,232	4,622	50,779
Pesticides	11,982	330	14,468	27,957	4,580	45,038
PCBs	5,726	120	5,314	40,728	7,120	66,140

[1]North includes North Coast and San Francisco Bay Regional Boards

[2]Central includes Central Coast Regional Board

[3]South includes Los Angeles, Santa Ana, and San Diego Regional Boards

The toxicity data includes information from tests conducted on whole sediment, interstitial water, elutriate (suspended sediment phase for dredging studies) and the sediment-water interface test for a variety of species groups (Table 2-3). There are also a variety of miscellaneous tests in the database (e.g., plant, tissue culture) not included in Table 2-3.

Table 2-3. Number of toxicity sample tests by matrix and species group, not including control test samples.

Species Group	Dredging Studies			Monitoring/Research Studies			
	Bulk Sediment	Interst. Water	Elutriate	Bulk Sediment	Interst. Water	Elutriate	Sed/Water Interface
Amphipod	571	0	0	2758	46	0	11
Polychaete	420	0	0	380	0	0	0
Bivalve	189	0	389	63	60	236	130
Fish	58	0	247	0	0	0	12
Echinoderm	0	0	42	22	1177	0	223
Crustacean (Mysid)	213	0	244	0	0	0	0
Crustacean (Leptostracan)	0	0	0	11	0	0	0
Gastropod	0	0	0	119	116	0	0
Zooplankton	0	0	0	0	1	0	21
Total	1451	0	922	3353	1400	236	397

Tissue chemistry in the database includes data from laboratory bioaccumulation studies, and field-collected finfish, invertebrates, and shellfish. There are also some samples from studies for field-deployed or transplanted shellfish. All of the dredging studies are associated with laboratory bioaccumulation (Table 2-4), generally for clams and polychaetes. Monitoring studies have samples of all the types of tissue samples (Table 2-4).

Table 2-4. Number of tissue samples organized by California Regional Water Quality Control Board showing the tissue sample type.

California Regional Water Quality Control Board	Number of Samples With Tissue Data in Category			
	Laboratory	Field-Collected FinFish	Field-Collected Other[1]	Field-Deployed or Transplanted
Dredging Studies				
Central Coast	0	0	0	0
Los Angeles	102	0	0	0
North Coast	4	0	0	0
San Francisco Bay	111	0	0	0
San Diego	0	0	0	0
Santa Ana	38	0	0	0
Total	255	0	0	0
Monitoring/Research Studies				
Central Coast	0	98	0	0
Los Angeles	6	107	0	0
North Coast	0	21	13	7
San Francisco Bay	173	671	311	242
San Diego	63	180	39	0
Santa Ana	0	39	0	0
Total	242	1116	363	249
Grand Total	497	1116	363	249

[1]Includes invertebrates, resident infauna, shellfish, or vegetatation

2.1.2 Extracting Data from the Database

The CA SQO database is intended to be a repository for data in a standardized format. Before analyses of the data can be conducted, the desired information must first be extracted from the CA SQO database using a query. The database has ten pre-designed queries that are intended to help the user learn how to build and edit a query. The guide to using these queries is included in this User Guide as Appendix B.

2.2 MetaManager Metadata Database

An Access database was created to store metadata for each study in the CA SQO database, with an interface called the MetaManager that allows ease of browsing the metadata, as well as creation of exported text files compatible with the federal standard. A section on how to use this information is included in this User Guide, Section 5.

NOTE More information on the FGDC Content Standard for Digital Geospatial Metadata is available on the web at the URL: http://www.fgdc.gov/metadata/contstan.html.

2.3 Documentation and Help Information

An electronic version of this User Guide and associated technical information is available from http://www.sccwrp.org. The User Guide describes the content of the CA SQO database, and explains how to extract information or enter new data. Appendices are also available as separate pdf files.

There is also basic on-line help available in the database itself, in several formats:

- Status bar – Field definitions are shown in the status bar, along the bottom of the Access window, when the cursor is in that field.
- Pre-defined queries – As described in Appendix B, there are several queries that were created for the casual user to be able to extract specific information. You can modify these queries using the instructions in this appendix.

Section 3
System Requirements

3.1 System Requirements

The main CA SQO database is a large database, nearly 300 MB, and requires sufficient hard drive space to store the database locally, as well as a computer with sufficient speed to run queries in the database. It can be used with most MS Windows™ operating systems, through Windows™ XP. Because of the size and complexity of database queries, we recommend using a computer with a Pentium processor and at least 256K of RAM.

The data are provided in Microsoft Access™ 2000. If you do not know which version of Microsoft Access you have, open your program and look for "About Microsoft Access" under the Help menu. The database can be opened in Access 2002; when you first open the file, you will be notified that the file needs to be updated.

3.2 Database Maintenance

The CA SQO database will be maintained for the near-term by SCCWRP. New data will be added as resources are available. New studies can be submitted for consideration into the database; information on what data to collect and submit is provided in Section 6.

NOTE If you are using the database regularly, it is useful to learn the MS Access tool called "Compact and Repair Database" (available under Tools/Database Utilities/Compact and Repair Database). This user should not try to join two tables if they do not appear joined in a query, as erroneous relationships between tables may yield erroneous results.

3.3 User Comments and Feedback

If you have problems using the database, or find errors in the data, contact Steve Bay at SCCWRP (steveb@sccwrp.org). Additional instructions on how to extract data from the database and to use some of the pre-created queries in the database are provided in Appendix B. Section 6 provides step-by-step instructions on what data to collect when submitting data for the CA SQO database.

Section 4
Features and Description of the Database

4.1 Database Structure and Hierarchy

A relational database is an efficient mechanism to store large amounts of data by keeping related information in separate tables that are related by one or more key fields (columns in the table). As an example, information about a whole study is stored in a table called *tblStudy*, so that this information is not repeated for every result. Information is retrieved from the database through the use of a query, which defines a subset of linked tables and contains a series of criteria used to retrieve the specific data of interest.

The CA SQO database contains 53 tables. The list of tables can be seen by selecting the "Tables" category under the list of objects in MS Access database window. Double clicking on a table name in this list will open the table and allow you to view the contents.

4.1.1 Data Tables and Look up Lists

There are two types of tables in the database: the data table, and the look up list. Data tables start with the preface 'tbl' followed by the description of the data within that table (e.g., *tblChemistryResults*). These tables contain the actual data stored in the database. There are 18 data tables in the database. The look up tables start with the preface 'luList' followed by the list number, and a descriptive name of the information stored in that table. Look up lists store standardized definitions of codes and names of data stored in the data tables. There are 35 look up list tables in the database.

There are three ways to discover the definitions and conventions used for the fields. First, while in the CA SQO database, click on the field while the table is open; the description will appear in the Status Bar at the bottom of the screen (right above the Task Bar). Second, a description of each field is included in the database dictionary contained in Appendix C of this manual. Finally, this section describes many the most important tables and fields used for each type of data.

Appendix C shows all of the fields, including key fields and required fields. Fields that are linked to look up tables must match a code in the corresponding look up table. In general, nulls (blanks) were avoided in the CA SQO database. Although many of the fields are not required in the database (other than key fields), most were populated with relevant information, or with a standard default value if no information was available. This population effort was conducted so the user could know the difference between the different types of the meaning of null (e.g., no information available *vs*. not applicable). Nulls were accepted in comment fields, and in fields where null is an implicit not applicable (e.g., null fields in the Qualifier

field indicate that there was no qualifier for that result).

CONVENTION – Null values

In order to avoid having blank fields in the database, a series of conventions were adopted to handle missing or unavailable information:

- Missing numerical information has a –99 in the field;
- Missing text information has an 'NA' in the field; the exception is if the field links to a look up list that has a specific code for missing, inapplicable, or unreported data;
- Missing or unreported dates are filled with 1/1/1900;
- Missing or unreported times are filled with 00:00.

There are other conventions for missing or inapplicable data that are specific to that field, and are discussed in individual sections in this guide.

4.1.2 Database Structure and Relationships

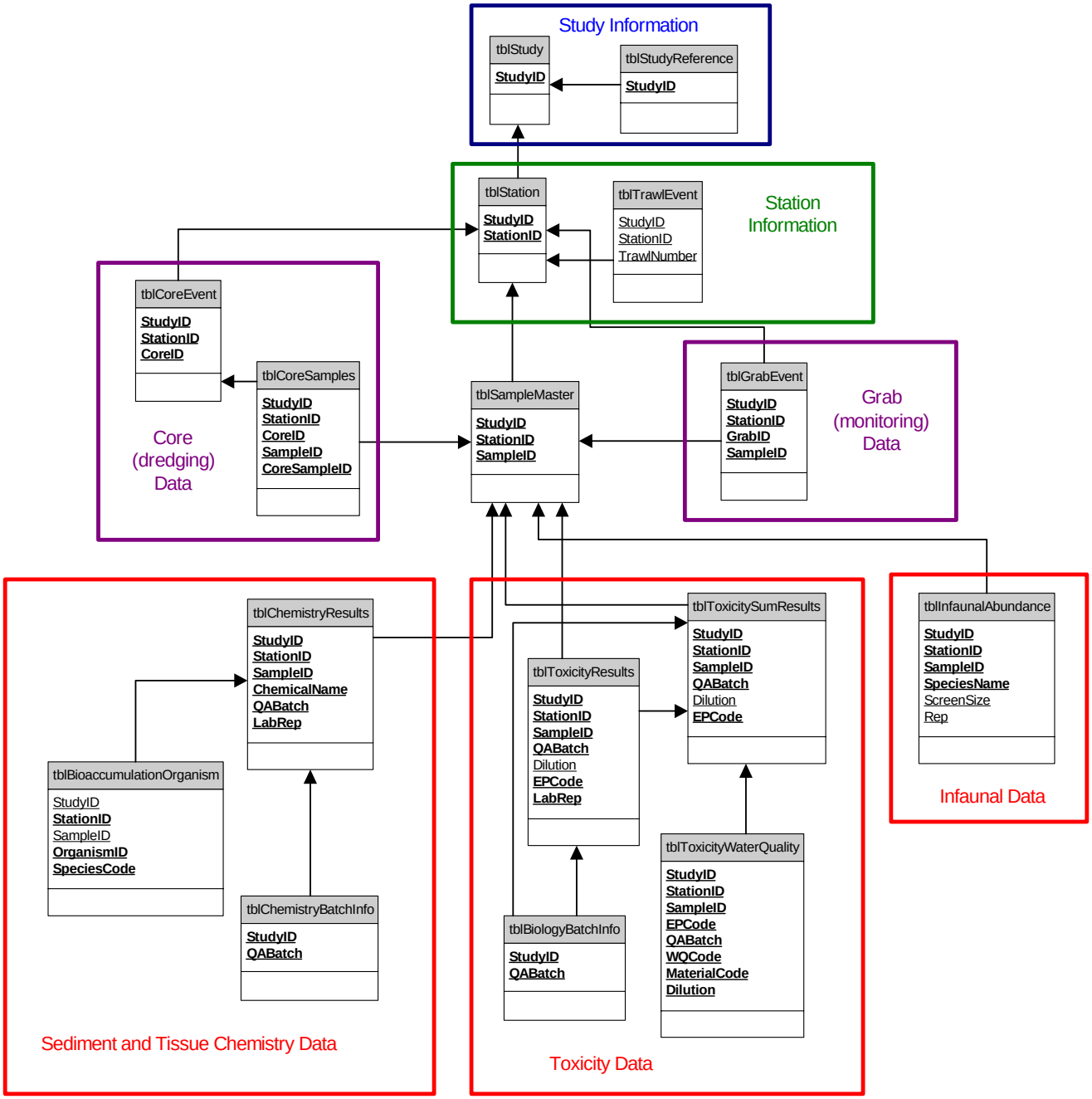
The CA SQO database structure contains four levels of organization: Study, Station, Sampling, and Data (Figure 4-1). The top level CA SQO hierarchy is the Study. A study is commonly one survey or dredging report; however, for some monitoring programs, one study might encompass a large range of sample dates (e.g., the Bay Protection and Toxics Control Program [BPTCP] data and the San Francisco Bay area's Regional Monitoring Program [RMP] are each only one study). Each study has a unique identifier (***StudyID***); the tables *tblStudy* and *tblStudyReference* contain information about each study. Appendix A summarizes the studies included in the CA SQO database. There is also one metadata record for each ***StudyID***, and is stored in the Metadata Database (Section 5).

The next level of the CA SQO database hierarchy contains information about stations, and environmental information collected during a visit to a station (Section 4.1.3).

After station information there are a series of tables that describe sampling information for the studies. Separate tables are present to document the sampling information for dredging-related information as well as monitoring and research-related information because of differences in study design and sample compositing between the methods (Section 4.1.4).

The lowest level of the CA SQO contains the data tables. These tables are organized by information type (e.g., chemistry, toxicity, and infauna) and contain the results of measurements.

Figure 4-1. Organization of the sediment quality database.

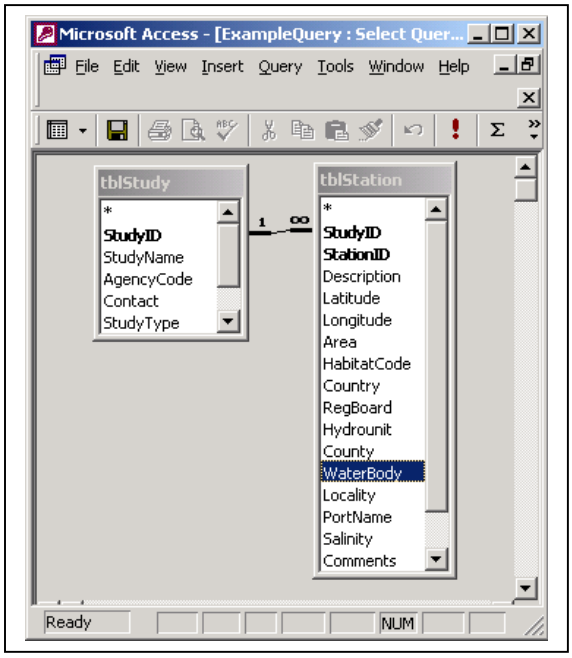


The tables are related to each other in a specific way, such that for any queries that are developed, the tables must be first be related according to the structure of the CA SQO database. In the discussion below, example queries are shown to illustrate how data can be filtered by using the data tables and look up lists.

The database contains tables that are related on a multiple key index. A description of the primary keys in each table is in Appendix C. Because of the varied sources of the data, several studies may use the same station number for different samples, so therefore several fields are required as primary keys to make each record in a table unique. The data tables are generally related on one or more of the following fields:

- ***StudyID***
- ***StationID***
- ***SampleID***

All of the database relationships are enforced, meaning that no data can be added to one (child) table without having matching data in the related (parent) table. When two related tables are opened into a query, the tables will automatically be joined if they are intended to be related. Two legitimately related tables will appear with a line between them, and a symbol that shows the relationship. In the example below, each unique ***StudyID*** in tblStudy is related in a 1-to-many (1-infinity) relationship to a ***StudyID+StationID*** in *tblStation*. In this example, you will not be able to add a new Station to *tblStation* unless the ***StudyID*** is in the station record, and there is already a matching ***StudyID*** record in *tblStudy*.

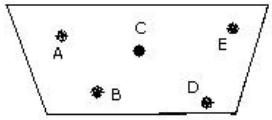


NOTE The user should not try and join two tables if they do not appear joined in a query, as erroneous relationships between tables may yield erroneous results.

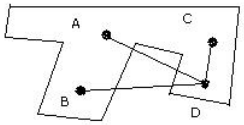
4.1.3 Stations and Station Locations

All dredging and monitoring data have a geo-referenced location in latitude/longitude coordinates (NAD83). For dredging data, the 'Station' may actually represent an area, such as a dredging polygon from which multiple cores were collected. In this case, the field ***Area*** in *tblStation* will be checked to 'Yes.'

In order to assign each dredging area to a point location that could be stored in the station table, a single core location was selected to represent the area. The representative location was selected using an algorithm using GIS software that selected the point that was closest to all the other points (median).



In this case, the core location 'C' would be selected to represent the area.



In this case, the core location 'D' would be selected to represent the area.

Figure 4-2. Example of how a median location was selected to represent a dredging polygon.

NOTE If the ***Area*** box is checked to 'Yes' in the Station table, the coordinates provided in that table is a median point selected from several cores or grabs collected at that station. Actual coordinates for all the cores collected at that station are stored in the table called *tblCoreEvent* or *tblGrabEvent.*

In addition to a point location, each station was assigned to geographic locations using GIS (geographic information system) layers, as well as professional judgment. Each region type has a unique list of names in a look up list, and those look up lists are related to *tblStation*, as follows:

- ***Country*** (*luList40_Country*)
- ***Regional Board*** (California Regional Water Quality Board; *luList41_RegBoard*)
- ***Hydrounit*** (Hydrologic Unit Code name or watershed description; *luList42_Hydrounit*)
- ***County*** (*luList43_County*)
- ***Water body*** (*luList44_WaterBody*)
- ***Locality*** (*luList45_Locality*)
- ***Port*** (*luList46_Ports*)
- ***Habitat*** (*luList48_HabitatCode*)

The ***HabitatCode*** is a 3-character code describing the habitat in which the station is located. The first character describes whether the station is in an embayment, freshwater, upland, or offshore. The second code further classifies the embayment stations into intertidal or subtidal. The third code classifies each station into a stratum related to water depth or environment (e.g., marinas, marshes, rivers, etc.). The habitat codes were developed using a combination of US Fish and Wildlife wetland data, bathymetric data, and professional judgment.

County, country, and Regional Board boundaries were obtained from the California Teale Data Center (see http://www.gis.ca.gov/). County boundaries include a three nautical mile extension into the water, so that the layers incorporate the water-based data. For stations located more than three miles offshore, the nearest county boundary was used. The water body and locality fields were based on SCCWRP GIS layers of bays and harbors in California, and on San Francisco Estuary Institute GIS layers and professional judgment for San Francisco Bay.

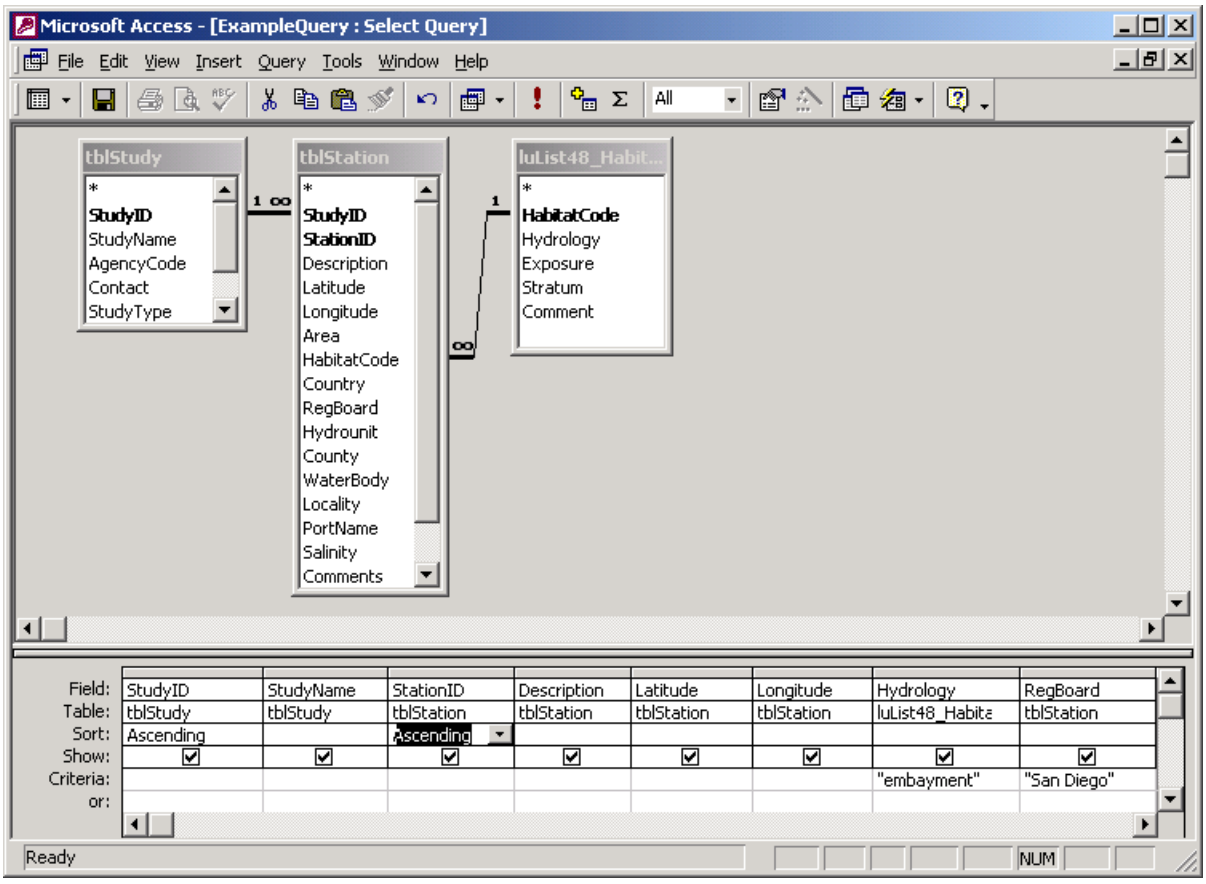
Control stations were identified as to location of the collected sediment (e.g., Tomales Bay); if this information was unavailable or inapplicable (e.g., water controls), the regions were classified as 'NA.'

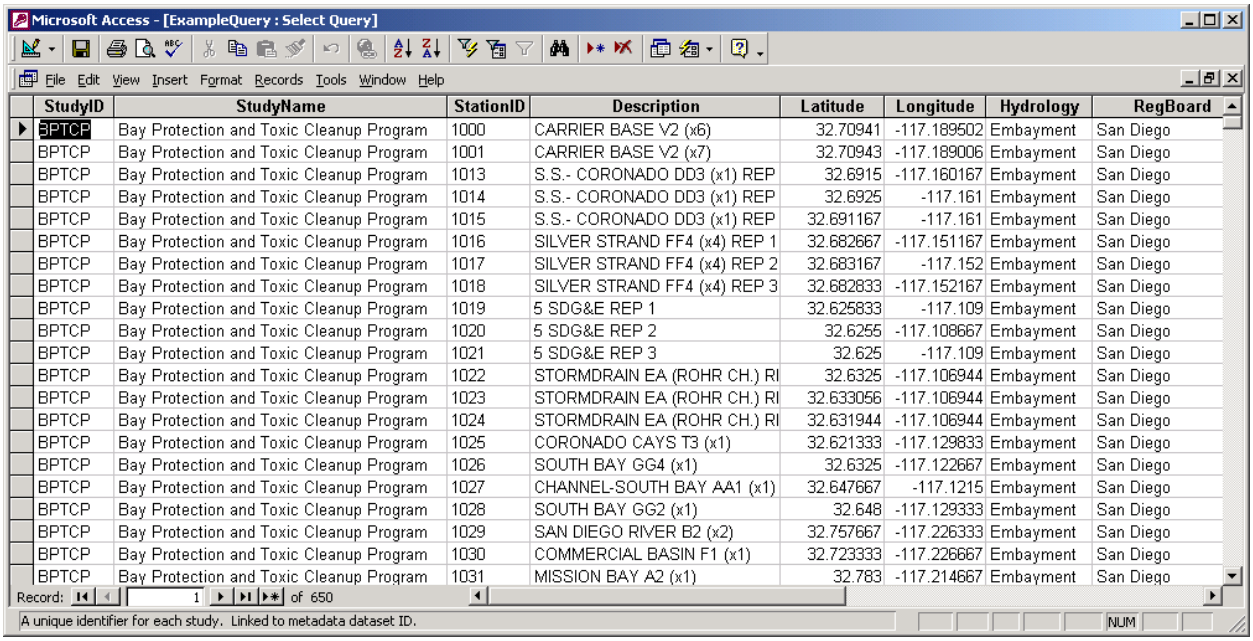
Port boundaries for the Port of Los Angeles (POLA) and Port of Long Beach were provided by the POLA. A GIS layer for watersheds for California was also provided by the POLA. The HUC name was used for classification, except for the Dominguez Channel watershed (a sub-classification of the HUC).

CONVENTION – Station Locations

There are some latitude/longitudes that are unknown or were unavailable, these are noted with a –99. Latitude/longitudes that are noted with zero (0) values are not geo-referenced stations (e.g., laboratory control samples).

EXAMPLE – Query for Stations. In the example below, the user queries all of the stations collected in bays from the San Diego RWQCB, sorted by Study and Station.





StudyID	StudyName	StationID	Description	Latitude	Longitude	Hydrology	RegBoard
BPTCP	Bay Protection and Toxic Cleanup Program	1000	CARRIER BASE V2 (x6)	32.70941	-117.189502	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1001	CARRIER BASE V2 (x7)	32.70943	-117.189006	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1013	S.S.- CORONADO DD3 (x1) REP	32.6915	-117.160167	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1014	S.S.- CORONADO DD3 (x1) REP	32.6925	-117.161	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1015	S.S.- CORONADO DD3 (x1) REP	32.691167	-117.161	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1016	SILVER STRAND FF4 (x4) REP 1	32.682667	-117.151167	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1017	SILVER STRAND FF4 (x4) REP 2	32.683167	-117.152	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1018	SILVER STRAND FF4 (x4) REP 3	32.682833	-117.152167	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1019	5 SDG&E REP 1	32.625833	-117.109	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1020	5 SDG&E REP 2	32.6255	-117.108667	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1021	5 SDG&E REP 3	32.625	-117.109	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1022	STORMDRAIN EA (ROHR CH.) RI	32.6325	-117.106944	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1023	STORMDRAIN EA (ROHR CH.) RI	32.633056	-117.106944	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1024	STORMDRAIN EA (ROHR CH.) RI	32.631944	-117.106944	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1025	CORONADO CAYS T3 (x1)	32.621333	-117.129833	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1026	SOUTH BAY GG4 (x1)	32.6325	-117.122667	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1027	CHANNEL-SOUTH BAY AA1 (x1)	32.647667	-117.1215	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1028	SOUTH BAY GG2 (x1)	32.648	-117.129333	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1029	SAN DIEGO RIVER B2 (x2)	32.757667	-117.226333	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1030	COMMERCIAL BASIN F1 (x1)	32.723333	-117.226667	Embayment	San Diego
BPTCP	Bay Protection and Toxic Cleanup Program	1031	MISSION BAY A2 (x1)	32.783	-117.214667	Embayment	San Diego

4.1.4 Samples and Sample Collection Nomenclature

Below the station level is the ***SampleID***. The ***SampleID*** is used to match samples analyzed for multiple analyses. The field called ***SampleType*** distinguishes different kinds of samples. Field replicates have a ***SampleType*** of FR. If the replicate is a laboratory replicate, the ***SampleType*** field is DUP. In the chemistry results table, there is a ***Labrep*** field to distinguish between multiple laboratory replicates.

Due to the differences in sample collection between different study types, the database structure has several tables to capture these variable sample designs. Dredged material characterization data are often collected using long cores, with composite samples created from parts of several different cores. As an example, one sample may reflect the top half of five different cores (five different locations), representing an upper layer of a berth area to be dredged. Conversely, monitoring and research data typically commonly are collected using a grab sampler, with one sample reflecting a single point location. The structure reflects this difference, with several tables containing only core-related data (tables starting with 'tblCore'), and several tables reflecting only grab-related data (tables starting with 'tblGrab'). In general, tables with the preface tblCore contain only dredging-related information.

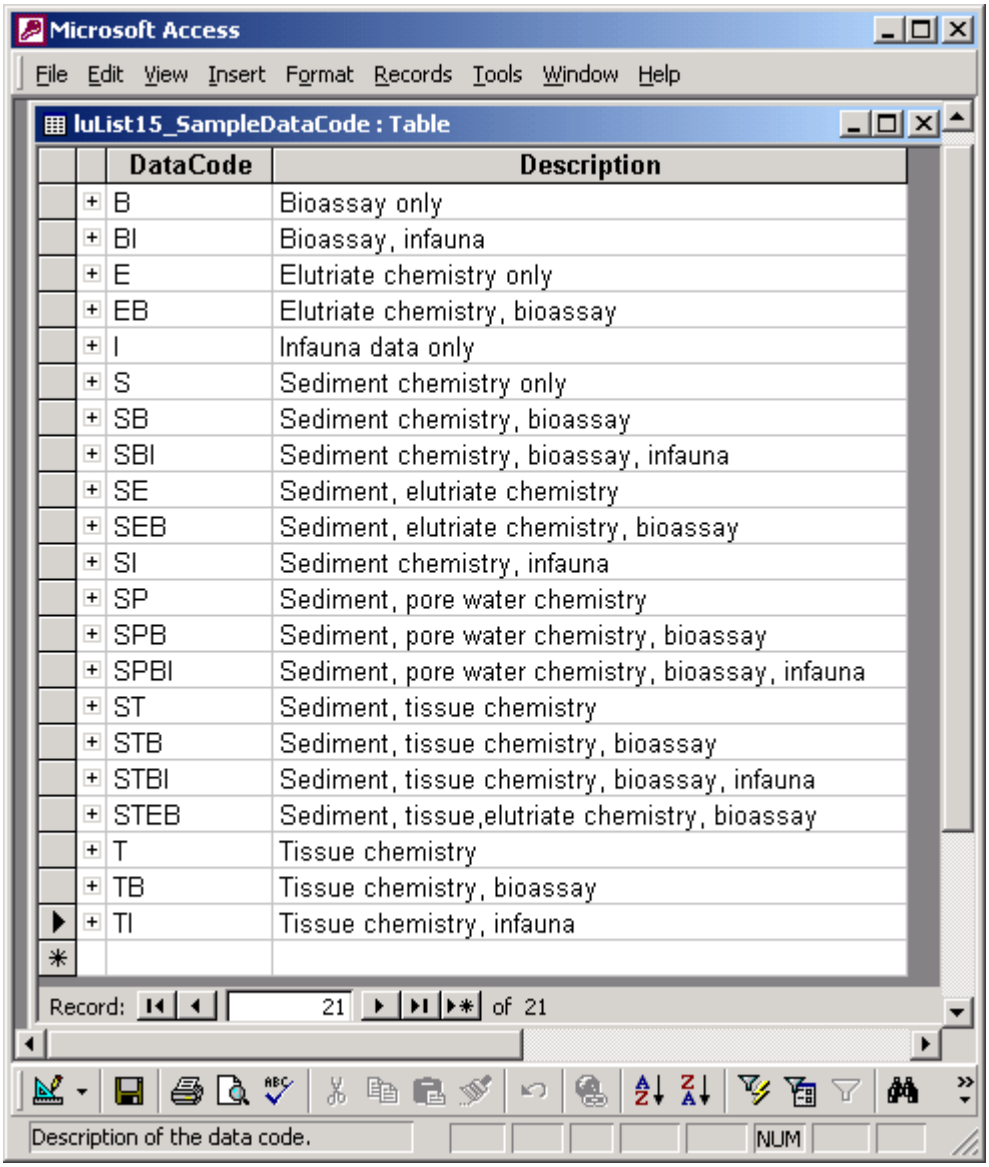
A master sample table was created (*tblSampleMaster*) that contains basic sample information for both core and grab data. This table increases the efficiency of querying, and simplifies the use of the CA SQO for novice users. It contains the basic information necessary to describe a sample event (e.g., date, sediment depth).

♫ NOTE ♫ If you are interested only in basic sampling information such as the sample date or sediment depth, you do not need to include any core- or grab-related tables in your query.

There are several critical fields in tblSampleMaster that will be useful for querying. These fields are described below.

- ***SampleMethod*** – the code for the method of sampling (e.g., core, grab), described in Look up List 03;
- ***SampleType*** – the code for the type of sample (e.g., negative control), described in Look up List 04;
- ***Composite*** – a field that notes whether the sample in question was a composite (can be a composite of separate grabs or cores);
- ***Upper/Lower Measure*** – these fields describe the upper and lower sediment depth from which the sample was collected, in cm, where 0 cm is the sediment-water interface;
- ***Sedcomp/SedColor*** – these fields describe standardized texture and color of the sediment sample, if available, described in Look up Lists 06 and 26, respectively;
- ***DataCode*** – this field describes what data types (sediment chemistry, tissue chemistry, toxicity, or infauna) that are associated with this sample, as

described in Look up List 15, as shown below.



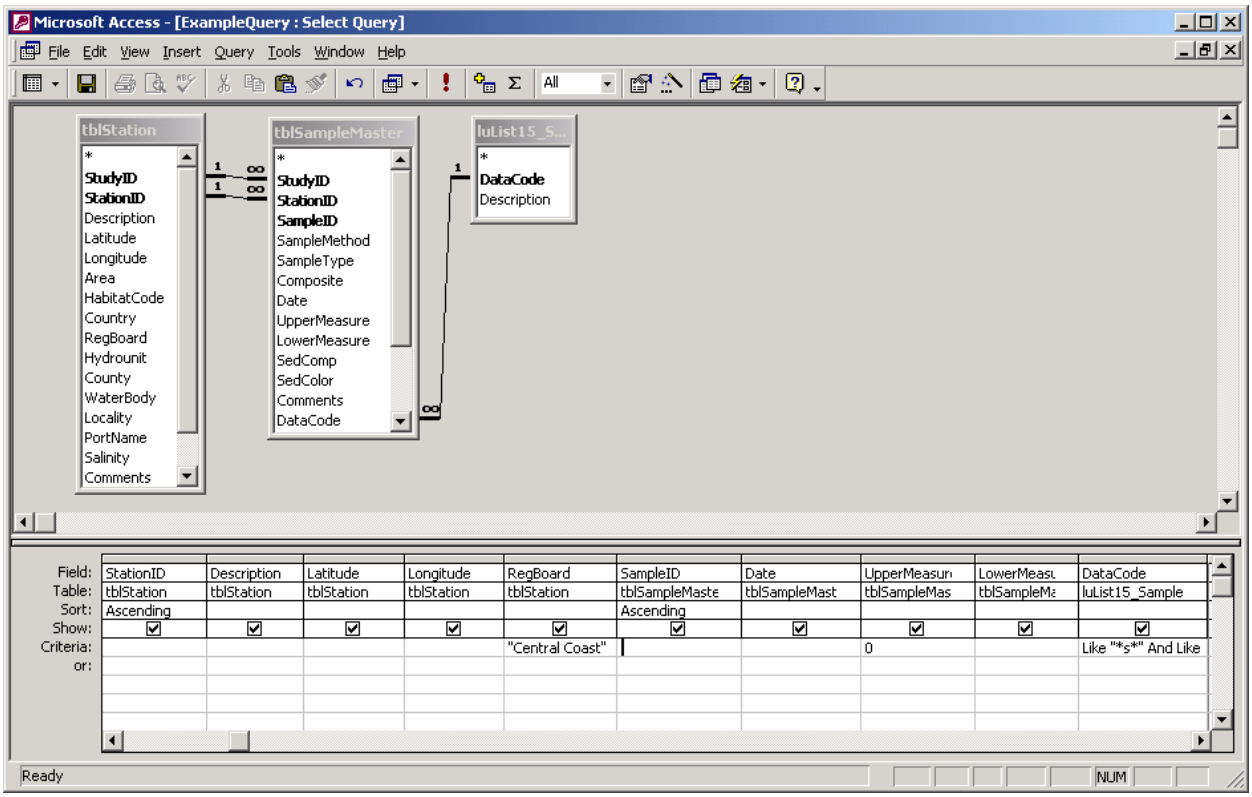
DataCode	Description
B	Bioassay only
BI	Bioassay, infauna
E	Elutriate chemistry only
EB	Elutriate chemistry, bioassay
I	Infauna data only
S	Sediment chemistry only
SB	Sediment chemistry, bioassay
SBI	Sediment chemistry, bioassay, infauna
SE	Sediment, elutriate chemistry
SEB	Sediment, elutriate chemistry, bioassay
SI	Sediment chemistry, infauna
SP	Sediment, pore water chemistry
SPB	Sediment, pore water chemistry, bioassay
SPBI	Sediment, pore water chemistry, bioassay, infauna
ST	Sediment, tissue chemistry
STB	Sediment, tissue chemistry, bioassay
STBI	Sediment, tissue chemistry, bioassay, infauna
STEB	Sediment, tissue,elutriate chemistry, bioassay
T	Tissue chemistry
TB	Tissue chemistry, bioassay
TI	Tissue chemistry, infauna

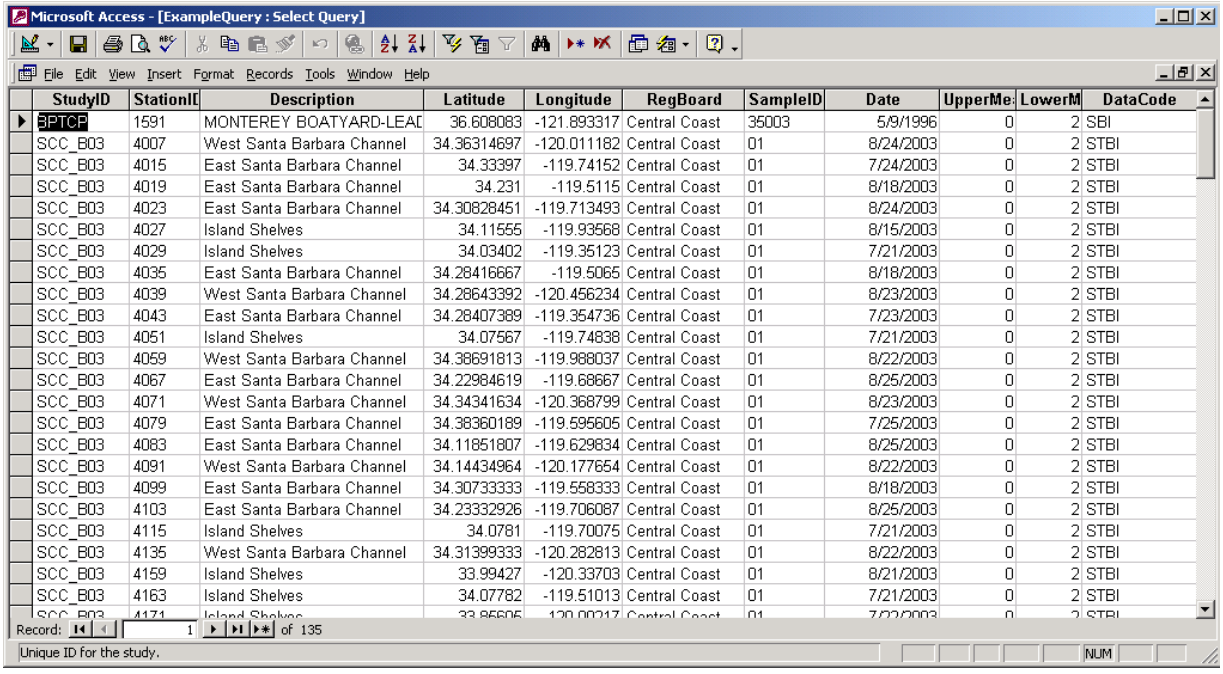
NOTE Appendix B provides additional examples for how to use the ***DataCode*** field for extracting samples with matching analyses.

CONVENTION – Composite sample sediment depth

Samples that are composites (generally of core samples) have an average upper and lower sediment depth of all of the individual samples that made up the composite sample in *tblSampleMaster*.

EXAMPLE – Query for Samples. In the example below, the user queries samples within the Central Coast RWQCB jurisdiction collected from the surface sediment (upper sediment depth = 0 cm) that have triad analyses (DataCode of S [sediment], B [bioassay], and I [infauna]), sorted by Study, Station, and Sample.





4.1.5 Sample and Result Types

Look up list 04 (*lulist04_SampleTypes*) contains classifications that are used to describe both sample and result types. The reason for descriptors for both the sample and the result is elucidated in the examples below.

Possible sample types (documented in the field ***SampleType*** in *tblSampleMaster*) include negative controls (CNEG), field replicates (FR), reference samples (REF), and normal sample results (RESULT).

Possible result types can be one of the types listed above, but can also include documentation of analytical duplicates or replicates. These are specific to the type of analyses, and include analytical duplicates (DUP), tissue replicates (TREP; commonly there are 5 tissue replicates for laboratory bioaccumulation analyses), and duplicates of tissue replicates (TRDUP). If the replicate is a laboratory replicate, the ***SampleType*** field is DUP. In the chemistry results table, there is a ***Labrep*** field to distinguish between multiple laboratory replicates.

4.2 Sediment, Tissue, and Water Chemistry Data

Chemistry data for sediment, tissue, and sediment elutriate and interstitial water samples are all stored in the same table, called *tblChemistryResults*. The matrix of the result is stored in a field called ***MaterialCode***, options include SD (sediment), EL (elutriate), IW (interstitial water) and TS (tissue).

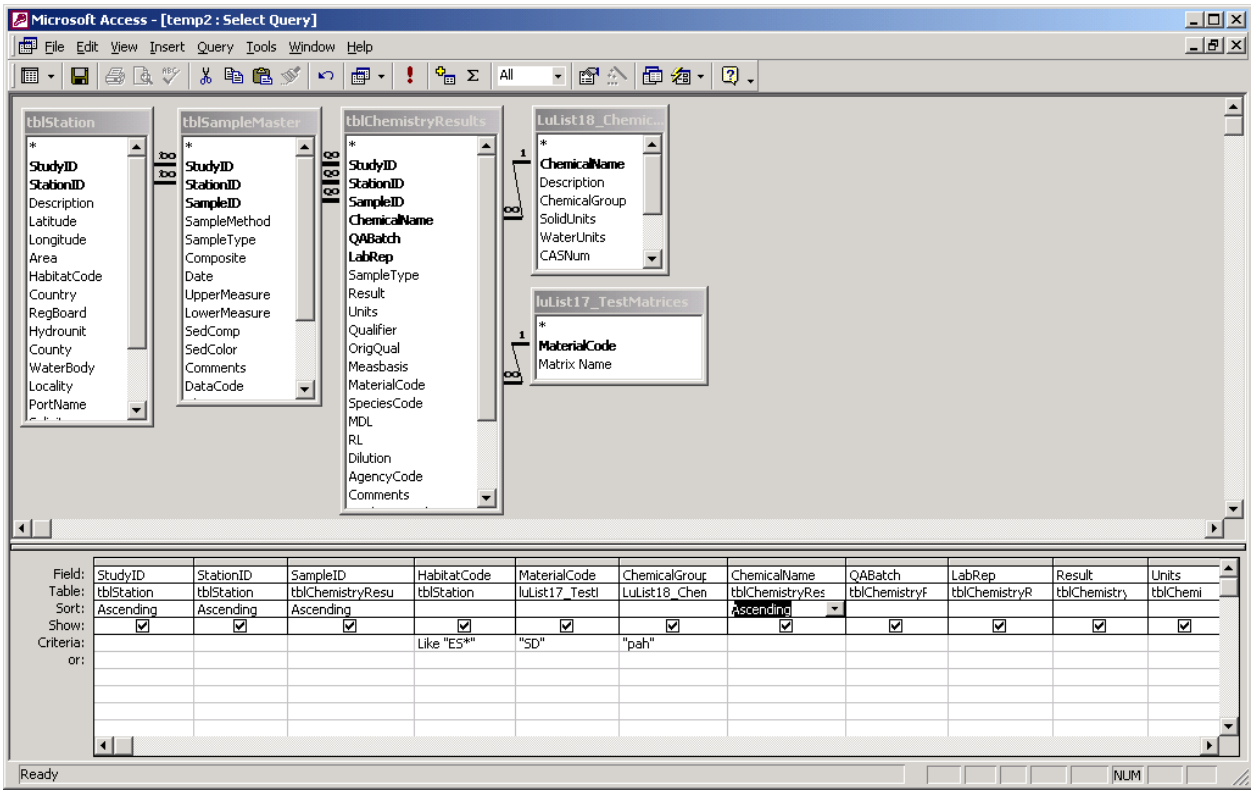
This section provides details on the structure and fields of the *tblChemistryResults* table. Additional information on tissue chemistry (bioaccumulation) data is provided in Section 4.3.

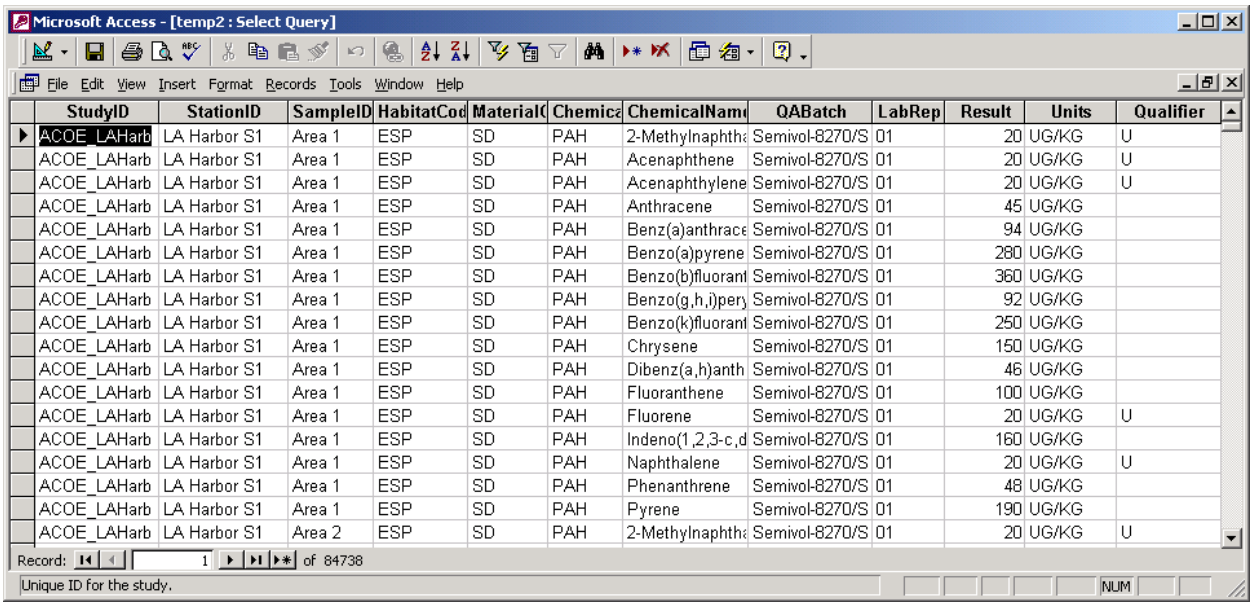
4.2.1 Chemicals, Units, Material Code and Measuring Basis

The chemical names and units have all been standardized to increase the efficiency of analyses. The standard chemical names and units are stored in *luList18_ChemicalParameters*. The standard unit for the majority of organic chemicals is parts per billion (µg/kg). Exceptions are several dioxin/furan compounds (parts per trillion, ng/kg), and conventional organic tests such as TRPH and oil & grease (parts per million, mg/kg). Metals are stored as mg/kg, and grain size and total organic carbon (TOC) are stored as percent (%).

As noted above, the field ***MaterialCode*** describes the matrix of the chemistry result. The measurement basis (***Measbasis***) is the code that describes the reporting basis for the data; in general, data and units for sediment are in dry weight (***Measbasis*** = DW); data and units for tissue are in wet weight (***Measbasis*** = WW).

EXAMPLE – Query for Chemistry Data. Below, the user queries all PAH sediment chemistry data (***MaterialCode*** = "SD", ***ChemicalGroup*** = "PAH") from subtidal embayments (***HabitatCode*** like "ES*") sorted by Study, Station, Sample, and Chemical name.





StudyID	StationID	SampleID	HabitatCod	MaterialC	Chemica	ChemicalNam	QABatch	LabRep	Result	Units	Qualifier
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	2-Methylnaphtha	Semivol-8270/S	01	20	UG/KG	U
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Acenaphthene	Semivol-8270/S	01	20	UG/KG	U
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Acenaphthylene	Semivol-8270/S	01	20	UG/KG	U
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Anthracene	Semivol-8270/S	01	45	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Benz(a)anthrace	Semivol-8270/S	01	94	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Benzo(a)pyrene	Semivol-8270/S	01	280	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Benzo(b)fluorant	Semivol-8270/S	01	360	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Benzo(g,h,i)pery	Semivol-8270/S	01	92	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Benzo(k)fluorant	Semivol-8270/S	01	250	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Chrysene	Semivol-8270/S	01	150	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Dibenz(a,h)anth	Semivol-8270/S	01	46	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Fluoranthene	Semivol-8270/S	01	100	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Fluorene	Semivol-8270/S	01	20	UG/KG	U
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Indeno(1,2,3-c,d	Semivol-8270/S	01	160	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Naphthalene	Semivol-8270/S	01	20	UG/KG	U
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Phenanthrene	Semivol-8270/S	01	48	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 1	ESP	SD	PAH	Pyrene	Semivol-8270/S	01	190	UG/KG	
ACOE_LAHarb	LA Harbor S1	Area 2	ESP	SD	PAH	2-Methylnaphtha	Semivol-8270/S	01	20	UG/KG	U

4.2.2 Chemistry Results, Detection Limits, and Qualifiers

Results were provided as reported unless they were converted to match the standard units as listed in *luList18_ChemicalParameters*. For results reported as below detection, a 'U' was stored in the qualifier field, and the reported value reflects the best estimate of the reporting limit, as discussed in this section. Both the reporting limit (RL) and method detection limit (MDL) are included in the table, and populated when available. The RL is the best estimate available for a sample and analyte, and can vary by sample and by batch. The RL is the concentration of a parameter that can be reliably reported in the presence of a moderate amount of sample-based interferences. The MDL is the limit of detection for a particular analytical method and instrument, and generally is the same for all samples in a batch.

Following compilation of all of the data, qualifiers for results near or below the method detection limit were standardized as much as possible. Also, originally reported qualifier codes were grouped and standardized to match the definitions stored in *luList13_QualifierCodes*. The result, detection limit, and qualifier are all related; the procedures used to standardize the database for these fields are described in the following sections; these protocols were followed as much as possible relative to available information.

4.2.2.1 Chemical Results and Detection Limits

- Detected values were stored in the database as reported (unless the value was converted to match the standard units.
- If RLs and/or MDLs were reported in the original data, these were carried over as reported, with no check to verify the use of these terms.
- For data reported as <#, with no reported MDLs or RLs, the # was stored in both the ***Results*** field and the ***RL*** field, 'U' in the ***Qualifier*** field, and –99 (missing) in the ***MDL*** field.
- For data reported as ND with no RL provided, the best available detection limit was used in the ***Results*** field; commonly this was provided in the Methods section of a report, and was either the MDL or the Contract Required Detection Limit. This information should be stored in the metadata for that study.
- For data reported as ND with no detection limits provided, a –99 was placed in the ***Results*** field and a –99 in the ***MDL/RL*** fields.

4.2.2.2 Standardized Qualifiers

Following data compilation using the procedures listed above, an analysis of the results, MDLs, RLs, and qualifiers was conducted. The reported Results were compared with the reported MDL/RL, and re-qualified if necessary using the following qualifier definitions from *luList13_QualifierCodes*:

- U - The analyte was analyzed for, but not detected above the MDL or RL;
- J - The analyte was detected and reported as < the RL, but > or = the MDL;
- UJ – The analyte was reported as not detected, but the reported value was < the RL and >= the MDL.

In addition to the U and J qualifiers, other qualifiers were standardized to fit the look up list. Original qualifier codes were stored, and are available from SCCWRP.

4.2.3 Chemical Method Information

Within the Chemistry Results table, there is a field called ***QABatch***. This field, along with the ***StudyID***, relates to the chemical method information that is stored in the table called *tblChemistryBatchInfo*. This table stores the preparation and analysis method information. For dredging-related data, the method name was used as the ***QABatch*** identifier to uniquely identify a batch of samples analyzed by the same method. The ***QABatch*** for monitoring data generally were incorporated as provided. Many data (e.g., NSI) did not have method information; the ***QABatch*** in these cases is 'NA.' Codes for analysis and preparatory method information are stored in Look up Lists 33 and 34.

NOTE The preparation codes for metals analysis were standardized to reflect the level of digestion of metals, in a field called ***MetalDigestCode*** The options are 'NearTotal' (near total digestion); Total (total digestion); WeakAcid (weak acid digestion), and NoDigest (no digestion, applicable only for XRF metals data).

4.3 Tissue Chemistry Data

Tissue chemistry data have supplementary tables and information specific to bioaccumulation testing. As noted above, the ***MaterialCode*** for tissue is "TS" and the ***Measbasis*** for tissue is generally wet weight (WW). The chemistry results table (*tblChemistryResults*) also has a ***SpeciesCode*** field, linked to *luList20_SpeciesList*; the species code for matrices other than tissue is "NR." The CA SQO database has several types of bioaccumulation data, as documented by the field ***TestType***, and present in *tblBioaccumulationOrganism* for every tissue chemistry sample:

- Field-collected bioaccumulation consists of tissue chemistry for organisms collected in the field, including resident, trawl-caught finfish (***TestType*** = TIS_FI) and field-collected infauna, shellfish, and vegetation (***TestType*** = TIS_IN).
- Laboratory bioaccumulation (***TestType*** = ACC) consists of tissue chemistry data for organisms that are exposed to a sediment sample, and then analyzed for tissue chemistry residue. Commonly there are associated toxicity data (e.g., survival of exposed organisms).
- Transplanted or deployed organisms (***TestType*** = FLD).

There are several additional tables in the database specific to tissue data, and also specific to the type of tissue data. For trawl-caught organisms, there is the table

t*tblTrawlEvent*, which is related to *tblStation* and provides information on the length, location, and dates of trawl stations. There is limited transplanted data, with samples reported for only three studies (BTPCP, RMP, and a Richmond Harbor RCRA study).

All bioaccumulation data have associated information about the collected species. In addition to the ***SpeciesCode*** discussed above, the table *tblBioaccumulationOrganism* contains all of the data available associated with the individual or composited organisms, including age, length, weight, sex, and life stage of the organism.

To understand the structure and relationships of the laboratory bioaccumulation data tables, it is important to recognize that laboratory bioaccumulation data have both biological laboratory information (for the period of time the organisms are exposed to the sediment sample), as well as chemistry laboratory information (for the tissue analysis). In some laboratory bioaccumulation studies, one sediment sample provides data for sediment chemistry, tissue chemistry, as well as toxicity results. Details of laboratory information and the relationship between bioaccumulation and toxicity data are provided in the sections below.

4.3.1 Laboratory Test Information

Biological methods for bioaccumulation data are provided in the table *tblBiologyBatchInfo*. This table includes some redundant data with *tblBiologyOrganism* (the table that provides information about the species collected for tissue analyses) for laboratory bioaccumulation testing only. The biology batch table contains information for both toxicity testing (***TestType*** = TOX), as well as bioaccumulation testing (***TestType*** = ACC). The fields stored in *tblBiologyBatchInfo* are discussed in detail in Section 4.5 (toxicity data).

Chemistry methods for laboratory bioaccumulation data are stored in the same way as sediment and water chemistry, with a unique ***QABatch*** for each ***StudyID***. The *tblChemistryBatchInfo* table includes ***SpeciesCode*** and ***MaterialCode*** to specify the organism tested.

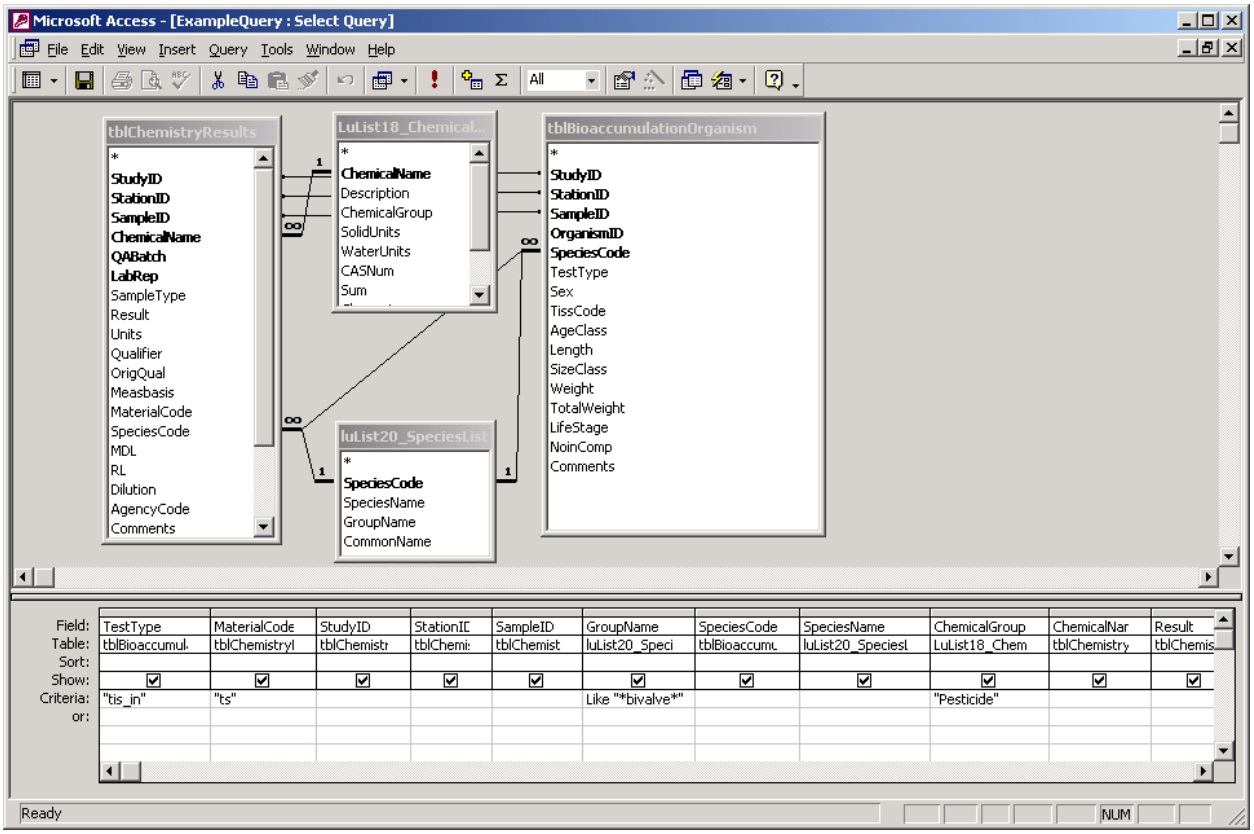
4.3.2 Relationship Between Bioaccumulation and Toxicity Tables

Biological methods for both bioaccumulation and toxicity data are provided in the table *tblBiologyBatchInfo*. Therefore, the two types of tests will have different QABatch fields, and the TestType distinguishes whether the protocol is for bioaccumulation or for toxicity testing. An example is shown below, which shows two toxicity tests (10 day test; ***TestType*** = TOX) for *Macoma nasuta* and Nephtys caecoides, and two bioaccumulation tests (28 day test; ***TestType*** = ACC) for the same species.

StudyID	QABatch	TestType	SpeciesCode	LifeStage	ProtocolCode	TestDuration	Temperature
OAK_38III	10DSP_MN	TOX	MN	A	GREENBOOK (draft)	10	15
OAK_38III	10DSP_NC	TOX	NC	A	GREENBOOK (draft)	10	15
OAK_38III	28DSP_MN	ACC	MN	A	GREENBOOK (draft)	28	15
OAK_38III	28DSP_NC	ACC	NC	A	GREENBOOK (draft)	28	15

NOTE The ***QABatch*** field for laboratory bioaccumulation results in *tblChemistryResults* relates to the chemistry batch table, **not the biology batch table**. Biological batch for laboratory bioaccumulation data is stored in tblBiologyBatchInfo, but only for records where toxicity was also reported.

EXAMPLE – Query for Bioaccumulation Data. Below, the user queries all pesticide tissue chemistry data (***MaterialCode*** = "TS", ***ChemicalGroup*** = "Pesticide") for all field-collected bivalves (***TestType*** = "TIS_IN", species ***GroupName*** LIKE "*bivalve*").



4.4 Toxicity Data

There are four tables that contain toxicity results:

- *TblBiologyBatchInfo* - contains method, species, matrix, and test duration information;
- *TblToxicityResults* - contains raw replicate results, if available;
- *TblToxicitySumResults* - contains mean toxicity results, and includes identifiers for statistical significance of toxic response;
- *TblToxicityWaterQuality* - contains summary water quality data from toxicity testing.

4.4.1 Toxicity Test Information

Toxicity test information is stored in the *tblBiologyBatchInfo*, and is linked to the Toxicity Results and Toxicity Sum Results tables on the field called ***QABatch***. This field, along with the ***StudyID***, relates to the toxicity method information. This table stores the fields that define the toxicity test, as linked to a series of look up lists:

- ***TestType*** – the code for the test type, described in Look up List 12;
- ***MaterialCode*** – the code for the matrix of the test, including sediment, elutriate, interstitial water, and sediment-water interface tests, described in Look up List 17;
- ***SpeciesCode*** – the code for the test species, described in Look up List 20;
- ***LifeStage*** – the code for the life stage of the test organism, described in Look up List 22;
- ***ProtocolCode*** – the code for the test protocol references, as described in Look up List 21;
- ***Test date, duration, and temperature*** – The date of the test, the duration (in number of days) of the test, and target temperature of the test.
- ***AcceptCode*** – A code for data qualifiers assigned to the test result, described in Look up List 25.

4.4.2 Toxicity Results

Replicate toxicity results were stored in *tblToxicityResults*, if available. This table contains similar fields as *tblToxicitySumResults*, except that the replicate field is required. Each of the toxicity tables has several fields in common describing the test condition:

- ***SpeciesCode*** – the code for the test species, described in Look up List 20;
- ***EPCode*** – the code for the test endpoint (e.g., survival), described in Look up List 23;
- ***Units*** – units of the endpoint;
- ***Dilution*** – applicable to water tests, this value stores the concentration of

the sample tested, expressed as a proportion (e.g., 0.5 = 50% concentration);
- ***AcceptCode*** – A code for data qualifiers assigned to the test result, described in Look up List 25.

CONVENTION – Test Endpoints

Test endpoints provided as mortality or abnormality were converted to survival and normality for ease of comparison across studies.

4.4.3 Toxicity Summary Statistics

The toxicity summary table (*TblToxicitySumResults*) stores a similar set of fields as the replicate results table, but includes a series of summary values describing the results of that test. These fields include:

- ***Mean*** – mean value of laboratory replicates;
- ***N*** – number of replicates;
- ***StdDev*** – standard deviation of replicates;
- ***PctControl*** – mean value expressed as a percent of the negative control assigned to that batch of samples;
- ***SigEffect*** – reported statistical significance from original report and/or database;
- ***Stat_Test*** – test used to calculate statistical significance;
- ***LC50*** – the concentration (%) of the sample that is lethal to 50% of the test organisms (applicable only to the endpoint of survival and usually only reported for dredged material elutriate tests);
- ***EC50*** – the concentration (%) of the sample that produces an adverse effect on 50% of the test organisms (applicable to sublethal endpoints and usually only reported for dredged material elutriate tests);
- ***NormSigEffect*** – results of a standardized pairwise statistical test between the sample and negative control conducted to provide a more consistent indicator of toxicity.

The codes used for statistical significance for the ***SigEffect*** field is described in Look up List 50, and Look up List 51 for ***NormSigEffect***. The codes differentiate between comparison to reference (SR/NSR) and control (SC/NSC). There is also a threshold value applied in some cases when comparing to reference. This most often is for sediment (solid phase) toxicity testing for dredging studies; if the resulting value is within 10% of reference, commonly there was no statistical analysis conducted (20% for amphipods, according to dredging guidelines). For more information on federal dredging testing and statistical guidelines (e.g., Green Book), see http://www.epa.gov/owow/oceans/gbook/index.html.

The ***NormSigEffect*** field reports the results of a one-tailed, two sample test procedure that compared the sample to the negative control for that test group (***QABatch***). One of three related tests was conducted, depending upon the characteristics of the data. A t-test assuming equal variances was used when the data were normally distributed and had equal variances. A t-test with unequal

variances was used if the variances were not equal, and a non-parametric t-test using a rankit-transformation was applied when the data were not normally distributed. An alpha = 0.05 was used to identify significant differences for all three test methods.

CONVENTION – Negative Control and Reference Samples

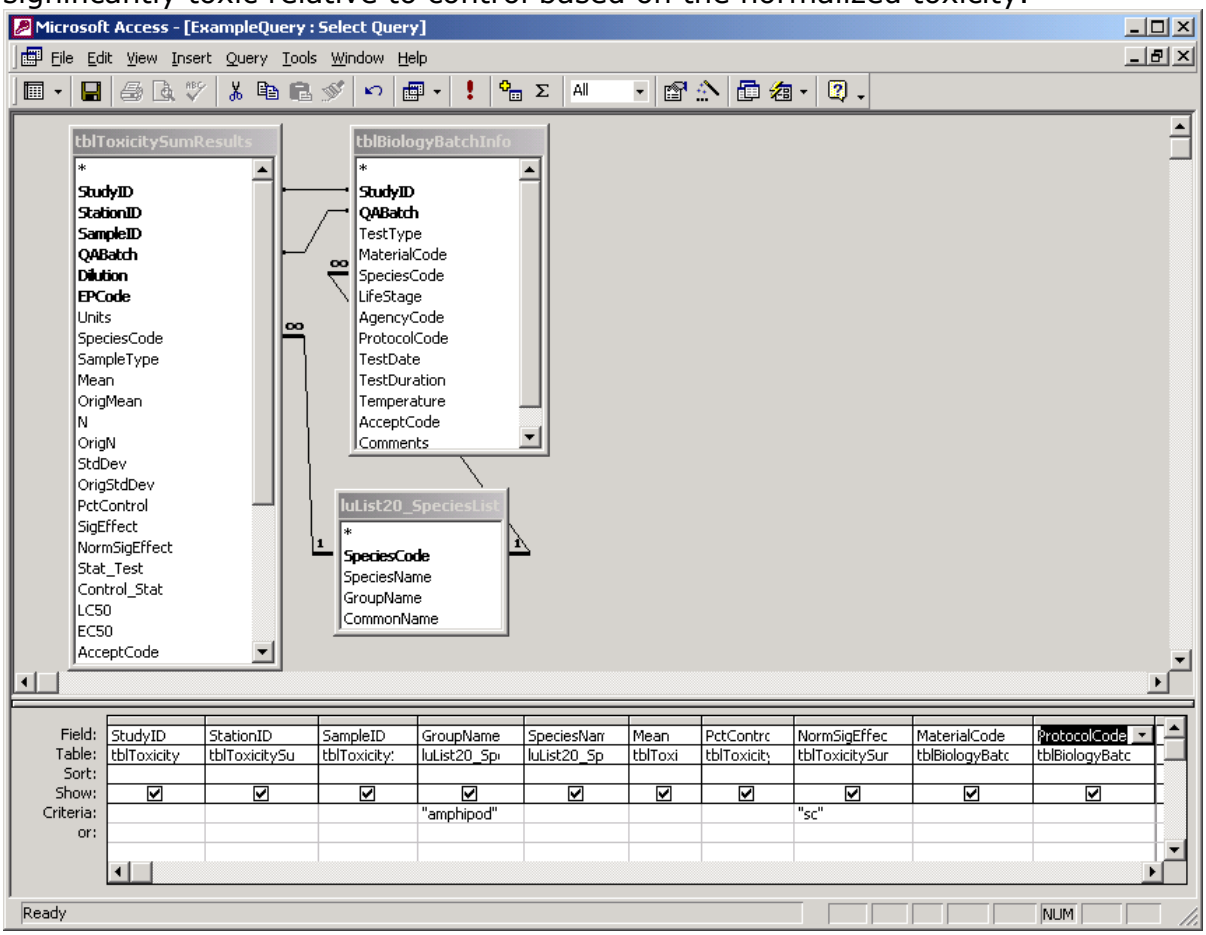
If there was more than one negative control sample analyzed for a batch of samples, only one was selected for calculation of percent control and for standardized negative control. The reason for the replicate controls, and the choice of which control to use for statistics, is provided in the metadata for that study. Commonly, a second control was analyzed if there was unacceptably low survival in the first batch. Reference samples were treated as normal results for control-normalization and significance calculations.

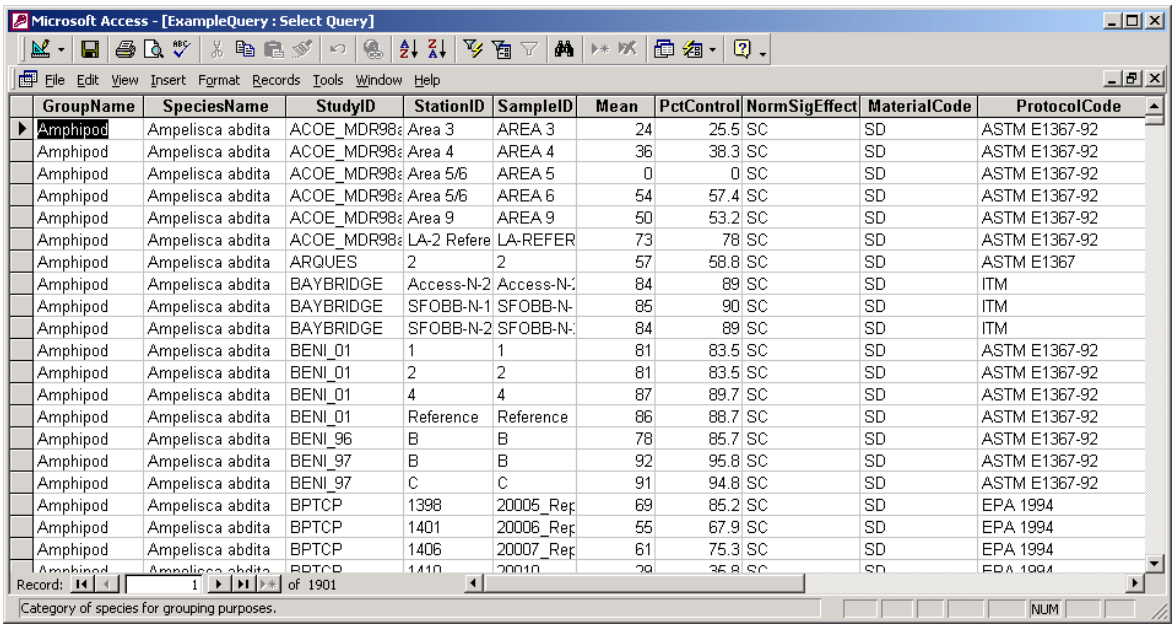
4.4.4 Toxicity Water Quality Information

Measured water quality parameters are stored in the table *tblToxicityWaterQuality*. Minimum, maximum, mean, and standard deviation values are stored, if available. Water quality parameter codes are defined in Look up List 24.

NOTE The ***QABatch*** is an extremely important field in the CA SQO database. This field identifies a group of samples analyzed using the same methods. The ***QABatch*** must be included in a query in order to identify the correct negative control or reference sample for the test sample of interest.

EXAMPLE – Query for Toxicity Summary Data. Below, the user queries all amphipod data (species ***GroupName*** = "Amphipod") that is classified as significantly toxic relative to control based on the normalized toxicity.





4.5 Infaunal Data

Benthic infaunal abundance results are stored in *tblInfaunalAbundance*, if available. This table is linked to *tblSampleMaster* on the standard key fields (***StudyID***, ***StationID***, ***SampleID***). This table stores each infaunal species (***SpeciesName***) along with the count (abundance) of that species for each sample.

The full species name is stored in this table, but is linked to Look up List 10 (*luList10_Infaunal_SpeciesList*). Look up List 10 contains the standard spelling and usage of each species, as well as other ontongenic categories such as phylum, class, order, and family. The source of the standardization is stored in the ***Source*** field. There are three general sources of species names:

- ***SCAMIT*** – Many of the species names came from the Southern California Association of Marine Invertebrate Taxonomists (www.scamit.org).
- ***StudyID*** – If a study was included that had reported species not in the original SCAMIT list, it was added, and the StudyID was stored as the source.
- ***SQO 2005*** – If a name was added during the process of data compilation for the CA SQO database, then the source was listed as SQO2005.

Other important fields in *tblInfaunalAbundance* table include:

- ***ScreenSize*** – This field stores the sieve size in mm.
- ***Qualifier*** – If there are any qualifications to the identification or count, this information is stored in this field.
- ***AreaSampled*** – This fields stores the area of sediment sampled in units of m^2.
- ***TaxaStd*** – This field stores the samples that had species names standardized subsequent to the original analysis. Samples standardized specifically for the CA SQO benthic index development project will have a TaxaStd of "SQO 2005." A code of NA indicates samples that have not been standardized.

Section 5
5 User Guide for the CA SQO MetaManager

What is metadata? Metadata is data about data. Each original study included in the CA SQO database has a metadata report summarizing the quality and content of that data set. This section gives a brief overview of the CA SQO MetaManager, and provides a guide for finding the information necessary to complete a metadata record

This MetaManager is compliant with the Federal Geographic Data Committee (FGDC) standard. If you need more information on metadata in general, sources are available at www.fgdc.gov. For detailed information regarding the FGDC standards used here, please refer to the FGDC Content Standard for Digital Geospatial Metadata (FGDC-STD-001-1998).

There are two options for using the MetaManager: View Report and Browse Data. The "View Report" function is used to generate text reports on existing metadata. "Browse Data" is the main operation, and allows you to view, edit, or add metadata.

5.1 View Report

This feature allows you to generate an FGDC-compliant metadata report for a single set of data. A report listing every metadata record in the CA SQO database can be viewed from this screen. This option allows you to view or save the metadata all in one file. It will produce a metadata report compatible with that used by SCCWRP, as well as the long and short forms of the FGDC standard.

To select the metadata record you would like to view, click on the drop-down menu box under "Select a Metadata Record" found on the opening screen of the MetaManager (Figure 5-1). The list that appears will show every record entered in MetaManager.

Next, indicate which type of report you would like to generate by checking the box for the Full (long form) FGDC Metadata Report or the Summary (short form) Metadata Report. You have the option of viewing the report on screen, saving the report to a text file, or printing the report.

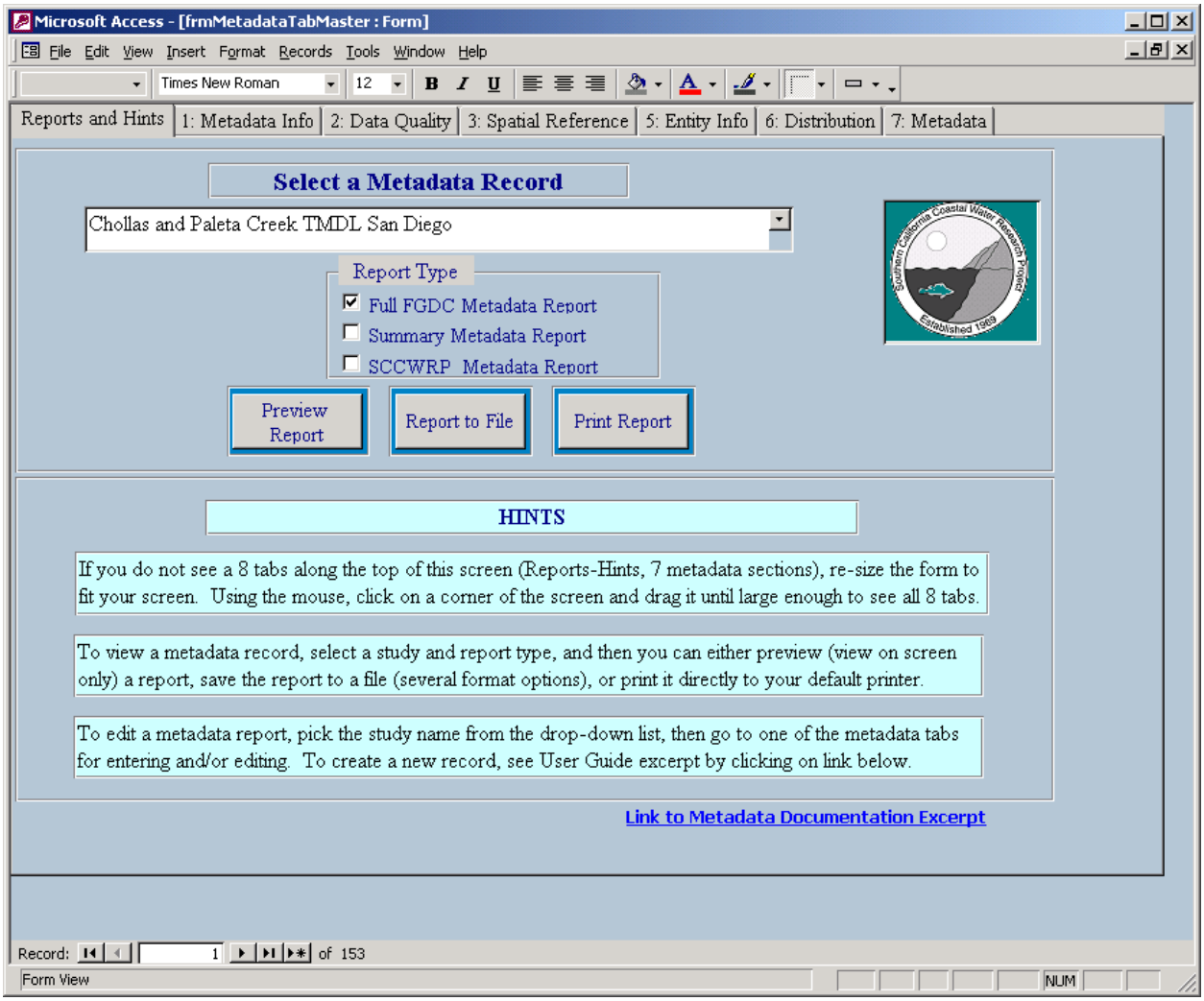


Figure 5-1. MetaManager View Report screen.

5.2 Browse Data

Clicking on the various tabs at the top of the MetaManager opening screen will allow you to look through all of the information collected in each record. If you are familiar with Access, you can browse through the information more quickly using the filter functions.

Section 1 of the FGDC standard information is displayed when the 1: Metadata Info" tab is selected. Additional sections are accessed by clicking the other tabs at the top of the form. From this form, you can browse through the records by incrementing the Record Number at the bottom of the form. Or, to more easily find a specific record, you can use native Access functions to filter or sort the records.

Sections 1, 2, 5, and 7 of the FGDC standard are included for each study in the database. However, other sections may be included in some records. Following is a

review of the fields in the required sections and also Sections 8, 9, and 10.

5.3 Metadata Sections

The Metadata contains information about each study. The sections below contain general information about the standard and how information was collected to include in the metadata.

5.3.1 FGDC Section 1—Identification Information

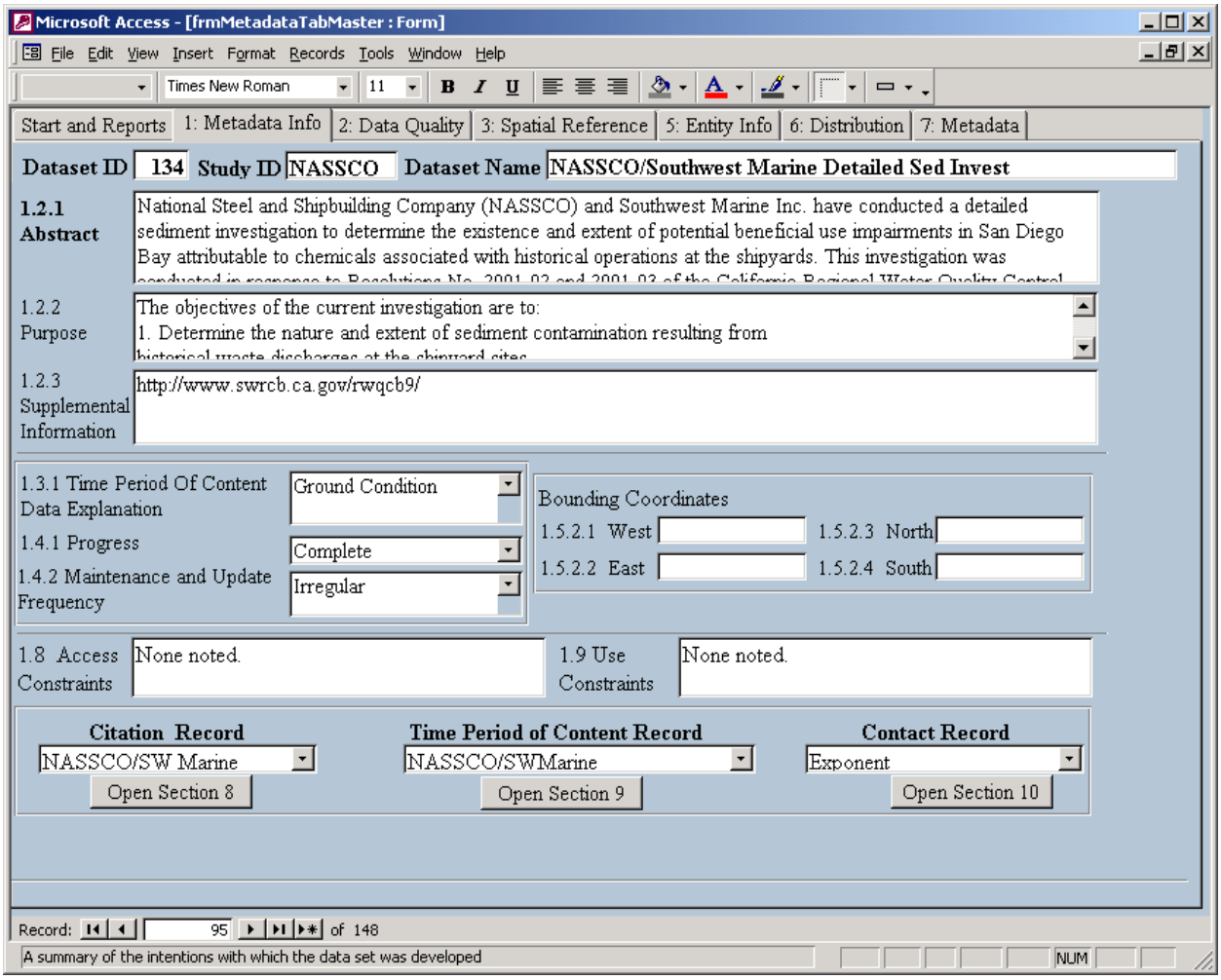


Figure 5-2. MetaManager Metadata Information and Section 1 screen.

FGDC Section 1 contains identification information for a given study including its purpose, along with an abstract summarizing the study. It is linked to the tables for Sections 8, 9, and 10 for citation, time period, and contact information. Click on the "1: Metadata Info" tab to display this information.

Metadata Name

Study ID is a shortened version of the formal title for a given dredged material characterization report. It should match the ***StudyID*** in the CA SQO database.

Keywords

Keywords should capture the significance of the data. Taxonomic keywords are the most common and include species names for biological tests. Theme keywords include information about the type of tests performed and collection methods, such as 'Sediment Chemistry' and 'vibracore.' Place keywords include names of towns, bays, counties, or other place names that refer to the area that the data represents.

Abstract

The abstract is a critical description of the data set contents. It should contain a concise but specific summary of the characteristics and meaning of the data.

Purpose

Purpose describes simply the purpose of the study.

Supplementary Information

Supplemental information may contain source URLs or important notes about the data.

Progress

Progress describes the state of the data set, whether is it considered to be complete or in progress. If, for example, the purpose of a study is to collect monitoring data, then the data set is considered in progress.

Maintenance and Update Frequency

Maintenance and Update Frequency describes the frequency with which changes and additions are made to data set. This applies to studies "in progress."

Bounding Coordinates

For the dredging studies, the same bounding coordinates (West, East, North, South) were used as the data fell within a limited geographic range. Bounding coordinates were included for other databases if provided in the original source material.

Access/Use Constraints

Access/Use Constraints defines restrictions to data access or uses of the data. If there were any disclaimers in the originating report, this information was included here.

Time Period of Content

Time Period of Content has two standard options, Publication Date or Ground Condition. If the Time Record in MetaManager FGCC Section 9 refers to the

publication date, the correct entry here is Publication Date. If the Time Record in Section 9 refers to a time for which the data are meant to represent and reflect observations and conditions, the correct entry for this field is Ground Condition.

5.3.2 FGDC Section 2—Data Quality

Section 2 contains information about the accuracy and completeness of the data, including a completeness report, attribute accuracy report, process description, and processing reference. The CA SQO database metadata also includes three non-FGDC sections describing the lab methods, field methods, and analysis methods used in the study. These fields are derived from the National Biological Service version of the metadata standard, as used by SCCWRP. From the MetaManager Information form, select the tab "2: Data Quality" to access this information.

Attribute Accuracy Report

The Attribute Accuracy Report contains much of the quality assurance information for the data set. For dredging reports, the discussion was focused on the presence or absence of a QA section in the originating report. Also, any problems with the data were noted in this section.

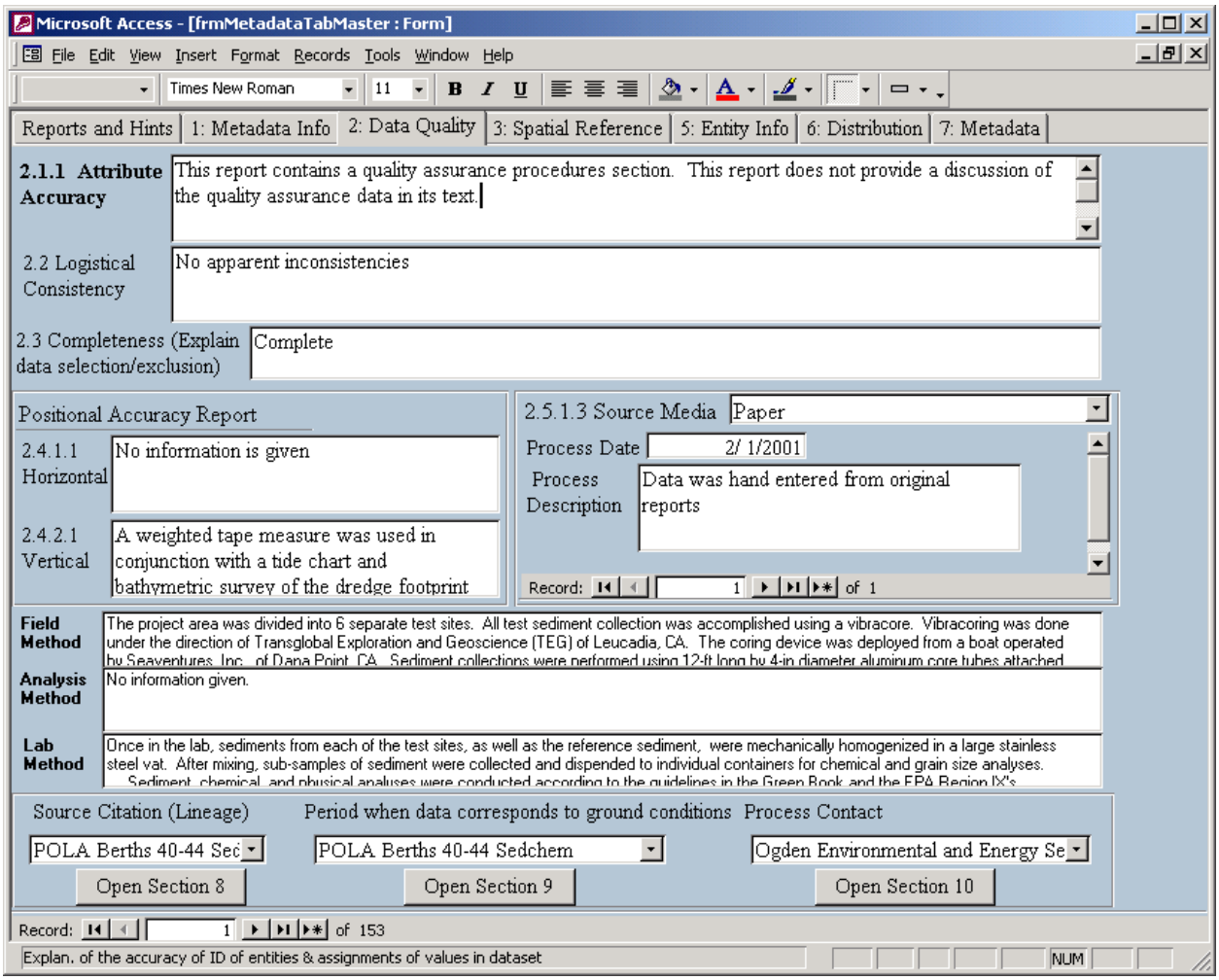


Figure 5-3. MetaManager Data Quality/Lineage Information Section 2 screen.

Logical Consistency Report

The Logical Consistency Report describes any inconsistent data within the set. If there are no apparent inconsistent data for this field, this field was filled with "N/A" for not available.

Completeness Report

The Completeness Report reflects any missing data, such as samples that were collected but not analyzed. Other examples include data that were analyzed but rejected due to quality control issues.

Positional Accuracy Reports

The Horizontal and Vertical positional accuracy reports describe the methods and accuracy used to determine positions of the samples collected for analysis. Vertical position refers to water depth and horizontal position refers to the latitude and longitude.

Type of Source Media

Type of Source Media describes the physical medium of the data set. The most common descriptions are either paper (for a bound document) or electronic.

Process Description

Process Description provides key information about the creation and development of the data. A thorough process description will help future users understand the quality of the data even if other fields in this section are blank. It contains a description of the most recent data processing steps. For hand-entered data (dredging reports), it contains primarily any processing that had to be done outside of data entry (e.g., incorporate latitude and longitude into the data set when only maps of sample locations were provided). For electronic data, a summary of the processing steps required to make the database compatible with the CA SQO format is summarized.

Process Date

Process Date indicates when the latest edits or revisions to the data set were made.

Field, Laboratory, and Analysis Methods

Field Method describes how the samples were collected. Lab Method describes the processes and procedures that were followed in the laboratory. This includes the conditions under which the samples were held, compositing, and the specific analyses that were performed. Analysis Method describes the specific statistical analysis methods used to determine the quality of the data and the performance of the samples relative to the established criteria.

Citation

Citation (Lineage) refers to the most recent responsible agency. It is linked to Section 8 of the database. If the data were passed from the originating publisher to another agency for pre-inclusion processing, the agency that processed the data would be listed here. Usually, the agency listed in Section 1 still applies to Section 2.

Time Period

Time Period is linked to the "ground condition," that is, what time period the data actually represent. This may be the same as in Section 1.

Process Contact

Process Contact is the name of a contact person at the most recent responsible agency in the data lineage. Often the contacts are the same for Sections 1 and 2.

5.3.3 FGDC Section 5—Entity and Attribute

The Entity and Attribute Section contains important information about the data set's contents. This section documents all of the chemistry and toxicity tests reported in a study.

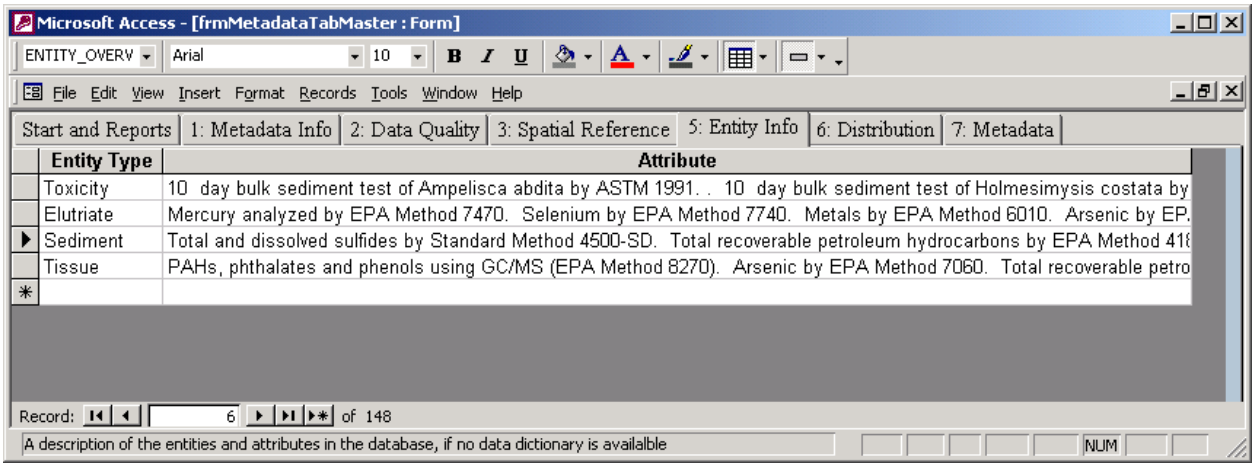


Figure 5-4. MetaManager Entity and Attribute Information Section 5 screen.

There will only be one record each for Sediment, Elutriate, and Tissue, despite the number of different chemical analyses performed on these materials.

5.3.4 FGDC Section 7—Metadata Reference Information

FGDC Section 7 contains information about the metadata, including the date, standard, and contact information for each record.

Metadata Standard Name and Version

The Metadata Standard Name and Version reflects the standard used by the

database. As of this writing, that default is the FGDC Content Standard for Digital Geospatial Metadata Version 2.0.

Contact Information

Contact information is linked to Section 10 and indicates the person responsible for the metadata entry.

5.3.5 FGDC Section 8—Citation Information

FGDC Section 8 is essentially the bibliographic information for the study. It contains required fields for a data set citation, including the originator, publication date, title, and version. Section 8 is linked to Sections 1 and 2 and duplicates information found there. The fields available for describing bibliographic information in the metadata standard Section 8 include:

- Citation Record Name
- Originator
- Publication date
- Title
- Edition
- Data Presentation
- Other Citation Details
- Online Linkage

5.3.6 FGDC Section 9—Time Period Information

FGDC Section 9 is used to describe the time period describing either when the data were collected ('Ground Condition') or reported ('Publication'). The time can be reported as either a single date or a range of dates. Sections 1, 2, and 6 link to Section 9 to provide a time reference. If sampling dates were not provided, the publication date was entered. All dates conformed to a standard form of YYYYMMDD.

The fields available for describing bibliographic information in the metadata standard Section 9 include:

- Time Period of Content Data Explanation
- Time Record Name
- Calendar Dates

5.3.7 FGDC Section 10—Contact Information

The contact for the study should be the person who would know most about the contents of the study. In general, this will be the agency representative (i.e., project manager) for the study.

The fields available for describing bibliographic information in the metadata standard Section 10 include:

- Contact Record Name
- Contact Person
- Contact Organization
- Contact Position
- Address Type
- Address
- Contact Voice Phone
- Internet Address

Section 6
Adding New Data to the Database

6.1 Overview

When collecting new samples it is important to keep in mind that adequate information needs to be provided in order to incorporate these data into the CA SQO database. All new information should be submitted with basic metadata describing who, what, when, where, and why of the data, in addition to analyses, results and interpretation methods accompanying each sample. In order to better understand the characteristics of the information required, the previous sections of this document should be once more reviewed to better understand the characteristics of the information contained in each one of the database tables. It is important to keep in mind that the new data to be included in the CA SQO database need to convey variables that identify samples in a unique manner. In addition to that, the new data also need to be clear and standardized since individual samples will be related to information already present in different tables of the database. An explanation of the CA SQO database table format and organization levels are included in sections four and five of this report.

6.2 Sediment Chemistry Data

Each new chemistry dataset needs to contain sampling collection data describing the purpose of the study, the agency responsible for the collection of the sample, the study design, as well as analytical information. In other words, the chemistry dataset should not only include chemistry information, but also additional information relating detail characteristics for each sample. The information that should be submitted is shown in Table 6-1.

Proper datasets should have standardized chemical units, according to the principles used in the CA SQO database. These specifications are located in section four of this document. It is also recommended to consult the look-up lists (Table D1) for a better understanding of data format and constraints. It is critical to provide complete explanations of the reported and maximum detection limits (MDL and RL values), qualifier criteria used (and explanations of the criteria assignments), as well as specific chemical preparation and analyses methods used to process the sediment samples. Complementary metadata information should be provided following the requirements presented in section five. Specifics for the collection of new data can be found in the CA SQO Chemistry Indicators Manual. The following table shows the types of information that should be compiled in order to integrate new chemistry data into the CA SQO database. In Table 6-1, the information location column denotes the different tables where this information will be stored (main tables), or where the conventions and standardized format of a particular type of information are located (look up lists).

Table 6-1. Sediment chemistry data necessary to integrate new data into the CA SQO Database.

Required Fields	Information Location
Study ID	All main tables
Station ID	All main tables
QA Batch	Chemistry Results and Chemistry Batch Info tables
Sample ID	All main tables
Chemical Name	Chemistry Results table and Look up list 18
Lab Replicate	Chemistry Results table (if applicable)
Result	Chemistry Results table
Units	Chemistry Results table and Look up list 18
Measuring Basis (dry weight)	Chemistry Results table and Look up list 19
Qualifier	Chemistry Results table and Look up list 13
MDL / RL	Chemistry Results table
Analysis Date	Chemistry Batch Info table
Latitude/Longitude (NAD83)	Station Table
Core or Grab Collection Information	Core or Grab Event tables
Sample date	Sample Master table
Sample time	Sample Master table
Sediment Depth	Sample Master table
Additional Fields	
Study Reference Information	Study Reference table
Station Information	Station table
Sample Type	Chemistry Results table and Look up list 04
Sample Information	Sample Master table
Test Material	Chemistry Results and Chemistry Batch Info tables, and Look up list 17
Preparation Method	Chemistry Batch Info table and Look up list 34
Chemical Analyses	Chemistry Batch Info table and Look up list 33
Dilution	Chemistry Results table
Agency	Chemistry Results, Chemistry Batch Info, and Look up list 01
Comments	Chemistry Results and Chemistry Batch Info tables
Metadata	Metadata Database

6.2 Tissue Chemistry Data

Each new tissue chemistry dataset needs to contain sampling collection data describing the purpose of the study, the agency responsible for the collection of the sample, the study design, as well as analytical information. In other words, the chemistry dataset should not only include chemistry information, but also additional information relating detail characteristics for each sample. The information that should be submitted is shown in Table 6-2.

Proper datasets should have standardized chemical units, according to the principles used in the CA SQO database. These specifications are located in section four of this document. It is also recommended to consult the look up lists (Table 6-2) for a better understanding of data format and constraints. It is critical to provide complete explanations of the reported and maximum detection limits (MDL and RL values), qualifier criteria used (and explanations of the criteria assignments), as well as specific chemical preparation and analyses methods used to process the sediment samples. Complementary metadata information should be provided following the requirements presented in section five.

The data needed for the database will be different depending on whether the tissue chemistry data is from laboratory bioaccumulation or field-collected organisms. Ancillary information for laboratory bioaccumulation will be stored in grab or core event tables similar to sediment chemistry. Collection data for field-collected organisms are stored in the trawl event table. In addition, every tissue sample requires a record in the Bioaccumulation Organism table, which stores information about the tissue being analyzed. In Table 6-2, the information location column denotes the different tables where this information will be stored (main tables), or where the conventions and standardized format of a particular type of information are located (look up lists).

Table 6-2. Tissue chemistry data necessary to integrate new data into the CA SQO Database.

Required Fields	Information Location
Study ID	All main tables
Station ID	All main tables
QA Batch	Chemistry Results and Chemistry Batch Info tables
Sample ID	All main tables
Chemical Name	Chemistry Results table and Look up list 18
Lab Replicate	Chemistry Results table (if applicable)
Species	Chemistry Results, Chemistry Batch Info, Bioaccumulation Organism tables, and Look up list 20
Result	Chemistry Results table
Units	Chemistry Results table and Look up list 18
Measuring Basis (wet weight)	Chemistry Results table and Look up list 19
Qualifier	Chemistry Results table and Look up list 13
MDL / RL	Chemistry Results table
Analysis Date	Chemistry Batch Info table
Latitude/Longitude (NAD83)	Station table
Collection Information	Core or Grab (laboratory bioaccumulation) or Trawl Event tables (field accumulation)
Sample date	Sample Master table
Sample time	Sample Master table
Additional Fields	
Tissue Information	Bioaccumulation Organism table
Study Reference Information	Study Reference table
Station Information	Station table
Sample Type	Chemistry Results table and Look up list 04
Sample Information	Sample Master table
Test Material	Chemistry Results and Chemistry Batch Info tables, and Look up list 17
Preparation Method	Chemistry Batch Info table and Look up list 34
Chemical Analyses	Chemistry Batch Info table and Look up list 33
Dilution	Chemistry Results table
Agency	Chemistry Results, Chemistry Batch Info, and Look up list 01
Comments	Chemistry Results and Chemistry Batch Info tables
Metadata	Metadata Database

6.3 Toxicity Data

Each new toxicity dataset needs to contain sampling collection data describing the purpose of the study, the agency responsible for the collection of the sample, the study design, as well as analytical information. There are four different tables to store the analytical data: replicate results (tblToxicityResults); summary results (tblToxicitySumResults); water quality information (tblToxicityWaterQuality); and laboratory information (tblBiologyBatchInfo). The information that should be submitted is shown in Table 6-3.

Proper datasets should have standardized species names and test endpoints, according to the principles used in the CA SQO database. These specifications are located in section four of this document. It is also recommended to consult the look up lists for a better understanding of data format and constraints. It is critical to provide complete explanations of statistical significance of toxicity designations, as well as any qualifier criteria used (and explanations of the criteria assignments), and specific toxicity methods used to process the samples. Complementary metadata information should be provided following the requirements presented on section five.

The information location column of Table 6-3 identifies the different tables where this information will be stored (main tables), or where the conventions and standardized format of a particular type of information are located (look up lists).

Table 6-3. Toxicity data necessary to integrate new data into the CA SQO Database.

Required Fields	Information Location
Study ID	All main tables
Station ID	All main tables
QA Batch	Toxicity Results, Summary Results, Biology Batch, and Water Quality tables
Sample ID	All main tables
Dilution	Toxicity Results, Summary Results, and Water Quality tables
Endpoint	Toxicity Results, Summary Results, Water Quality tables, and Look up list 23
Endpoint Units	Toxicity Results, Summary Results, and Water Quality tables
Replicate	Toxicity Results table
Species	Toxicity Results, Summary Results, Water Quality tables, and Look up list 20
Result	Toxicity Results and Summary Results tables
Toxicity Significance	Toxicity Summary Results table and Look up List 50
Statistical Test	Toxicity Summary Results table
Qualifier	Toxicity Results, Summary Results and Biology Batch tables and Look up List 25
Analysis Date	Biology Batch Info table
Latitude/Longitude (NAD83)	Station table
Collection Information	Core or Grab Event tables
Sample date	Sample Master table
Sample time	Sample Master table
Additional Fields	
LC50/EC50	Toxicity Summary Results table
Study Reference Information	Study Reference table
Station Information	Station table
Sample Type	Toxicity Summary table and Look up list 04
Sample Information	Sample Master table
Test Material	Biology Batch Info tables, and LookUp list 17
Bioassay Protocol	Biology Batch table and look up list 21
Agency	Biology Batch table and look up list 1
Comments	Toxicity Results, Summary Results, Biology Batch, and Water Quality tables
Metadata	Metadata Database

6.4 Benthic Infaunal Data

Each new benthic infaunal dataset needs to contain sampling collection data describing the purpose of the study, the agency responsible for the collection of the sample, the study design, as well as analytical information. The information that should be submitted is shown in Table 6-4.

Benthic infaunal abundance results are stored in *tblInfaunalAbundance*, if available. This table is linked to *tblSampleMaster* on the standard key fields (***StudyID***, ***StationID***, ***SampleID***). This table stores each infaunal species (***SpeciesName***) along with the count (abundance) of that species for each sample.

The full species name is stored in this table, but is linked to Look up List 10 (*luList10_Infaunal_SpeciesList*). Look up List 10 contains the standard spelling and usage of each species, as well as other categories such as phylum, class, order, and family. The source of the standardization is stored in the ***Source*** field.

Proper datasets should have standardized species names as provided in Look up List 10. In addition to abundance, it is critical to provide information on the screen size used to process the samples. Complementary metadata information should be provided following the requirements presented on section five.

The information location column of Table 6-4 identifies the different tables where this information will be stored (main tables), or where the conventions and standardized format of a particular type of information are located (look up lists).

Table 6-4. Infaunal Abundance data necessary to integrate new data into the CA SQO Database.

Required Fields	Information Location
Study ID	All main tables
Station ID	All main tables
Sample ID	All main tables
Species Name	Infaunal abundance table and luList10
Screen Size	Infaunal abundance table
Rep	Infaunal abundance table
Abundance	Infaunal abundance table
Qualifier	Infaunal abundance table
Additional Fields	
Area Sampled	Infaunal abundance table
Taxa Standard	Infaunal abundance table
Agency	Infaunal abundance table and LuList01
Comments	Infaunal abundance table
Metadata	Metadata Database

Section 7
Glossary and Acronyms

7.1 Glossary

7.2.1 Database Definition and Terms

Database - A database is a collection of pieces of electronic information (known as *data*) that have been organized into categories (known as *fields*) and grouped into units (known as *records and tables*). Databases are created so that information can be stored efficiently and quickly retrieved. Some examples of databases are a library catalog or motor vehicle records. The CA SQO database is discussed in this document.

Key Field/Primary Key – A well-designed table will have unique records for each record. The record will be unique for each primary key; for example, *tblStudy* will have only one record for each unique Study, as enforced by the primary key ***StudyID***. The CA SQO database has what is called a Multiple Primary Key, which uses the combination of several fields to define uniqueness.

Objects - Databases have objects (tables and queries) that can be thought of as discrete units that are contained within the database. Tables are the basic unit of data storage in a database.

Query – A query is a statement that is used to extract data from a database. Also, within Access, it is an object that is used to store query statements. It can also be used as a verb (to query the database).

Relationships – A relationship defines how two or more tables are related through key fields. Common types of relationships between two tables include one-to-one (each record in one table is related to one record in the other), or one-to-many. An enforced relationship means that a record cannot be added to one table without a matching record (on related key fields) in the related table.

Table – Object within the database application used to store information.

7.2.2 Selected Environmental Data Terminology

Composite – A sample for analysis that has been created from the combination of multiple field samples. Composite sediment samples are often created to represent a large sample area or stratum (e.g., combining the same depth interval from multiple core samples). Composite tissue samples, composed of multiple individual organisms, are also used to provide adequate tissue mass for chemical analysis or to represent a population.

Detection Limit or Method Detection Limit - The lowest concentration of a particular analyte that is detectable by the analytical instrument.

Elutriate – The fraction of sediment contaminants that are easily released into water. The standard elutriate test is used to predict the release of contaminants to the water column resulting from open-water dredged material disposal.

Metadata - Documentation about spatial datasets that is federally mandated. Provides important information about the quality and content of a spatial data set.

Negative Control Sample - A test sample expected to produce optimum results in a toxicity test. The negative control results are used to assess the health and acceptability of the toxicity test and are also used in statistical comparisons. Negative controls are specific to each test method, and may consist of uncontaminated sediment from the test organism collection site or laboratory dilution water.

Reference Sample - A sediment sample collected from an area that has environmental characteristics similar to the samples collected for a study.

Refusal - When a core does not reach full penetration due to interference with a geologically hard layer (e.g., sand, rock).

Reporting Limit - The adjusted method detection limit reflecting dilutions made to sample prior to analysis or elevated limit due to matrix interference.

Tiers - A term used in dredged material characterization studies to describe a hierarchy of investigation intensity. Tier I includes sediment chemistry analyses and a review of other information. Tiers II and III include toxicity testing. Tier IV includes bioaccumulation analyses.

7.2 Acronyms

BPTCP – Bay Protection and Toxic Cleanup Program
CA SQO – California Sediment Quality Objectives
CSTF – Contaminated Sediments Task Force
EMAP – Environmental Monitoring and Assessment Program
EPA – Environmental Protection Agency
FGDC – Federal Geographic Data Committee
GIS – Geographic Information System
HUC – Hydrologic Unit Code
MDL – Method Detection Limit
NSI – National Sediment Inventory
POLA – Port of Los Angeles
POLB – Port of Long Beach
RL – Reporting Limit
RMP – Regional Monitoring Program (SFEI)

SCCWRP – Southern California Coastal Water Research Project
SFEI – San Francisco Estuary Institute
SQO – Sediment Quality Objective
SQL – Structured Query Language
USACE – United States Army Corps of Engineers
VBA – Visual Basic for Applications

Appendix A

List of Studies in the California Sediment Quality Objectives Database

Total count of samples excludes negative control samples

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
ACOE_LAHarb	ACOE LA Harbor and Estuary Sed Test	Army Corps of Engineers	18	10/12/94	10/19/94
ACOE_LARiv95	ACOE LA River Est Sed Tests	Army Corps of Engineers	20	02/13/95	02/23/95
ACOE_LARiv98	ACOE LA River Estuary Sed Testing	Army Corps of Engineers	9	07/13/98	07/27/98
ACOE_MDR98a	ACOE Marina del Rey Sed Tests	Army Corps of Engineers	28	12/11/97	12/13/97
ACOE_MDR98b	ACOE Marina del Rey Chem Tests	Army Corps of Engineers	6	03/01/98	03/02/98
ACOE_MDR99	ACOE 1999 Marina del Rey Chem Tests	Army Corps of Engineers	30	02/02/99	02/03/99
ACOE_Port	ACOE Portwide Prelim Testing	Army Corps of Engineers	64	04/30/93	05/07/93
ANAS_SEAPL	Alameda Naval Air Station - Seaplane Lagoon	EPA Region Nine	219	03/08/94	11/14/02
ARQUES	Arques Shipyard and Marina Dredging Sausalito 1999	Arques Shipyard and Marina	4	09/02/98	10/14/98
BAL_III_93	John F. Baldwin Ship Channel, Phase III, 1993	Army Corps of Engineers	50	01/01/92	05/05/92
BAYBRIDGE	SFOBB East Span Project	California Department of Transportation (CalTrans)	18	05/19/99	07/29/99
BENI_01	Benicia Marina 2001	City of Benecia	6	11/16/00	11/16/00
BENI_96	Benicia Marina 1996	City of Benecia	5	04/22/96	04/22/96
BENI_97	Benicia Marina 1997	City of Benecia	5	08/20/97	08/20/97
BPTCP	Bay Protection and Toxic Cleanup Program	Bay Protection and Toxic Cleanup Program	1156	07/29/92	12/03/97
CISNET	CISNET San Pablo Bay Stress Indicators	San Francisco Estuary Institute	110	09/14/99	03/08/01
CLIPPER	Clipper Yacht Harbor 2002	Western Dock Enterprises	7	03/07/02	03/13/02
COYOTE	Coyote Point Marina, San Mateo	County of San Mateo, CA	4	04/10/02	04/10/02
EMRY_MAR_00	Emery Cove Marina Dredging 2000	Emery Cove Marina	7	07/10/00	07/29/00
FERRY_LARK2	Larkspur Landing Ferry Terminal Berthing Basin 200	Golden Gate Bridge Highway and Transportation District	6	04/27/00	05/03/00
FERRY_VAL	Vallejo Ferry Terminal 2003	City of Vallejo	7	04/09/03	04/09/03

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
HUMB_93	Humboldt Bay Baseline Survey FY 1993	Army Corps of Engineers	5	10/30/92	11/02/92
HUMB_94	Humboldt Bay Baseline Survey II FY 1994	Army Corps of Engineers	7	03/31/94	04/05/94
HUMB_95	Humboldt Bay Baseline Survey III FY 1995	Army Corps of Engineers	8	03/30/95	04/04/95
HUMB_EUR	Humboldt Eureka Expansion Channel	Army Corps of Engineers	5	03/07/99	03/09/99
HUNT	Huntington Harbor and Anaheim Bay	Regional Water Quality Control Board - Santa Ana	120	08/07/01	04/14/03
HUNT_PT	Hunters Point EPA Parcel F, 2001	EPA Region Nine	137	05/02/01	05/24/01
KAPPAS	Kappas Marina Dredging Sausalito 1997	Kappas Marina	4	08/12/97	08/21/97
LBNAVY	Long Beach Naval Station Feasibility Study 1998	Long Beach Naval Station	122	09/28/98	10/05/98
LEMP	Local Effects Monitoring Program (BADA)	San Francisco Estuary Institute	62	09/01/94	08/01/97
LOCHLOM	Loch Lomond Marina San Rafael 2001	Advanced Biological Testing, Inc. (ABT)	9	02/12/01	02/14/01
MARTINEZ	Martinez Marina Dredging 2000	Blue Water Design Group	4	11/10/00	11/10/00
MDR_91	Marine Environment of Marina del Rey 1990-91	Los Angeles County Department of Beaches and Harbors	30	10/18/90	05/16/91
MDR_92	Marine Environment of Marina del Rey 1991-92	Los Angeles County Department of Beaches and Harbors	15	10/17/91	10/17/91
MDR_93	Marine Environment of Marina del Rey 1992-93	Los Angeles County Department of Beaches and Harbors	15	10/21/92	10/21/92
MDR_94	Marine Environment of Marina del Rey 1993-94	Los Angeles County Department of Beaches and Harbors	15	04/21/94	04/21/94
MDR_95	Marine Environment of Marina del Rey 1995-96	Los Angeles County Department of Beaches and Harbors	15	10/26/95	10/26/95
MDR_96	Marine Environment of Marina del Rey 1996-97	Los Angeles County Department of Beaches and Harbors	15	10/16/96	10/16/96
MDR_97	Marine Environment of Marina del Rey 1997-98	Los Angeles County Department of Beaches and Harbors	15	10/14/97	10/14/97

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
MDR_98	Marine Environment of Marina del Rey 1998-99	Los Angeles County Department of Beaches and Harbors	15	09/03/98	09/03/98
MDR_99	Marine Environment of Marina del Rey 1999-2000	Los Angeles County Department of Beaches and Harbors	15	10/13/99	10/13/99
MOSS_02	Moss Landing Harbor Dredging 2002	Army Corps of Engineers	19	05/01/02	09/01/02
NASSCO	NASSCO/Southwest Marine Detailed Sed Invest	National Steel and Shipbuilding Company/SW Marine	413	08/01/01	11/08/02
NEWP_TOX	Newport Bay Sediment Toxicity	SCCWRP	30	09/19/00	05/07/01
NOAA_01	NOAA San Francisco Bay 2001	National Oceanographic and Atmospheric Administration	100	08/06/01	09/01/01
NOAA_NST	NSI/NOAA NS&T Benthic Surveillance 1984	National Oceanographic and Atmospheric Administration	18	UNK	UNK
OAK_38III	Oakland Harbor 38-Foot Phase III 1990	Army Corps of Engineers	47	09/17/90	09/29/90
OAK_42IIIA_92	Oakland Harbor 42 Foot Phase IIIA 1990	Army Corps of Engineers	58	06/01/90	09/01/90
OAK_42IIIB	Oakland Harbor 42 Foot Phase IIIB 1990	Army Corps of Engineers	32	11/06/90	11/11/90
OC9097	NSI/Orange County 1990-97 Sediment Data	Orange County Sanitation District	393	01/17/90	08/04/97
ODES_EN	NSI/ODES Encina 301(h) Sediment Data	National Sediment Inventory, EPA	16	UNK	UNK
ODES_GO	NSI/ODES Goleta 301(h) Sediment Data	National Sediment Inventory, EPA	124	04/04/90	01/04/92
ODES_MB	NSI/ODES Morrow Bay 301(h) Sediment Data	National Sediment Inventory, EPA	30	05/04/90	09/04/92
ODES_OC	NSI/ODES Orange County 301(h) Sediment Data	Orange County Sanitation District	274	UNK	UNK
OYSTPT	Oyster Point Marina 1998	Oyster Point Marina	6	01/16/98	01/18/98
PINOLE	Pinole Shoals Navigation Channel 2003	Army Corps of Engineers	7	05/19/03	05/21/03

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
PITT_POWER	Pittsburg Power Plant Intake Channel Dredging 2000	Southern Energy Company	5	09/28/00	09/28/00
POAK_50FT	Port of Oakland 50 Ft Harbor Deepening	Port of Oakland	69	08/01/97	04/10/98
POAK_B2630	Port of Oakland Berths 26, 30, and Outer Harbor	Port of Oakland	5	03/14/94	04/01/94
POLA_B100	POLA Berth 100 Final Report	Port of Los Angeles	2	04/27/01	04/30/01
POLA_B10709	POLA Berths 107-109 Chem/Elut Tests	Port of Los Angeles	21	05/28/93	05/29/93
POLA_B11820	POLA Berths 118-120 Eval	Port of Los Angeles	5	04/14/97	04/14/97
POLA_B12124	POLA Berth 121, 122-124 Final Rprt 2/2	Port of Los Angeles	6	12/19/00	12/21/00
POLA_B12126	POLA Berths 121-126 Final Rprt 1/2	Port of Los Angeles	15	02/26/97	03/01/97
POLA_B12731	POLA Berths 127-131 Final Report	Port of Los Angeles	5	05/06/95	05/10/95
POLA_B142	POLA Berth 142 Sed Test 2/2	Port of Los Angeles	4	06/30/92	06/30/92
POLA_B14244	POLA Berths 143-144 Sed Test 1/2	Port of Los Angeles	6	06/30/92	07/05/92
POLA_B144	POLA Berth 144 Final Report 1/2	Port of Los Angeles	21	04/01/96	06/01/96
POLA_B147	POLA Berth 147 Final Report 2/2	Port of Los Angeles	28	04/26/96	05/01/96
POLA_B14851	POLA Berths 148-151 Sed Test	Port of Los Angeles	7	05/21/99	05/21/99
POLA_B16364	POLA Berths 163-164 Sed Tests	Port of Los Angeles	15	05/21/96	05/22/96
POLA_B16769_00	POLA Berths 167-169 Sed Tests	Port of Los Angeles	7	06/25/99	06/25/99
POLA_B16769_92	POLA Berths 167-169 Tech Eval	Port of Los Angeles	3	11/27/91	11/27/91
POLA_B17173	POLA Berths 171-173 Sed Tests	Port of Los Angeles	26	07/17/96	07/19/96
POLA_B17476	POLA Berths 174-176 Sed Tests	Port of Los Angeles	4	08/04/93	08/06/93
POLA_B18790	POLA Berths 187-190 Final Report	Port of Los Angeles	5	05/06/95	05/11/95
POLA_B191	POLA Berth 191 Final Report 2/2	Port of Los Angeles	10	02/28/97	02/28/97
POLA_B21215	POLA Berths 212-215 Sed Tests	Port of Los Angeles	9	05/21/99	05/21/99

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
POLA_B21621	POLA Berths 216-221 Sed Tests	Port of Los Angeles	16	05/22/96	05/23/96
POLA_B23336	POLA Berths 233-236 Sed Tests	Port of Los Angeles	16	05/23/96	05/24/96
POLA_B23739	POLA Berths 237-239 Sed Tests	Port of Los Angeles	11	05/20/96	05/20/96
POLA_B240B	POLA Berth 240B Final Report	Port of Los Angeles	5	12/20/02	12/20/02
POLA_B25859	POLA Berths 258-259 Final Report	Port of Los Angeles	3	05/06/95	05/12/95
POLA_B26162	POLA Berths 261-262 Sed Tests	Port of Los Angeles	5	07/15/98	08/29/98
POLA_B26364	POLA Berths 263-264 Sed Tests	Port of Los Angeles	9	05/21/99	05/21/99
POLA_B35	POLA Berth 35 Final Report	Port of Los Angeles	3	05/06/95	05/06/95
POLA_B36	POLA Berth 36 Final Report	Port of Los Angeles	2	10/04/01	10/04/01
POLA_B400	POLA Pier 400 Final Rprt Chem Tests	Port of Los Angeles	5	09/18/96	09/18/96
POLA_B4044_95	POLA Berths 40-44 Sedchem	Port of Los Angeles	7	05/06/95	05/12/95
POLA_B4044_98	POLA West Ch B40-44 Sed Testing	Port of Los Angeles	23	08/13/98	08/14/98
POLA_B4547	POLA Berths 45-47 Final Report	Port of Los Angeles	6	05/06/95	05/09/95
POLA_B5	POLA Slip 5 Sed Tests	Port of Los Angeles	10	07/01/98	07/01/98
POLA_B5155	POLA Berth 51-55 Final Report	Port of Los Angeles	2	05/24/96	05/24/96
POLA_B5758	POLA Berths 57-58 Sed Tests	Port of Los Angeles	7	03/22/94	03/22/94
POLA_B71	POLA Berth 71 Maintenance Dredging	Port of Los Angeles	8	09/28/98	09/28/98
POLA_B97102	POLA Berths 97-102 Sed Testing	Port of Los Angeles	14	05/18/95	05/21/95
POLA_Bmulti	POLA Berths145,146,121-122 TechEval	Port of Los Angeles	21	08/31/93	09/01/93
POLA_CHAN	POLA Main Channel Sed Eval	Port of Los Angeles	76	04/01/97	04/20/97
POLA_CONSOL	POLA Consolidated Slip Channel	Port of Los Angeles	3	05/12/97	05/13/97
POLA_PIPE	POLA DWP Reclaimed Water Pipeline Crossing	Port of Los Angeles	7	04/09/97	04/25/97
POLB_B8894	POLB Berths 88-94, 11/94	Port of Long Beach	8	10/31/94	11/01/94
POLB_BJ24547	POLB Berths J245-247	Port of Long Beach	7	03/06/97	03/06/97

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
POLB_BJ26670	POLB Berths J266-270	Port of Long Beach	15	07/29/97	07/29/97
POLB_Bmulti	POLB Contract HD5951	Port of Long Beach	15	02/18/98	02/18/98
POLB_CHAN2	POLB Channel 2 Sed Testing	Port of Long Beach	111	03/01/98	11/01/98
POLB_PJ	POLB Pier J, East Channel Dredge	Port of Long Beach	6	11/21/91	11/19/01
POLB_PS	POLB Pier S Dredging, Final Report	Port of Long Beach	9	09/20/99	09/20/99
POLB_WEST12367	POLB West Basin SA I, II, III, VI, VII	Port of Long Beach	59	03/11/96	03/15/96
POLB_WEST45	POLB West Basin SA IV and V	Port of Long Beach	15	04/03/96	04/04/96
POLB_WEST696	POLB West Basin, 6/96 Sed Testing	Port of Long Beach	54	06/22/96	06/23/96
POLB_WEST896	POLB West Basin, 8/96 Sed Testing	Port of Long Beach	38	08/03/96	08/03/96
POLB_WEST98	POLB West Basin, 8/98 Sed Testing	Port of Long Beach	20	08/27/98	08/28/98
PRCH_T1	Port of Richmond Terminal 1 Retest	Port of Richmond	9	02/07/94	02/08/94
PRCH_T1T4	Richmond Harbor Terminals 1 and 4	Port of Richmond	3	12/16/92	01/11/93
PSF_P35E_03	Port of San Francisco Berth 35 E 2003	Port of San Francisco	6	01/28/03	01/30/03
PSF_P35W_02	Port of San Francisco Pier 35 West 2002	Port of San Francisco	4	08/28/02	09/04/02
PV85	Sediments from Palos Verdes and Santa Monica Bay	EPA Region Ten	8	05/13/80	05/13/80
PV86	Ecological changes in the Southern CA Bight	SCCWRP	7	06/27/83	06/27/83
PV88	Characteristics and Effects of Contaminated Seds	SCCWRP	13	09/19/87	11/03/87
PV91BEN	Temporal Change in the Benthos: EPA Outfall Study	EPA Region Ten	9	06/01/86	06/01/86
PV91CORE	Vertical Profiles, PV Shelf and Santa Monica Bay	EPA Region Ten	32	03/15/85	03/15/85
PV94	Investigation of Toxicity in Palos Verdes Sediment	SCCWRP	15	06/24/92	06/24/92

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
RH_92	Richmond Harbor USACE Dredging October 1992	Army Corps of Engineers	57	06/01/91	06/20/91
RH_CERCLA_EPA	United Heckathorn Superfund Site, Richmond Harbor	EPA Pacific Coast Ecosystems Branch, Newport OR	199	10/01/91	02/07/92
RH_CERCLA_UCD	Richmond Harbor Ecotox Changes after Remediation	University of California, Davis	16	07/23/96	03/01/98
RH_LR_93	Ecological Investigation of Richmond Harbor 1993	Army Corps of Engineers	14	12/01/92	12/14/92
RH_TURN	Richmond Harbor Deepening Project/Turning Basin	Army Corps of Engineers	64	01/24/94	10/19/94
RHINE	Rhine Channel Chemistry and Toxicity	SCCWRP	15	05/14/02	05/14/02
RMCLONESTAR	RMC Lonestar Redwood City 1999	RMC Lonestar Cement Terminals Operations	4	08/18/99	08/19/99
RMP	Regional Monitoring Program	San Francisco Estuary Institute	1196	02/18/93	09/01/03
RWQCB_00	NSI/California RWQCB Surface Water Study	Regional Water Quality Control Board - Los Angeles	27	10/26/92	08/20/96
SANPAB	Point San Pablo Yacht Harbor 2002	Point San Pablo Yacht Harbor	6	10/24/02	10/24/02
SCC_B03	Bight 2003 Regional Marine Monitoring Survey	SCCWRP	397	08/20/99	10/16/03
SCC_B94	Southern California Bight Pilot Project 1994	SCCWRP	252	07/13/94	08/22/94
SCC_B98	Bight 1998 Regional Marine Monitoring Survey	SCCWRP	688	07/13/98	09/21/98
SD_CHOLPAL	Chollas and Paleta Creek TMDL San Diego	SCCWRP	61	07/17/01	10/09/02
SD_SWBRAN	San Diego Bay B Street/Broadway/Anchorage/Switzer	Regional Water Quality Control Board - San Diego	52	02/01/03	07/01/03
SFO	SF Airport Sediment Characterization	CA State Water Resources Control Board	67	06/26/00	09/06/00
SFPUC_ISLA	Islais Creek SFPUC Sed Investigation 98-00	City and County of San Francisco Public Utilities Commission	71	10/20/98	06/02/00
SFPUC_MISS	Mission Creek SFPUC Sed Investigation, 98-00	City and County of San Francisco Public Utilities Commission	73	10/20/98	06/02/00

StudyID	Study Name	Agency	Total Number of Samples	Start Date	End Date
SFPUC_YOSE	Yosemite Creek SFPUC Sed Investigation 98-00	City and County of San Francisco Public Utilities Commission	69	10/20/98	06/02/00
SUIS_BULLHD	Bulls Head Channel Dredging (Suisun Bay)	Army Corps of Engineers	55	01/21/94	01/24/94
SUIS_LAUNCH	Suisun City Launch Ramp 1999	City of Suisun	3	10/08/99	10/08/99
UNOCAL_96	UNOCAL Corporation Loading Terminal, Rodeo, 1996	UNOCAL Corporation	7	09/11/96	09/11/96
URS	URS Evaluation of US Steel Sediments	CA State Water Resources Control Board	151	10/13/99	10/20/99
USCG_BAKER	USCG Baker East Facility 1999	US Coast Guard	3	07/19/99	07/20/99
USCG_YERBA	USCG Yerba Buena Island 1999	US Coast Guard	5	07/19/99	07/20/99
USGS_CLAM	USGS Trace Metals in Sediment and Clams Palo Alto	United States Geological Survey	484	01/01/77	12/01/03
USGS9098	NSI/USGS 1990-1998 Sediment Data	United States Geological Survey	34	07/30/90	11/24/98
VISTA	Marina Vista Homeowners Assoc San Rafael 1998	Marina Vista	3	09/02/98	09/17/98
WEMAP00	EMAP Western Pilot/NOAA 2000 San Francisco Bay	EPA Region Nine	144	03/16/00	08/17/00
WEMAP99	EMAP Western Pilot 1999 Small Estuaries	EPA Region Nine	146	07/19/99	09/21/99

Appendix B

Extracting Data from the Database

Overview

There are ten queries that have been set up to answer some basic questions, and to help the user develop their own queries. These queries are available from the Form Objects section of the database. The Objects are shown in the figure below, and appear on the left of the main Access database screen.

NOTE

Although this guide provides some instructions for using the inherent functions of MS Access, it is assumed that the user has some experience opening a query, adding tables, adding fields, and running a query. No linking of tables should be necessary; if the tables do not automatically create a link between tables, then most likely you are missing a table that provides all of the correct linkages.

When you double-click on the frmQueries form, you will have the option of ten queries (Figure B-1). Select a query, and then click on 'View Query.' ***These queries should not be edited directly!*** There is a copy of each query for the User, and can be edited as shown in the examples below.

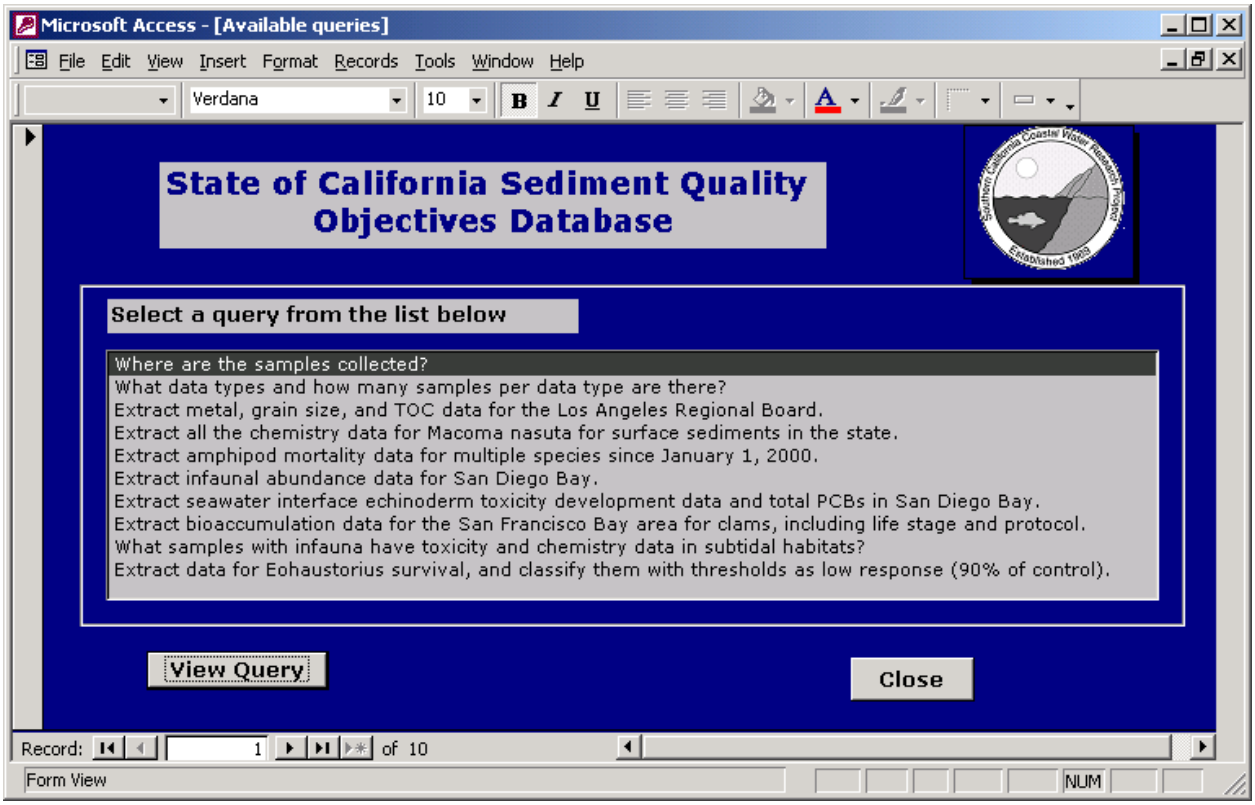


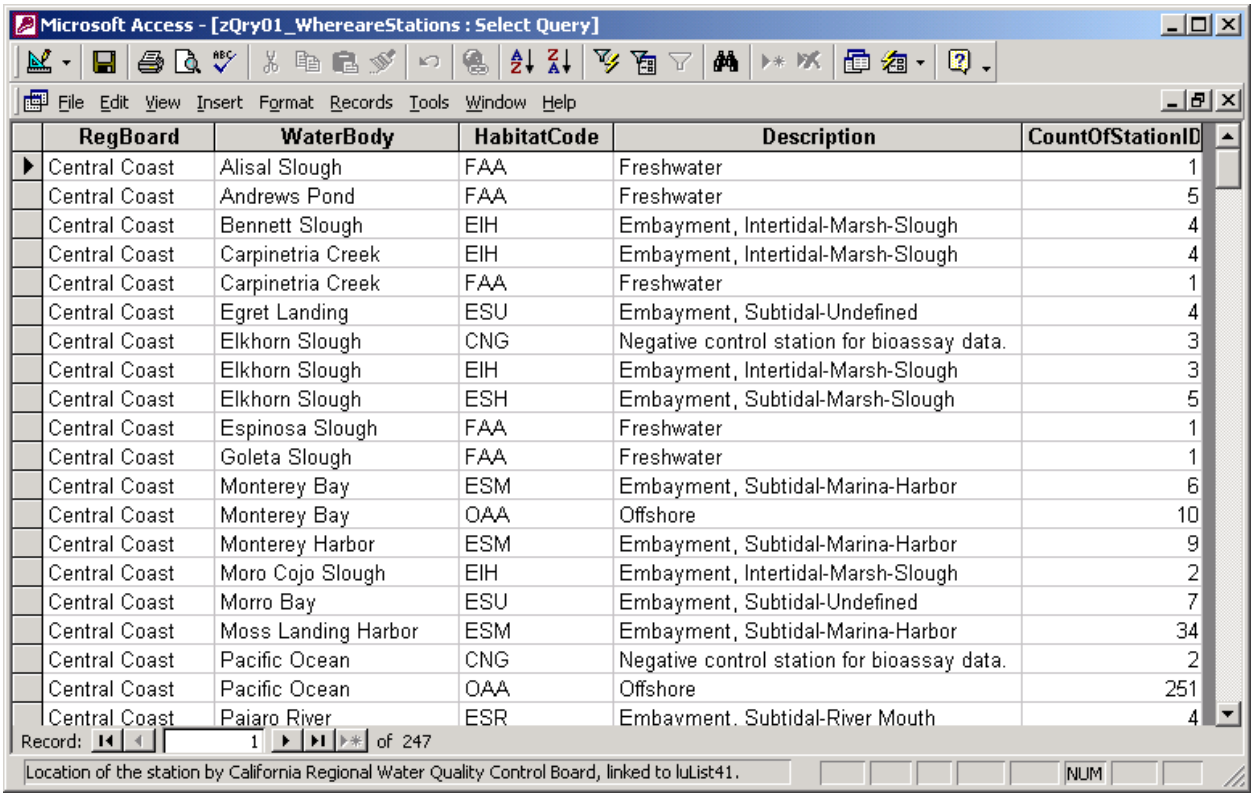
Figure B-1. Query form containing ten available pre-defined queries.

To Create or Edit Your Own Query

In order to edit any query for your own purposes, it is important that ***you do NOT open the query in Design View from the query form***. There are copies of all of the queries that are run by the Query Form that you can edit and save using your own descriptive name. The queries that are available for editing all start with "***UserQry***" as shown below. The queries that are run when you run a query from the form all start with "***zQry***." If you edit and/or change the name of the zQry queries, then the Query Form will not work correctly.

Query 1. Where are the samples collected?

This query shows a summary of the stations, and where the stations are located. When you select 'View Query' you will end up with the records as shown in Figure B-2.



RegBoard	WaterBody	HabitatCode	Description	CountOfStationID
Central Coast	Alisal Slough	FAA	Freshwater	1
Central Coast	Andrews Pond	FAA	Freshwater	5
Central Coast	Bennett Slough	EIH	Embayment, Intertidal-Marsh-Slough	4
Central Coast	Carpinetria Creek	EIH	Embayment, Intertidal-Marsh-Slough	4
Central Coast	Carpinetria Creek	FAA	Freshwater	1
Central Coast	Egret Landing	ESU	Embayment, Subtidal-Undefined	4
Central Coast	Elkhorn Slough	CNG	Negative control station for bioassay data.	3
Central Coast	Elkhorn Slough	EIH	Embayment, Intertidal-Marsh-Slough	3
Central Coast	Elkhorn Slough	ESH	Embayment, Subtidal-Marsh-Slough	5
Central Coast	Espinosa Slough	FAA	Freshwater	1
Central Coast	Goleta Slough	FAA	Freshwater	1
Central Coast	Monterey Bay	ESM	Embayment, Subtidal-Marina-Harbor	6
Central Coast	Monterey Bay	OAA	Offshore	10
Central Coast	Monterey Harbor	ESM	Embayment, Subtidal-Marina-Harbor	9
Central Coast	Moro Cojo Slough	EIH	Embayment, Intertidal-Marsh-Slough	2
Central Coast	Morro Bay	ESU	Embayment, Subtidal-Undefined	7
Central Coast	Moss Landing Harbor	ESM	Embayment, Subtidal-Marina-Harbor	34
Central Coast	Pacific Ocean	CNG	Negative control station for bioassay data.	2
Central Coast	Pacific Ocean	OAA	Offshore	251
Central Coast	Pajaro River	ESR	Embayment, Subtidal-River Mouth	4

Figure B-2. Results for the query "Where are the samples collected?"

This table shows the count of stations grouped by Regional Board, Water Body, and Habitat. Each station has a habitat code, the description of which is included in the 'Description' field of this query.

If you want to edit this query, close the query and the form, then select "***UserQry01_WhereareStations***" from the Query objects window (Figure B-3a). Open the query in Design Mode, by clicking the ***blue triangle***  at the upper left of the Access screen. When you click on this button for the query "***UserQry01_WhereareStations***," you will see the screen as shown in Figure B-3b. Notice that there are only two tables

required for this query. This is called a Totals query, which is generated by clicking on the Greek Summary button (Σ). This button allows you to pick fields to group by, and then perform basic mathematical functions (count, sum, average, etc.). In this first query, the stations in the station table are grouped by Regional Board, then Water Body, then Habitat Code. The description of the habitat code is provided, and the stations are counted.

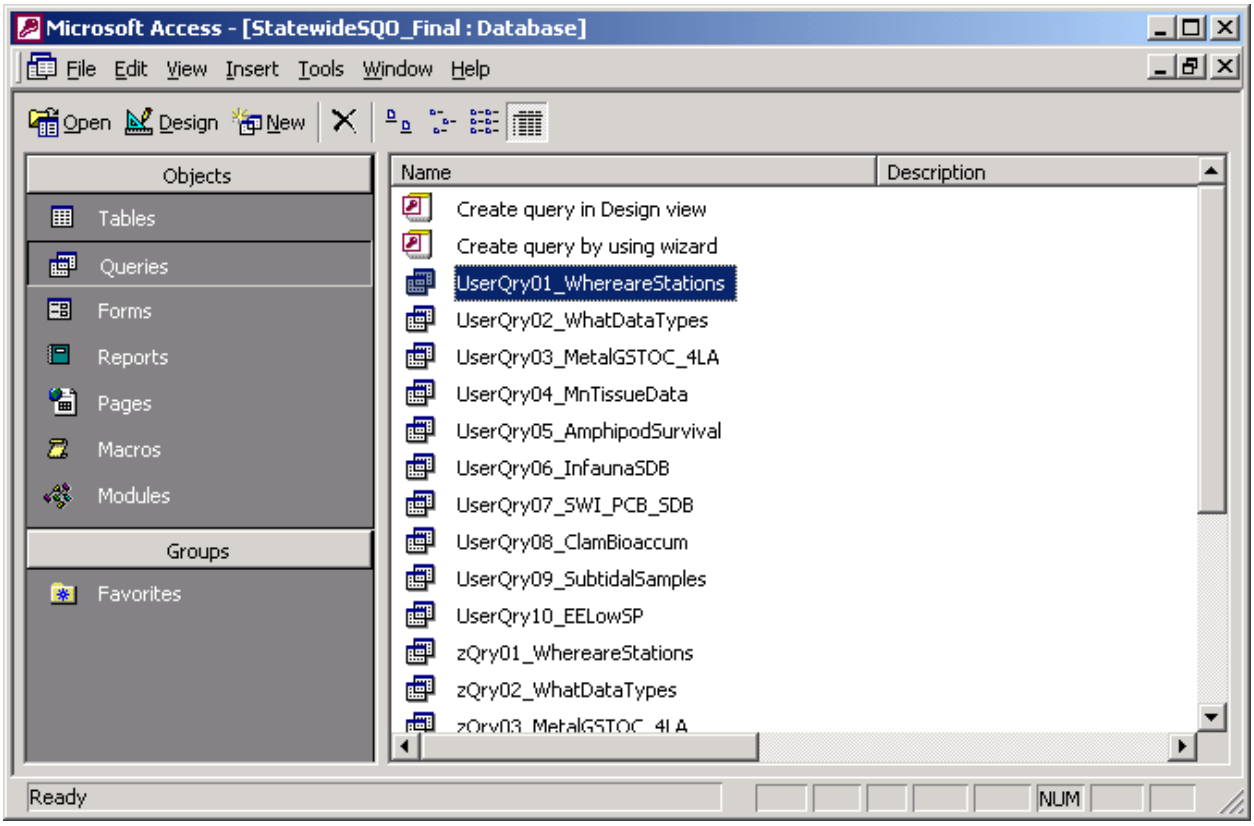


Figure B-3a. Location of User Query 01, used to answer the question "Where are the samples collected?"

In Figure B-3b, the query has been modified to filter out only records from the San Francisco Bay Regional Board. This is done by using the *Criteria* section of the query screen. In each of the query descriptions, we will ask a question (?) and then answer (▲) the question by demonstrating how to edit the query.

? How would I do modify this query to count only samples from the San Francisco Bay Regional Board?

▲ In order to filter this query by one Regional Board, either you have to know exactly the term you are filtering by, or use the term "like" to be able to filter on an approximate version of what you want. In Look up list 41, the Regional Boards are spelled out, and you could type in **"San Francisco Bay"** in the Criteria line. However, you can also type in an approximate filter if you don't want to type in the whole term. In the example below (Figure B-3b), the Criteria line is filled with: **Like "*san francisco*"**

♫ NOTE ♫ MS Access **does not** recognize differences in the case of the letter.

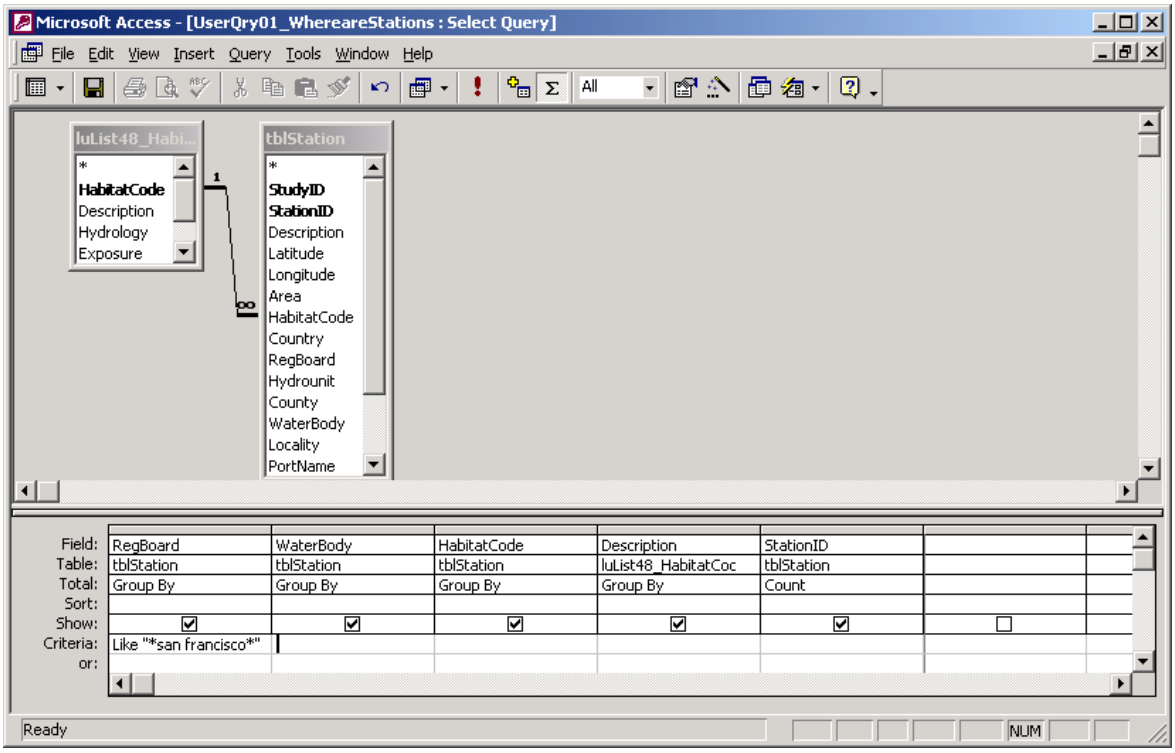
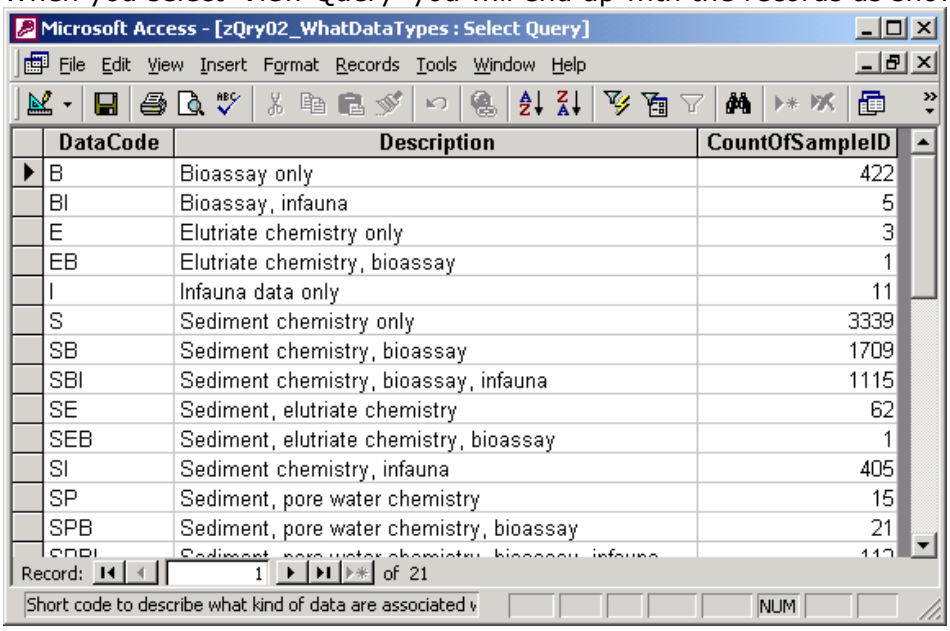


Figure B-3b. The query "Where are the samples collected?" in Design Mode, modified to include only samples from the San Francisco Bay Regional Board.

Query 2. What data types and how many samples per data type are there?

This query shows a summary of all of the samples in the database organized by data type. When you select 'View Query' you will end up with the records as shown in Figure B-4.



DataCode	Description	CountOfSampleID
B	Bioassay only	422
BI	Bioassay, infauna	5
E	Elutriate chemistry only	3
EB	Elutriate chemistry, bioassay	1
I	Infauna data only	11
S	Sediment chemistry only	3339
SB	Sediment chemistry, bioassay	1709
SBI	Sediment chemistry, bioassay, infauna	1115
SE	Sediment, elutriate chemistry	62
SEB	Sediment, elutriate chemistry, bioassay	1
SI	Sediment chemistry, infauna	405
SP	Sediment, pore water chemistry	15
SPB	Sediment, pore water chemistry, bioassay	21

Figure B-4. Results for the query "What data types, and how many samples per data type are there?"

You can see how this query was created by opening "***UserQry02_WhatDataTypes***" in Design Mode. The field ***DataCode*** was used from *tblSampleMaster* to group the samples. This is also a totals query (as was Query 1), and requires only *tblSampleMaster* and the ***DataCode*** look up list (15). The query then counts the total number of records in the Sample Master table for each unique Data Code.

How would I do modify this query to count only samples with at least sediment chemistry, bioassay, and infauna (triad samples)?

The code letters for the triad data types are S, B, and I, respectively. In order to retrieve samples with all of these letter types, you would type in the following in the *Criteria* section of the query:

Like "*S*" And Like "*B*" And Like "*I*"

This will retrieve records with the codes SBI (1115), SPBI (112), and STBI (76).

Query 3. Extract metals, grain size, and TOC data for samples from the Los Angeles Regional Board.

This query will select all of the sediment chemistry data for all metals, plus all of the grain size data as well as TOC. A series of ancillary fields are selected in addition to the chemistry results; this example will show you how to select different fields, how to create a multi-parameter query, and further use of the term "like" in a query statement. When you select 'View Query' you will end up with the records as shown in Figure B-5.

Microsoft Access - [zQry03_MetalGSTOC_4LA : Select Query]

File Edit View Insert Format Records Tools Window Help

RegBoard	StudyID	StationID	Latitude	Longitude	SampleID	Date	ChemicalG	ChemicalNam	LabRe	Result	Ur
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Arsenic	01	6.3	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Cadmium	01	0.38	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Chromium	01	33.5	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Grain Size	Clay	01	13.86	PCT
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Copper	01	47.3	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Grain Size	Fines	01	34.1	PCT
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Grain Size	Gravel	01	2.732	PCT
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Lead	01	32.6	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Mercury	01	0.26	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Nickel	01	19.8	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Grain Size	Sand	01	63.21	PCT
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Selenium	01	0.5	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Grain Size	Silt	01	20.2	PCT
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Silver	01	0.15	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Conventiona	TOC	01	0.65	PCT
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 2	10/19/1994	Metal	Zinc	01	87.5	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 3	10/19/1994	Metal	Arsenic	01	8.5	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 3	10/19/1994	Metal	Cadmium	01	0.43	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 3	10/19/1994	Metal	Chromium	01	54.8	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 3	10/19/1994	Grain Size	Clay	01	12.64	PCT
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 3	10/19/1994	Metal	Copper	01	66.5	MG/KG
Los Angeles	ACOE_LAHarb	LA Harbor S1	33.75347	-118.2712	Area 3	10/19/1994	Grain Size	Fines	01	37.3	PCT

Record: 1

Location of the station by California Regional Water Quality Control Board, linked to luList41.

NUM

Figure B-5. Results for the query "Extract metals, grain size, and TOC data for samples from the Los Angeles Regional Board."

This query is a simple one to construct, depending on the ancillary information you want. In this example, if you view "***UserQry03_MetalsGSTOC_4LA***" in Design Mode (Figure B-6), you will see we have selected the tables *tblStation*, *tblSampleMaster*, and

tblChemistryResults in order in include the Regional Board, latitude and longitude, and sample dates for the data. If you only wanted the sample identifier and the chemistry results, you would only need one table (*tblChemistryResults*), and the query will generally run faster. In Design Mode (Figure B-6), you can see that look up List 18 (chemical name list) is also included in order to be able to extract records using the ***ChemicalGroup*** of metals.

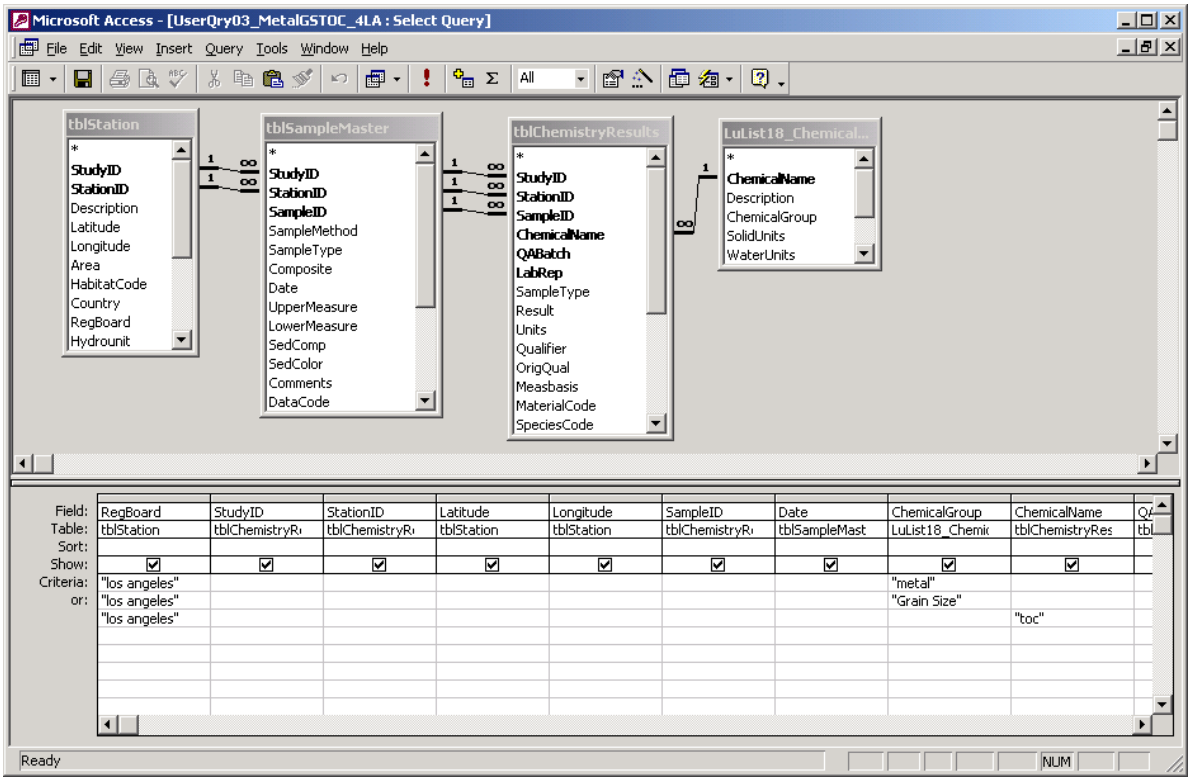


Figure B-6. The query "Extract metals, grain size, and TOC data for samples from the Los Angeles Regional Board" in Design Mode.

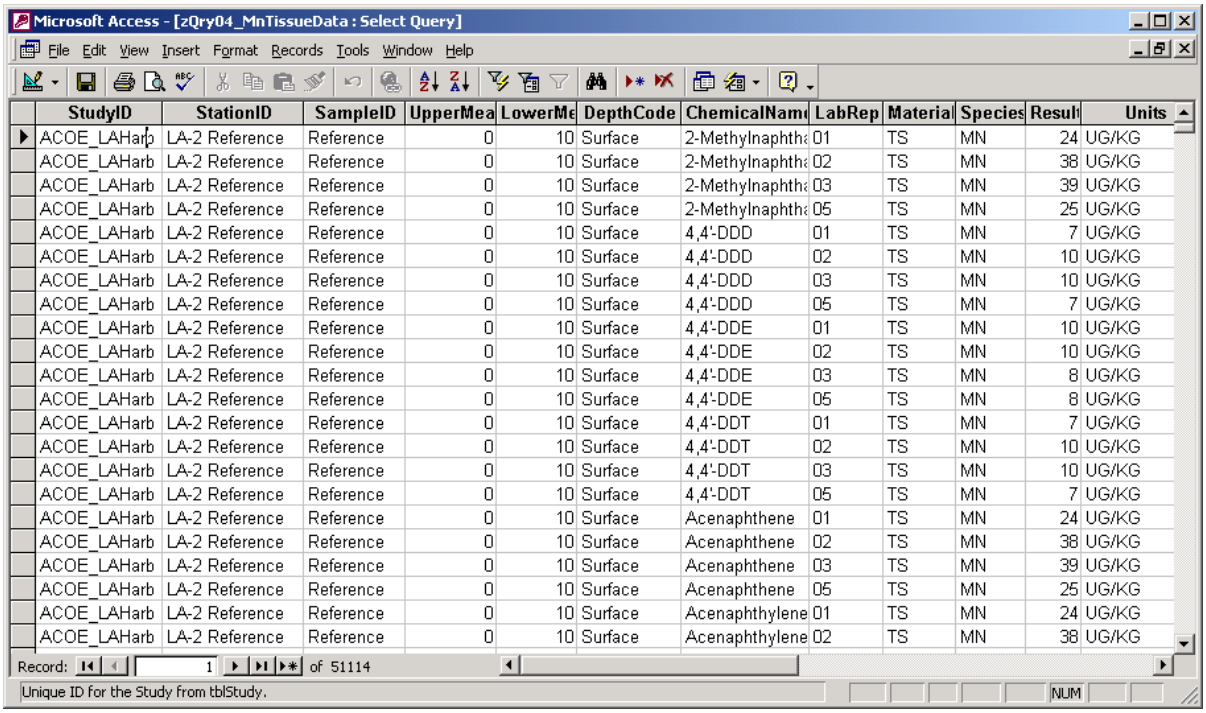
This query uses multiple row of the *Criteria* section. Each separate line acts as an "Or" query operator. The existing query retrieves every record from:
Los Angeles with a ***ChemicalGroup*** of "Metal" OR
Los Angeles with a ***ChemicalGroup*** of "Grain Size" OR
Los Angeles with a ***ChemicalName*** of "TOC."
Note that in this query, exact words were used (no "like" operator).

How would I retrieve the same data, but from either the Los Angeles OR the Santa Ana Regional Boards??

Instead of "los angeles" in the three criteria rows under the ***RegBoard*** field, you would simply replace it with: **"los angeles" or "santa ana"**

*Query 4. Extract all the chemistry tissue data for MN (**Macoma nasuta**) for surface sediments in the State.*

There are some inherent assumptions in this query that must be carefully thought out before using the data or editing the query. First, the query specifically asks for *sediment* samples, indicating that the user is requesting sediment bioaccumulation samples, and not, for example, tissue samples from clams collected in traps deployed in the water column. Second, the sediment samples need to be restricted to the surface, defined for the CA SQO as upper depth = 0 cm, and lower depth ≤30.48 cm. Also, control-type samples that are not associated with samples with a specific sediment depth should be excluded from this query. The output of this query is shown in Figure B-7; alternatives to this phrasing and consequent query design are provided below.



StudyID	StationID	SampleID	UpperMea	LowerMe	DepthCode	ChemicalNam	LabRep	Material	Species	Result	Units
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	2-Methylnaphth	01	TS	MN	24	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	2-Methylnaphth	02	TS	MN	38	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	2-Methylnaphth	03	TS	MN	39	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	2-Methylnaphth	05	TS	MN	25	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDD	01	TS	MN	7	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDD	02	TS	MN	10	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDD	03	TS	MN	10	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDD	05	TS	MN	7	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDE	01	TS	MN	10	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDE	02	TS	MN	10	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDE	03	TS	MN	8	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDE	05	TS	MN	8	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDT	01	TS	MN	7	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDT	02	TS	MN	10	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDT	03	TS	MN	10	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	4,4'-DDT	05	TS	MN	7	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	Acenaphthene	01	TS	MN	24	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	Acenaphthene	02	TS	MN	38	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	Acenaphthene	03	TS	MN	39	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	Acenaphthene	05	TS	MN	25	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	Acenaphthylene	01	TS	MN	24	UG/KG
ACOE_LAHarb	LA-2 Reference	Reference	0	10	Surface	Acenaphthylene	02	TS	MN	38	UG/KG

Figure B-7. Results for the query "Extract all the chemistry tissue data for MN for surface sediments in the State."

This query uses the field ***DepthCode*** in *tblSampleMaster* to restrict the samples to surface sediment samples. This field is more reliable than using the ***UpperMeasure*** and ***LowerMeasure*** fields (upper and lower sediment depth in cm), because for some samples, the exact depth was not known, but it was known if it was a surface or subsurface sample. The options for ***DepthCode*** are "Surface", "Subsurface", "CNEG" for negative control samples, or "NA" for samples not associated with sediment. If, however, the user wants to use a different definition for surface (e.g., <10 cm), then the ***UpperMeasure*** and ***LowerMeasure*** fields would have to be used for filtering the data.

Viewing this query, "***UserQry04_MnTissueData***," in Design Mode (Figure B-8) shows that this query required only *tblSampleMaster* and *tblChemistryResults*. The species can be filtered on the ***SpeciesCode*** field in the chemistry table. Entering '"TS" in the ***MaterialCode*** field indicates tissue chemistry only.

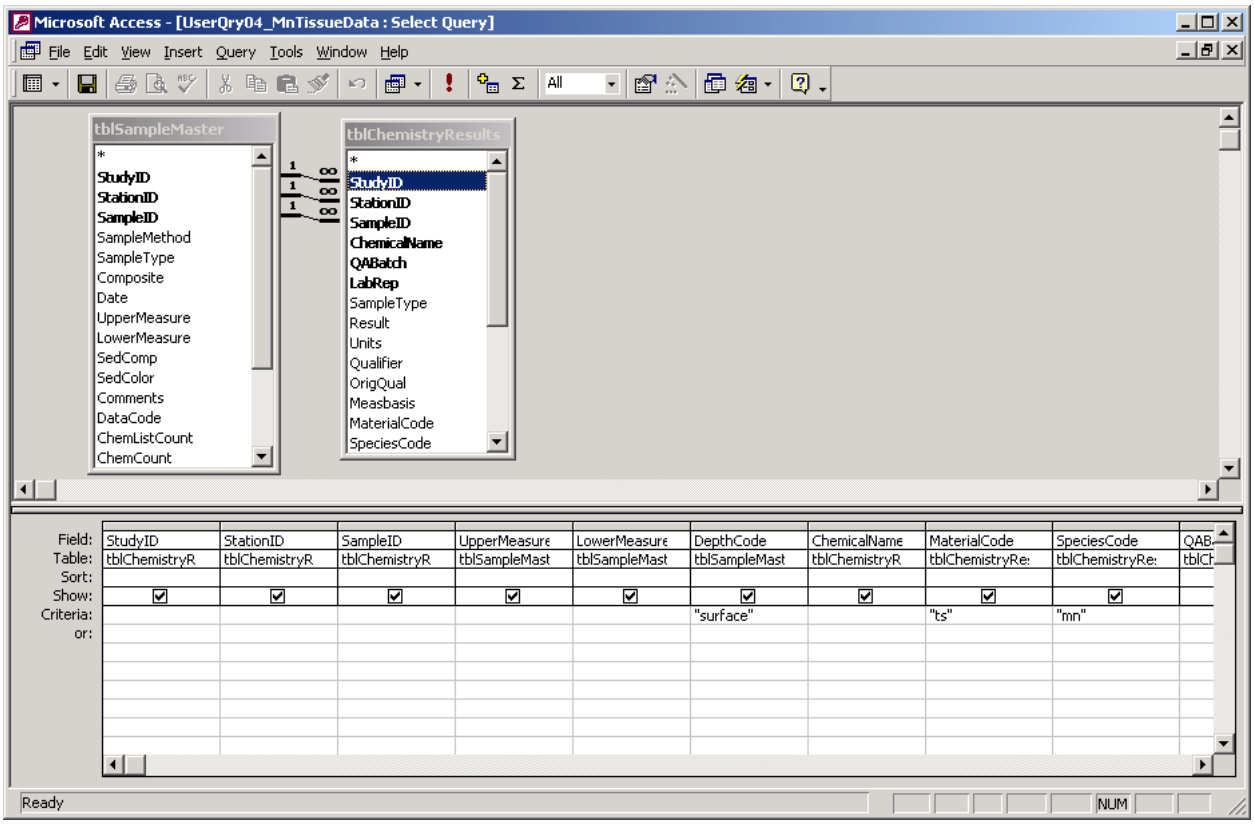


Figure B-8. The query "Extract all the chemistry tissue data for MN for surface sediments in the State" in Design Mode.

What would I do if I wanted to see the species name or other species-related information in the output?

Add the species look up list (20) to the query, and the select the additional fields you want to show up to the field list.

What would I do if I wanted to see all tissue chemistry related data for *Macoma nasuta*, regardless of whether it was associated with a sediment sample?

Remove the "Surface" modifier from the *Criteria* row. For additional information, you could add *tblBioaccumulationOrganism*, and add the ***TestType*** field. This will tell you whether the sample is a laboratory bioaccumulation sample (***TestType*** = "ACC"), a field-collected resident shellfish sample (TestType = "TIS_IN"), or a field-deployed or transplanted sample (***TestType*** = "FLD").

Query 5. Extract amphipod mortality data for multiple species since January 1, 2000.

This simple query is asking for toxicity data for the ***SpeciesGroup*** = "Amphipod" (all species), with a test endpoint (***EPCode***) of "SP" (survival, from look up list 23), in samples collected on or after 1/1/2000. It does not specify whether the user wants replicate data or summary (mean) data; for demonstration purposes, we will assume summary data in order to be able to select statistical significance options. When you open the user query "***UserQry05_AmphipodSurvival***" in Design Mode, you will see how this query was constructed (Figure B-9).

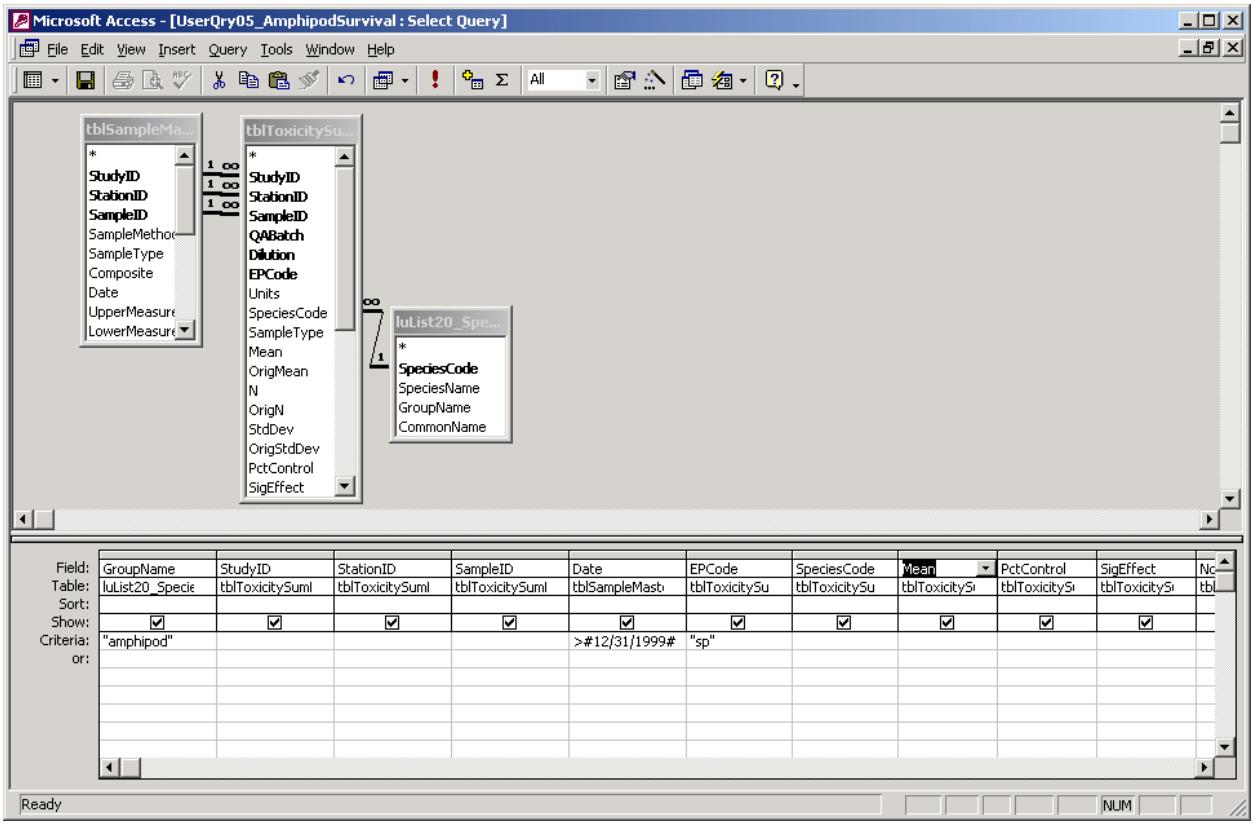


Figure B-9. Query design for the query "Extract amphipod mortality data for multiple species since January 1, 2000."

Note that the date is filtered by the *Criteria*:
>#12/31/1999#

You could also filter this with the expression:
>=#01/01/2000#

> **NOTE**
> MS Access requires the # sign to recognize dates.

How would I filter the output to see only samples that were classified as statistically toxic either in the original report, or using the normalized significance against control?

Look up list 50 contains the codes for reported significance (***SigEffect***); codes for significantly toxic samples include SC, SCT, SR, SRM, and SRT. Look up list 51 contains the

codes for calculated significance (***NormSigEffect***); the standardized code for significantly toxic samples is SC. The revised query is shown in Figure B-10.

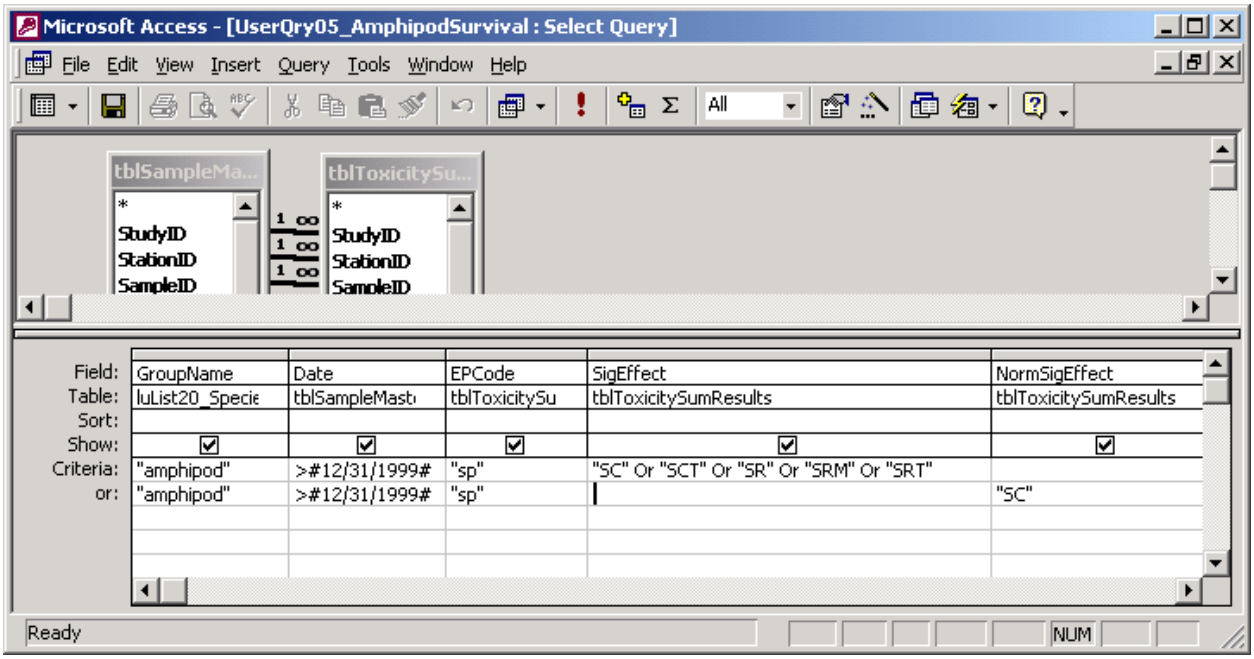


Figure B-10. Query design for the query "Extract amphipod mortality data for multiple species since January 1, 2000 " showing additional statistical significance criteria.

Query 6. Extract infaunal abundance data for San Diego Bay.

This query requires *tblStation* (for the location of San Diego Bay), *tblInfaunalAbundance*, and also *tblSampleMaster* (to ensure correct linkage between the infauna and station tables). The only variable that needs to be clearly defined is the location of San Diego Bay. The user could select one of several options, all with slightly different geographic meaning. This query uses the ***WaterBody*** field, as it is most specific to the location, without including samples outside of the bay but within the county or the regional board. Each option below is shown with the number of infaunal abundance records that are retrieved using each geographic option:

- ***RegBoard*** = "San Diego" (number of records = 24,500)
- ***Hydrounit*** = "San Diego Bay" (number of records = 12,495)
- ***County*** = "San Diego" (number of records = 24,500)
- ***WaterBody*** = "San Diego Bay" (number of records = 12,573)
- ***Locality*** = "SD Bay North" or "SD Bay South" (number of records = 10,964)

Query 7. Extract SWI (sediment-water interface) echinoderm toxicity data having development as the endpoint and total PCBs data located in San Diego Bay.

This complex query requires both the toxicity and chemistry data tables, as well as *tblStation* for the San Diego Bay location information. Because we must link samples with both chemistry and toxicity data, *tblSampleMaster* is used to link both sets of data tables together. Depending on your computer, this query may run slowly because of the many linkages required. By linking both *tblChemistryResults* and *tblToxicitySumResults* to *tblSampleMaster*, this will retrieve only those samples with both chemistry and toxicity data fitting the required criteria.

The design for "***UserQry07_SWI_PCB_SDB***" in Figure B-11 shows the components of the query, and the criteria used to select out the specific data required. First, the request is for the sediment-water interface data. This information is stored in *tblBiologyBatchInfo*, for the field ***MaterialCode*** = "SWI" (Figure B-11). Then, rather than a species, the user has requested a ***SpeciesGroup*** of "Echinoderm" which is located in *luList20_SpeciesList*. The development endpoint is equivalent to the ***EPCode*** of "NORM" as described in *luList23_SedimentToxEndPoints*; ***EPCode*** is a key field in *tblToxicitySumResults*. Total PCBs (calculated) is the ***ChemicalName*** of "PCBs." Finally, we chose to use the ***WaterBody*** of "San Diego Bay" for this demonstration query.

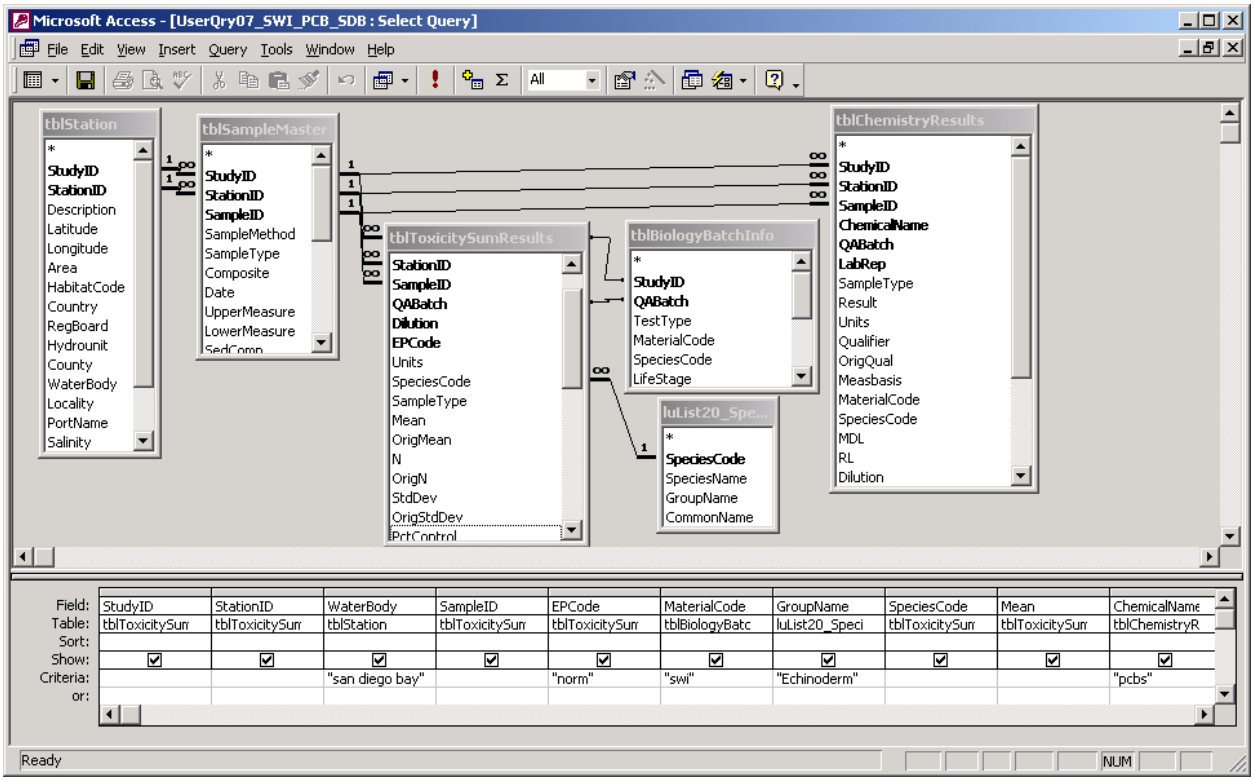


Figure B-11. The query "Extract SWI (sediment-water interface) echinoderm toxicity data having development as the endpoint and total PCBs data located in San Diego Bay" in Design Mode.

Query 8. Extract bioaccumulation data for the San Francisco Bay Area for clams, including life stage and protocol.

This query is similar to Query 4 (tissue chemistry data), except it asks for all clam data (rather than just *M. nasuta*), and also further information about the test and test specimens. Information about the test and test specimens is available in *tblBioaccumulationOrganism*.

One challenge of this query is the use of the term *clam*. The species look up list (20) has species-specific common and scientific names as well as groups for the species. The ***GroupName*** that contains clams is "Bivalve," but this group contains bivalves that are not clams. In order to extract only clam data, the criteria is designed to query out all species with the word "Clam" as part of the ***CommonName***, and the ***GroupName*** like *bivalve* (Figure B-12). If the '"Bivalve" criteria is not added, the query could extract data for the *Neanthes virens* which has the ***CommonName*** of "Clam Worm."

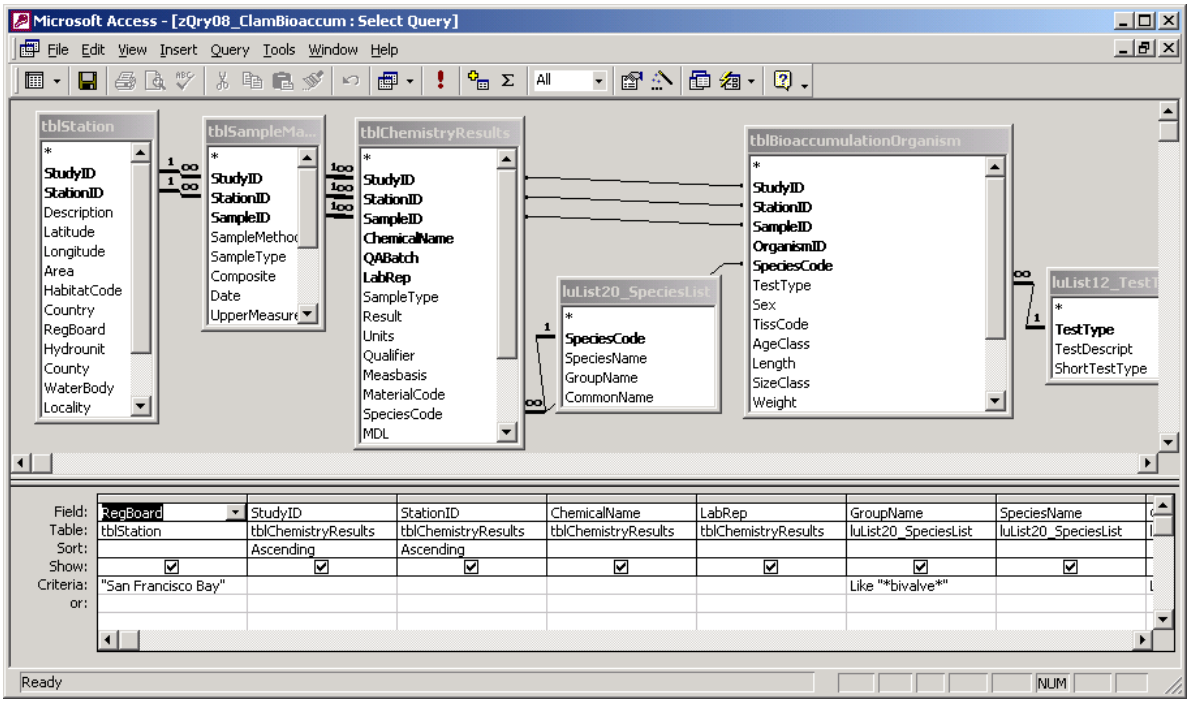


Figure B-12. Output of the query "Extract bioaccumulation data for the San Francisco Bay Area for clams, including life stage and protocol."

The specific Criteria used to develop this query, viewable in the user query "***UserQry08_ClamBioaccum***" (Figure B-13) is:
LuList20_SpeciesList.***GroupName*** Like "*bivalve*"
LuList20_SpeciesList.***GroupName*** Like "*clam*"
TblStation.***RegBoard*** = "San Francisco Bay"

The query is also sorted (ascending) on ***StudyID***, ***StationID***, ***SampleID***, and ***LabRep*** (Figure B-13). Note also that *tblBioaccumulationOrganism* is specific to the individual organism, although for invertebrates, there is usually only one record for all of the composited individuals in a sample. For larger organisms that are composited, however, there may be an individual record for every individual composited in the sample. In this case, you would end up repeating every set of chemical records for each individual in the

composite. Therefore, always review your results for oddities like repeat or missing records.

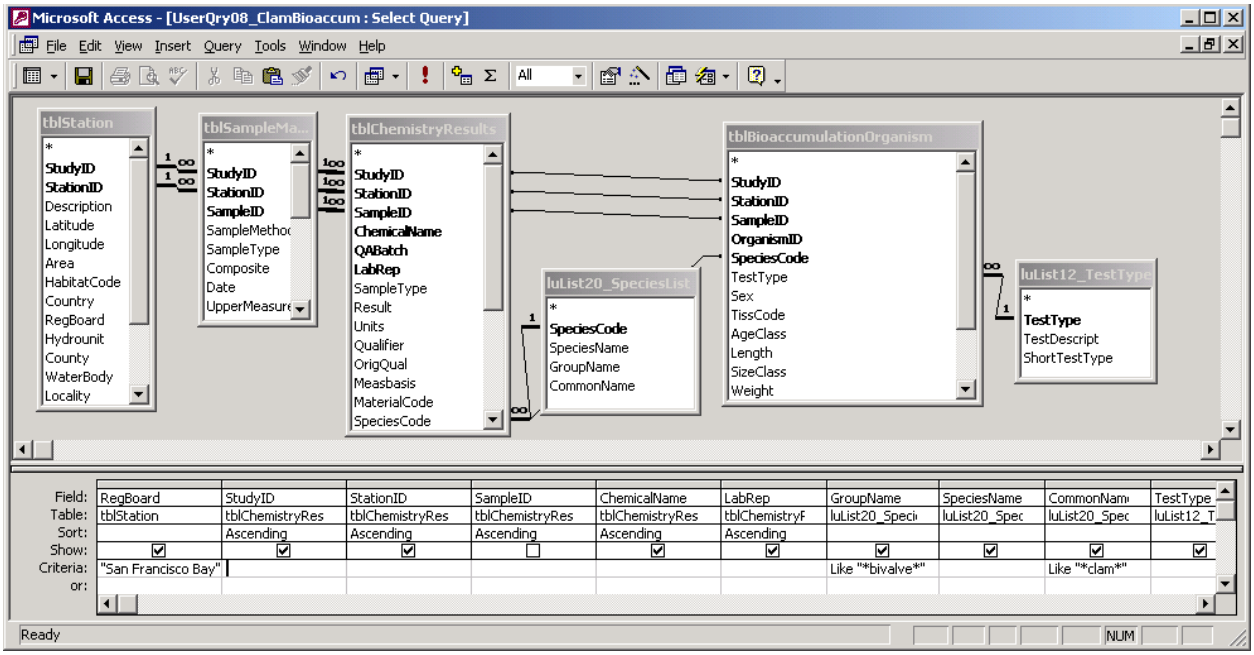


Figure B-13. Design for the query "Extract bioaccumulation data for the San Francisco Bay Area for clams, including life stage and protocol."

The ***TestType*** field is included as an indicator of the protocol. For laboratory bioaccumulation protocols (***TestType*** = "ACC"), the testing protocol is in tblBiologyBatchInfo (which is not related to the chemistry table).

What would I do if I wanted to exclude laboratory bioaccumulation samples from my tissue query, and include only field-collected or transplanted bivalves?

This can be easily done by editing the ***TestType*** you are interested in. If you want everything *except* laboratory bioaccumulation, enter the following into the *Criteria* row under ***TestType***:
<> "ACC"

What would I do if I wanted to see all tissue chemistry data for all clams *except* for *Macoma nasuta*?

The easiest thing to do in this case would be to enter the following into the *Criteria* row in the ***SpeciesCode*** field:
<> "MN"

A more complex way of achieving the same purpose is to add the following to the ***CommonName*** *Criteria*:
Like "*clam*" AND <> "Bent-nose Macoma clam"

Query 9. What samples with infauna have toxicity data and chemistry that are in subtidal habitats?

This query uses the ***DataCode*** field in *tblSampleMaster*, and also the ***HabitatCode*** field in *tblStation* (Figure B-14), as shown in the design for "***UserQry09_SubtidalSamples***." Because it asks "What samples..?" instead of "How many samples..," it is not a Totals query.

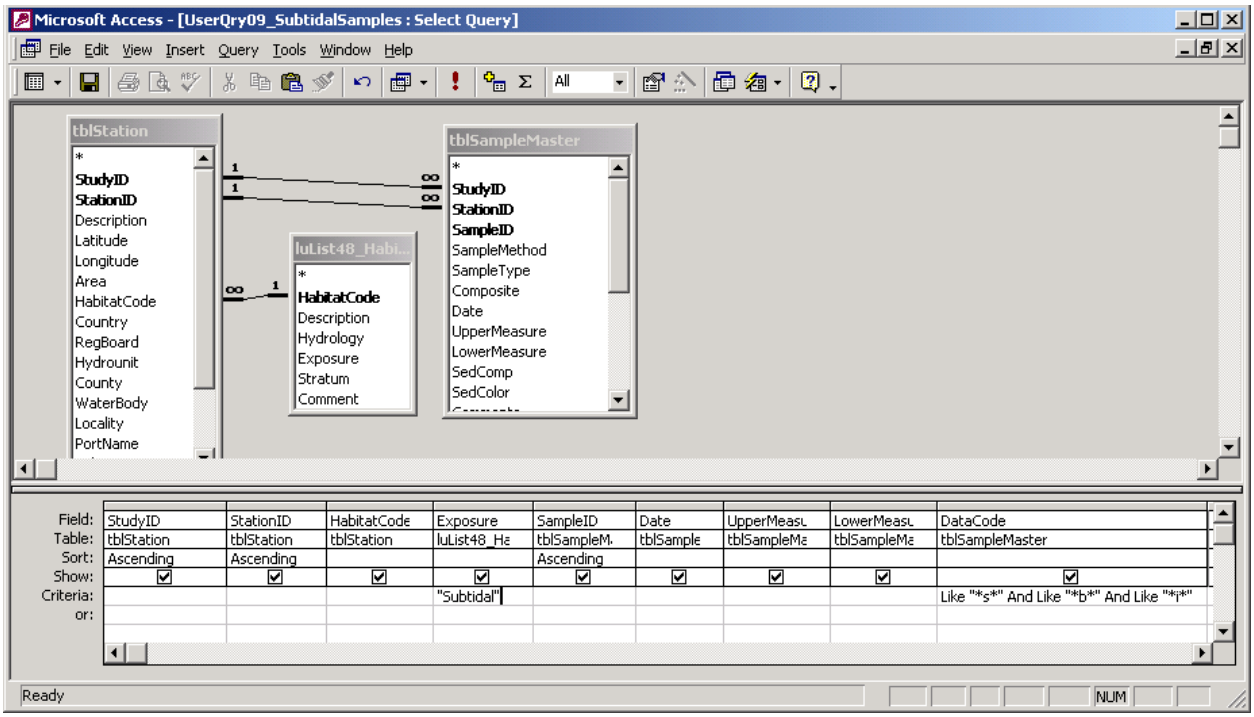


Figure B-14. The query "What samples with infauna have toxicity data and chemistry that are in subtidal habitats?" in Design Mode.

This query requires the Habitat Code Look up List (48) in order to specify the Subtidal habitat (which is the second layer of the habitat, or Exposure variable). Similar to Query 2, the ***DataCode*** *criteria* necessary to select the triad samples is:
Like "*S*" And Like "*B*" And Like "*I*"

What is the simplest way to view all of the bay and estuary samples, excluding the ocean and fresh water samples from my selection?

Select the Hydrology field in luList48_HabitatCode, and then type in any of the following *Criteria*:
= "Embayment"
Like "*bay*"
Like "E*"

Query 10. Extract data for Eohaustorius *survival and classify them with thresholds as low response (90% of control).*

This is a simple query, although it requires the creation of a new classification field to meet the user's requirements. The required elements are species (***SpeciesCode***, present in *tblToxicitySumResults*), survival (***EPCode*** of "SP"), with the results expressed as a percent of negative control (***PctControl***, also available in *tblToxicitySumResults*); therefore only one table is required.

In order to classify the ***PctControl*** field, a new field is created that becomes part of the query output, as shown in the design for the user query "***UserQry10_EELowSP***" (Figure B-15). Here we call it ***LowResponse*** (although you could call it anything) and it is populated with "Low" if PctControl is <90%, or "OK" if not.

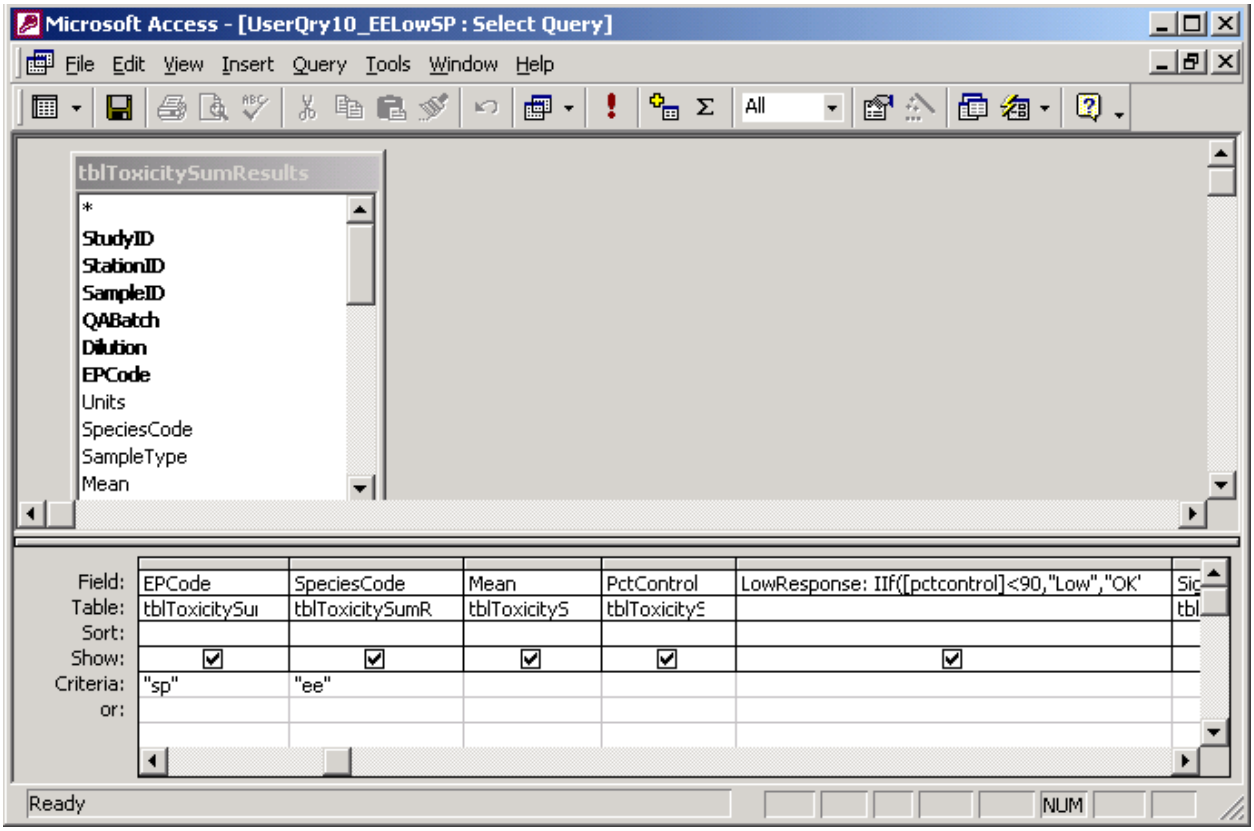


Figure B-15. The query "Extract data for Eohaustorius survival and classify them with thresholds as low response (90% of control)" in Design Mode.

To create this new field, you will be introduced to an Access function called "IIF." To use this classification method, enter the following into a blank column:
LowResponse: = IIF([PctControl] < 90, "Low", "OK")

In English, this translates into: If the reported value as a percent of control is <90%, populate this field with the word "Low", otherwise, populate the field with the word "OK." You can then run the query and sort by LowResponse to group the samples below the low response threshold.

Appendix C

Database Dictionary

Part A: List of Tables
Includes the Table Name, Field Name, and Description of the Field Name.

Part B: List of Fields
Includes the Table Name, Field Name, the Data Format (text, number, date/time), StudyID, whether the field is a Key Field, the default value for nulls, and if the field is formally required.

SQO Database
Part A: List of Tables

Table List
Sorted by Table Name

Table Name	Table Type	Description	System Table
luList01_AgencyCodes	Access	Lookup table for data collection, analysis, and reporting agencies.	☐
luList02_StudyType	Access	Lookup table for data collection, analysis, and reporting agencies.	☐
luList03_SampleMethod	Access	Lookup table that stores information about the sample collection device.	☐
luList04_SampleTypes	Access	Lookup table that stores standard classifications of types of samples, including control, reference, and replicates.	☐
luList05_StudyGaps	Access	Lookup table that stores standard classifications of types of samples, including control, reference, and replicates.	☐
luList06_SedimentCompositionCodes	Access	Lookup table that contains a standardized list of sediment composition descriptions.	☐
luList10_Infaunal_SpeciesList	Access	Lookup table of invertebrate species names obtained from the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT).	☐
luList11_TissueTypes	Access	Lookup table of tissue types analyzed for chemistry.	☐
luList12_TestType	Access	Lookup table differentiating different types of biological analyes.	☐
luList13_QualifierCodes	Access	Lookup table that contains a standardized list of qualifiers used in chemistry data.	☐
luList15_SampleDataCode	Access	Lookup table that contains a code for describing the data types for each sample.	☐
luList17_TestMatrices	Access	Lookup table that contains a standardized list of matrices for chemistry data.	☐
LuList18_ChemicalParameters	Access	Lookup table that contains a standardized list chemical parameters.	☐
luList19_Measbasis	Access	Lookup table that contains a standardized list of matrices for chemistry data.	☐
luList20_SpeciesList	Access	Lookup table that contains a standardized list of species used for toxicity testing and chemistry data.	☐
luList21_SedimentToxProtocols	Access	Lookup table that contains a standardized list of analysis protocols used in toxicity testing.	☐
luList22_SedimentToxLifeStage	Access	Lookup table that contains standardized codes for the lifestage of test and bioaccumulation organisms.	☐
luList23_SedimentToxEndPoints	Access	Lookup table that contains a standardized list of toxicity test end points.	☐
luList24_SedimentToxWQParameters	Access	Lookup table that contains a standardized list of sediment toxicity water quality parameters.	☐
luList25_SedimentToxTestAcceptability Codes	Access	Lookup table that contains a standardized list of acceptablility codes for toxicity tests.	☐
luList26_SedimentColors	Access	Lookup table that contains a standardized list colors used to describe sediment.	☐
luList28_NavType	Access	Lookup table that contains a standardized list codes describing navigation methods used in sample collection.	☐
lulist30_DMFateCodes	Access	Lookup table describing standardized codes for suitability for dredged material disposal.	☐
lulist31_DMDispCodes	Access	Lookup table describing standardized codes for dredged material disposal.	☐
luList33_ChemicalAnalysisMethods	Access	Lookup table that contains a standardized list of analysis protocols used in chemistry testing.	☐

SQO Database
Part A: List of Tables

Table List
Sorted by Table Name

Table Name	Table Type	Description	System Table
luList34_ChemicalPreparationCodes	Access	Lookup table that contains a standardized list of preparation methods used in chemistry testing.	☐
luList40_Country	Access	Lookup table that contains a standardized list of countries used to categorize stations.	☐
luList41_RegBoard	Access	Lookup table that contains a standardized list of CA Regional Water Quality Control Boards used to categorize stations.	☐
luList42_Hydrounit	Access	Lookup table that contains a standardized list of watersheds used to categorize stations.	☐
luList43_County	Access	Lookup table that contains a standardized list of CA counties used to categorize stations.	☐
luList44_WaterBody	Access	Lookup table that contains a standardized list of large-scale water bodies used to categorize stations.	☐
luList45_Locality	Access	Lookup table that contains a standardized list of small-scale water bodies used to categorize stations.	☐
luList46_Ports	Access	Lookup table that contains a standardized list of port names used to categorize stations.	☐
luList47_RefAreas	Access	Lookup table that contains a standardized list of port names used to categorize stations.	☐
luList48_HabitatCode	Access	Lookup list that contains codes that describe the habitat of each station.	☐
luList50_SigEffect	Access	Lookup table that contains a standardized list of toxicity significance codes for reported significance.	☐
luList51_NormToxSigCodes	Access	Lookup table that contains a standardized list of toxicity significance codes for the calculated significance.	☐
tblBioaccumulationOrganism	Access	Table that contains information about the organisms analyzed for tissue chemistry.	☐
tblBiologyBatchInfo	Access	Table that contains information about bioassay samples processed in the same batch.	☐
tblChemistryBatchInfo	Access	Table that contains analysis information about samples processed in the same batch.	☐
tblChemistryResults	Access	Table that contains information about results of sediment, tissue, and elutriate chemistry analyses.	☐
tblCoreEvent	Access	Information about the collection of each core.	☐
tblCoreSamples	Access	Stores sediment depth information for the individual sediment samples included in the composites.	☐
tblDredgeFate	Access	Table that contains information about suitability and disposal of dredged material.	☐
tblGrabEvent	Access	Table that contains information about grab sampling.	☐
tblInfaunalAbundance	Access	Benthic infaunal abundance data.	☐
tblSampleMaster	Access	Description of the composite samples for both monitoring and dredged material studies.	☐
tblStation	Access	Station positions for point data (NAD83).	☐
tblStudy	Access	Record describing each individual study.	☐
tblStudyReference	Access	Table that contains bibliographical information about each study.	☐
tblToxicityResults	Access	Table that contains information about results of toxicity tests.	☐

SQO Database
Part A: List of Tables

Table List
Sorted by Table Name

Table Name	Table Type	Description	System Table
tblToxicitySumResults	Access	Table that contains summary information about toxicity test results.	☐
tblToxicityWaterQuality	Access	Table that contains summary information about toxicity test conditions.	☐
tblToxRefSigEffect	Access	Table that contains records for toxicity significance for samples compared to more than one reference area.	☐
tblTrawlEvent	Access	Table that contains descriptions of trawl events for field-collected organisms.	☐

SQO Database
Part B: List of Fields

Table Fields
Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: luList01_AgencyCodes						
1	AgencyCode	Text	4	Code for the agency that collected or analyzed the data.	☑	No
2	Description	Text	80	Full name of the agency.	☐	No
Table: luList02_StudyType						
1	StudyType	Text	4	Code for the type of study and included data types of the study.	☑	No
2	Description	Text	75	Description of the study type.	☐	No
3	SedChem	Text	1	Study includes has sediment chemistry data.	☐	No
4	SedTox	Text	1	Study includes sediment toxicity data.	☐	No
5	LabAccum	Text	1	Study includes laboratory tissue bioaccumulation data.	☐	No
6	FieldAccum	Text	1	Study includes field-collected tissue bioaccumulation data.	☐	No
7	ElChem	Text	1	Study includes sediment elutriate chemistry data.	☐	No
8	Infauna	Text	1	Study includes benthic infaunal data.	☐	No
9	Type	Text	20	Standardized description of data group, including Dredging (D) or Monitoring/Research (M).	☐	No
Table: luList03_SampleMethod						
1	SampleMethod	Text	15	Code used for the sample collection device.	☑	No
2	Description	Text	50	Description of the sample collection device.	☐	No
Table: luList04_SampleTypes						
1	SampleType	Text	10	Code for the type of sample collected.	☑	No
2	Description	Text	75	Description of the Sample Type code.	☐	No
3	TableType	Text	50	Shows whether the code is for a Sample type or a Result type.	☐	No
Table: luList05_StudyGaps						
1	StudyGapCode	Text	5	Code for the summary of information missing from a study.	☑	No
2	Description	Text	80	Description of the Study Gap code.	☐	No
Table: luList06_SedimentCompositionCodes						
1	SedComp	Text	50	Standardized description of the composition of sediment.	☑	No

SQO Database | **Table Fields**
Part B: List of Fields | **Sorted by Table Name**

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: luList10_Infaunal_SpeciesList						
1	SpeciesName	Text	60	Entire Latin species name, to the level identified.	☑	No
2	Phylum	Text	40	Phylum.	☐	No
3	Class	Text	40	Class.	☐	No
4	Order	Text	40	Order.	☐	No
5	Family	Text	40	Family.	☐	No
6	Genus	Text	40	Genus.	☐	No
7	Species	Text	50	Species.	☐	No
8	Subspecies	Text	50	Subspecies.	☐	No
9	Authorship	Text	40	Author of or reference for the species name.	☐	No
10	CommonName	Text	40	Common name of the species.	☐	No
11	ITI	Text	40	Undefined from original source.	☐	No
12	P-Name	Text	40	Undefined from original source.	☐	No
13	P-code	Text	15	Undefined from original source.	☐	Yes (Duplicates OK)
14	Category	Text	50	General category of the species.	☐	No
15	Source	Text	20	Name of the database for source of species.	☐	No
Table: luList11_TissueTypes						
1	TissCode	Text	5	Code for the tissue type used in chemical analysis.	☑	No
2	TissueType	Text	55	Description of the tissue code.	☐	No
Table: luList12_TestType						
1	TestType	Text	7	Code for the test type used in biological testing.	☑	No
2	TestDescript	Text	75	Description of the test type.	☐	No
3	ShortTestType	Text	15	Short description of the test type for use in forms.	☐	No
Table: luList13_QualifierCodes						
1	Qualifier	Text	5	Code for the qualifier used for chemistry data.	☑	No
2	Description	Text	255	Description of the qualifier code.	☐	No
Table: luList15_SampleDataCode						
1	DataCode	Text	5	Short code to describe what kind of data are associated with this sample.	☑	No
2	Description	Text	50	Description of the data code.	☐	No
Table: luList17_TestMatrices						
1	MaterialCode	Text	4	Code for the matrix analyzed for chemistry results.	☑	No
2	Matrix Name	Text	50	Description of the matrix code.	☐	No

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: LuList18_ChemicalParameters						
1	ChemicalName	Text	50	Standardized name used for chemical parameters.	☑	No
2	Description	Text	80	Alternate description of the chemical name.	☐	No
3	ChemicalGroup	Text	20	Chemical group.	☐	No
4	SolidUnits	Text	8	Standardized units used for sediment and tissue data.	☐	No
5	WaterUnits	Text	8	Standardized units used for elutriate data.	☐	No
6	CASNum	Text	25	CAS Number	☐	Yes (Duplicates OK)
7	Sum	Text	10	Name of compound used to calculate totals.	☐	No
Table: luList19_Measbasis						
1	Measbasis	Text	2	Code for the measuring basis of the sediment chemistry results.	☑	No
2	MeasbasisName	Text	50	Description of the measuring basis.	☐	No
Table: luList20_SpeciesList						
1	SpeciesCode	Text	5	Code for species used in toxicity or laboratory bioaccumulation testing data.	☑	No
2	SpeciesName	Text	50	Description (name) of the test species, scientific.	☐	No
3	GroupName	Text	50	Category of species for grouping purposes.	☐	No
4	CommonName	Text	50	Common name of the species.	☐	No
Table: luList21_SedimentToxProtocols						
1	ProtocolCode	Text	25	Code for the toxicity test.	☑	No
2	ProtocolDescription	Text	100	Description of the toxicity test code.	☐	No
Table: luList22_SedimentToxLifeStage						
1	LifeStage	Text	10	Code for the organism life stage.	☑	No
2	LifeStageDescription	Text	50	Description of the life stage.	☐	No
Table: luList23_SedimentToxEndPoints						
1	EPCode	Text	10	Code for the end point of the toxicity test.	☑	No
2	EndPoint	Text	50	Description of the end point code.	☐	No
Table: luList24_SedimentToxWQParameters						
1	WQCode	Text	8	Code for the water quality parameter measured for toxicity tests.	☑	No
2	WQName	Text	50	Description of the water quality parameter code.	☐	No
3	Units	Text	10	Standardized reporting units for the water quality parameter code.	☐	No
Table: luList25_SedimentToxTestAcceptabilityCodes						
1	AcceptCode	Text	5	Code for the acceptability of the toxicity test.	☑	No
2	CodeDescription	Text	75	Description of the toxicity test acceptance code.	☐	Yes (Duplicates OK)
Table: luList26_SedimentColors						
1	SedColor	Text	20	Standardized name of the color of the sediment.	☑	No

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: luList28_NavType						
1	NavType	Text	10	Code for navigational equipment used in sample collection.	☑	No
2	Description	Text	50	Description of the navigation type code.	☐	No
Table: lulist30_DMFateCodes						
1	ReccomendCode	Text	4	Code for the recommended suitability for dredged material disposal from sediment characterization report.	☑	No
2	RecDescription	Text	125	Description of the codes.	☐	No
Table: lulist31_DMDispCodes						
1	DisposalCode	Text	4	Disposal location code.	☑	No
2	DispDescription	Text	125	Description of the codes.	☐	No
Table: luList33_ChemicalAnalysisMethods						
1	MethodCode	Text	25	Code for the analytical method used for chemistry results.	☑	No
2	Method	Text	255	Description of the method.	☐	No
3	Instrument	Text	50	Analytical instrument used for chemical analyses.	☐	No
Table: luList34_ChemicalPreparationCodes						
1	PrepCode	Text	10	Code for the preparation method used for chemistry results.	☑	No
2	Preparation Method	Text	255	Description of the method.	☐	No
3	MetalDigestCode	Text	10	Associated code for the metals prep method which dictates the level of acid extraction.	☐	Yes (Duplicates OK)
Table: luList40_Country						
1	Country	Text	25	Location of the station by Country name.	☑	No
Table: luList41_RegBoard						
1	RegBoard	Text	25	Location of the station by California Regional Water Quality Control Board.	☑	No
Table: luList42_Hydrounit						
1	Hydrounit	Text	25	Location of the station by Watershed name.	☑	No
Table: luList43_County						
1	County	Text	25	Location of the station in or near the noted County.	☑	No
Table: luList44_WaterBody						
1	WaterBody	Text	50	Location of the station by large scale water body name.	☑	No
Table: luList45_Locality						
1	Locality	Text	50	Location of the station by local, small-scale water body.	☑	No
Table: luList46_Ports						
1	PortName	Text	25	Code for the port name.	☑	No
2	Port	Text	50	Port name.	☐	No
Table: luList47_RefAreas						
1	Reference Code	Text	8	Code for the reference area.	☑	No
2	Reference Name	Text	50	Name of the reference area.	☐	No

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: luList48_HabitatCode						
1	HabitatCode	Text	4	Habitat code.	☑	No
2	Description	Text	50	Description of each habitat code.	☐	No
3	Hydrology	Text	50	Offshore (O), Freshwater (F), or Embayment (E)	☐	No
4	Exposure	Text	50	All (A), Intertidal (I), or Subtidal (S)	☐	No
5	Stratum	Text	50	All (A), Shoal (S), Channel (C), River Mouth (R), Port (P), Marina (M), PointSource (X), or Margin (G)	☐	No
6	Comment	Text	50	Comment.	☐	No
Table: luList50_SigEffect						
1	SigEffect	Text	5	Code for reported toxicity significance (according to the original investigator).	☑	No
2	SigEffectName	Text	30	Shortened name of the significant effect determination.	☐	No
3	Description	Text	255	Description or other information about toxicity significance determination.	☐	No
Table: luList51_NormToxSigCodes						
1	NormSigEffect	Text	5		☑	No
2	Description	Text	50		☐	No
Table: tblBioaccumulationOrganism						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	SampleID	Text	20	Identifier for the composite sample used for analysis.	☑	No
4	OrganismID	Text	10	Unique identifier for the individual. Use COMP for composite sample, species for multiple species for lab bioaccumulation data.	☑	No
5	SpeciesCode	Text	5	Code for species used in tissue bioaccumulation testing data from luList20.	☐	Yes (Duplicates OK)
6	TestType	Text	7	Differentiates field-collected, introduced, and laboratory bioaccumulation test methods, linked to luList12.	☐	Yes (Duplicates OK)
7	Sex	Text	5	Sex of individual, restricted to M (Male), F (female), I (indeterminate), or U (unknown).	☐	No
8	TissCode	Text	5	Code for the tissue type used in chemical analysis from luList11.	☐	Yes (Duplicates OK)
9	AgeClass	Number, Integer	2	Presumed age of the fish based on length (Bight '98).	☐	No
10	Length	Number, Single	4	Length of the individual, in cm.	☐	No
11	SizeClass	Number, Integer	2	Size class (Bight '98).	☐	No
12	Weight	Number, Single	4	Weight of the individual in grams.	☐	No
13	TotalWeight	Number, Single	4	Total weight of the composite sample, in grams.	☐	No
14	LifeStage	Text	10	Description of the life stage of the species analyzed linked to luList22.	☐	Yes (Duplicates OK)
15	NoinComp	Number, Integer	2	Number of individuals in a composite sample.	☐	No
16	Comments	Memo	0	Comments	☐	No

SQO Database | **Table Fields**
Part B: List of Fields | **Sorted by Table Name**

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblBiologyBatchInfo						
1	StudyID	Text	15	A unique identifier for each study, from the Study table.	☑	No
2	QABatch	Text	50	Identifier to match samples analyzed as a group.	☑	No
3	TestType	Text	3	Differentiates bioassay (TOX) and laboratory bioaccumulation (ACC) test methods, linked to luList12.	☐	Yes (Duplicates OK)
4	MaterialCode	Text	4	Code for the matrix analyzed for toxicity results, from luList17.	☐	Yes (Duplicates OK)
5	SpeciesCode	Text	5	Code of bioassay or bioaccumulation species from luList20.	☐	Yes (Duplicates OK)
6	LifeStage	Text	10	Life stage of the test organism, from luList22.	☐	Yes (Duplicates OK)
7	AgencyCode	Text	4	The agency that performed toxicity analyses, from luList01.	☐	Yes (Duplicates OK)
8	ProtocolCode	Text	25	Test protocol, from luList21.	☐	Yes (Duplicates OK)
9	TestDate	Date/Time	8	Date of the test.	☐	No
10	TestDuration	Number, Single	4	Duration of the test, in days.	☐	No
11	Temperature	Number, Single	4	Temperature of the test, degrees C.	☐	No
12	AcceptCode	Text	5	Quality assurance code from luList25.	☐	Yes (Duplicates OK)
13	Comments	Text	150	Comments.	☐	No
Table: tblChemistryBatchInfo						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	QABatch	Text	50	The code for all of the samples processed in the same batch.	☑	No
3	MaterialCode	Text	4	Test material code from luList17.	☐	Yes (Duplicates OK)
4	SpeciesCode	Text	5	Code for species used in tissue bioaccumulation testing data from luList20, use NR for non-tissue data or not reported.	☐	Yes (Duplicates OK)
5	PrepCode	Text	10	Preparation code from luList 34.	☐	Yes (Duplicates OK)
6	PrepDate	Date/Time	8	The date the sample was extracted expressed as mm/dd/yyyy.	☐	No
7	MethodCode	Text	25	Analysis method from lulist33.	☐	Yes (Duplicates OK)
8	AnalysisDate	Date/Time	8	The date the sample was processed in the instument expressed as mm/dd/yyyy.	☐	No
9	AgencyCode	Text	4	Agency code from luList01.	☐	Yes (Duplicates OK)
10	Comments	Text	80	Additional comments.	☐	No

SQO Database
Part B: List of Fields

Table Fields
Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblChemistryResults						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	SampleID	Text	20	ID for the sample or composite used for analysis.	☑	No
4	ChemicalName	Text	50	Name of parameter from luList18.	☑	Yes (Duplicates OK)
5	QABatch	Text	50	Code for all samples processed in the same batch.	☑	No
6	LabRep	Text	10	Laboratory replicates, if present. Default labrep = 01.	☑	No
7	SampleType	Text	10	The type of result from luList04.	☐	Yes (Duplicates OK)
8	Result	Number, Single	4	Numerical result; dry wt for sediment / wet weight for tissue.	☐	No
9	Units	Text	10	Units for the result (standard units as in luList18).	☐	No
10	Qualifier	Text	50	Standardized data qualifiers from luList13; U is standard for data below MDL.	☐	Yes (Duplicates OK)
11	Measbasis	Text	2	Measuring basis of chemistry result, linked to luList19.	☐	Yes (Duplicates OK)
12	MaterialCode	Text	4	Matrix code from luList17.	☐	Yes (Duplicates OK)
13	SpeciesCode	Text	5	Code for species used in tissue bioaccumulation testing data from luList20, use NR for non-tissue data or not reported.	☐	Yes (Duplicates OK)
14	MDL	Number, Single	4	Method detection limit.	☐	No
15	RL	Number, Single	4	Reporting limit.	☐	No
16	Dilution	Number, Single	4	Dilution factor if available.	☐	No
17	AgencyCode	Text	4	The agency code from luList01.	☐	Yes (Duplicates OK)
18	Comments	Text	80	Additional comments.	☐	No
19	BDL	Text	3	Below detection limit? (Yes or no)	☐	No
Table: tblCoreEvent						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	CoreID	Text	10	A unique identifier for the individual core.	☑	No
4	Date	Date/Time	8	The date the core sample was taken expressed as mm/dd/yyyy.	☐	No
5	Time	Date/Time	8	The time the core sample was taken expressed in 24 hour time.	☐	No
6	WaterDepth	Number, Single	4	Total water depth expressed in meters.	☐	No
7	NavType	Text	10	Type of navigation from luList28.	☐	Yes (Duplicates OK)
8	Vessel	Text	50	The name of the vessel.	☐	No
9	Segments	Number, Single	4	Number of segments tested from the core based on horizontal divisions.	☐	No
10	Latitude	Number, Single	4	Location of the individual core in decimal degrees (NAD83).	☐	No
11	Longitude	Number, Single	4	Location of the individual grab in decimal degrees (NAD83), negative for West longitude.	☐	No
12	CoreLength	Number, Single	4	Total core length expressed in cm below the sediment water interface.	☐	No
13	Penetration	Number, Single	4	Total penetration of the core barrel expressed in cm below the sediment water interface.	☐	No
14	Refusal	Text	1	Was refusal reached (Y/N/U)?	☐	No
15	Comments	Text	255	Additional comments.	☐	No

SQO Database
Part B: List of Fields

Table Fields
Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblCoreSamples						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	CoreID	Text	10	Identifier for the individual core.	☑	No
4	SampleID	Text	20	Identifier for the composite sample that includes the core sample.	☑	No
5	CoreSampleID	Text	10	Unique identifier for the core sample.	☑	No
6	Horizon	Text	50	First digit describes the lithological horizon the sample represents; 2nd digit the total number of segments.	☐	No
7	UpperMeasure	Number, Single	4	Upper sediment depth, measured from the sediment water interface, expressed in cm.	☐	No
8	LowerMeasure	Number, Single	4	Lower sediment depth, measured from the sediment water interface, expressed in cm.	☐	No
9	Comments	Text	80	Additional comments.	☐	No

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblDredgeFate						
1	StudyID	Text	15	A unique identifier for each study.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	SampleID	Text	20	Identifier for the composite sample used for analysis.	☑	No
4	Project Name	Text	80	Project name internal to the agency, for tracking purposes.	☐	No
5	AgencyCode	Text	4	The agency that paid for the study from luList01.	☐	Yes (Duplicates OK)
6	PredictedVolume	Number, Single	4	Estimated volume (cy) quoted in sediment characterization report.	☐	No
7	ProposedDisposalSite	Text	80	Proposed disposal site in sediment characterization report, if available.	☐	No
8	Area_SqFt	Number, Single	4	Area of footprint (square feet) to be dredged.	☐	No
9	Agency Number	Text	50	Project number internal to the agency, for tracking purposes.	☐	No
10	Project Start	Date/Time	8	Start date of project.	☐	No
11	COE Date Of Permit	Date/Time	8	Corps of Engineer Permit date.	☐	No
12	COE PermitNumber	Text	50	Corps of Engineer Permit number.	☐	No
13	RB Date Of Permit	Date/Time	8	Regional Water Quality Control Board Permit date.	☐	No
14	RB Case File Number	Text	50	Regional Water Quality Control Board Permit number.	☐	No
15	RB Permit Number	Text	50	Regional Water Quality Control Board Case File number.	☐	No
16	Dredge Start Date	Text	8	Date (year) dredging started.	☐	No
17	Dredge End Date	Text	8	Date (year) dredging ended.	☐	No
18	Disposal Method	Text	50	Disposal method used for project.	☐	No
19	DredgeMethod	Text	50	Type of dredging or dredge used for project.	☐	No
20	DisposalSite	Text	80	Ultimate location of material disposed.	☐	No
21	Volume	Number, Single	4	Total volume dredged and disposed (cy).	☐	No
22	Contractor	Text	50	Name of dredging contractor.	☐	No
23	Comments	Text	255	Comments.	☐	No
24	SuitabilityRecommendation	Text	255	Recommendation, if available, for fate of material from sediment characterization report.	☐	No
25	ReccomendCode	Text	4	Suitability for unconfined open-ocean disposal, as recommended in the sediment characterization report, from luList30.	☐	Yes (Duplicates OK)
26	RegulatoryCode	Text	7	Permitted suitability for unconfined open-ocean disposal, restricted to S (suitable), N (not suitable), or NA (not available).	☐	Yes (Duplicates OK)
27	DisposalCode	Text	4	Code for final disposal site, from luList31.	☐	Yes (Duplicates OK)

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblGrabEvent						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	GrabID	Text	10	A unique identifier for the individual grab sample.	☑	No
4	SampleID	Text	20	ID for the composite sample if the grab was used for analysis.	☑	No
5	Date	Date/Time	8	The date the grab sample was taken expressed as dd/mmm/yyyy.	☐	No
6	Time	Date/Time	8	The time the grab sample was taken expressed in 24 hour time.	☐	No
7	WaterDepth	Number, Single	4	Total water depth expressed in meters.	☐	No
8	NavType	Text	10	Type of navigation from luList28.	☐	Yes (Duplicates OK)
9	Vessel	Text	50	The name of the vessel.	☐	No
10	Latitude	Number, Single	4	Location of the individual grab in decimal degrees (NAD83).	☐	No
11	Longitude	Number, Single	4	Location of the individual grab in decimal degrees (NAD83), negative for West longitude.	☐	No
12	Penetration	Number, Single	4	Total penetration of the grab sampler expressed in cm below the sediment water interface.	☐	No
13	Comments	Text	255	Additional comments.	☐	No
Table: tblInfaunalAbundance						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	SampleID	Text	20	ID for the composite sample if the grab was used for analysis.	☑	No
4	SpeciesName	Text	60	Infaunal species from luList10.	☑	Yes (Duplicates OK)
5	ScreenSize	Number, Single	4	Sieve size in mm.	☑	No
6	Rep	Text	10	Field or laboratory replicate.	☑	No
7	Abundance	Number, Integer	2	Number of animals.	☐	No
8	Qualifier	Text	10	Qualifier for the data.	☐	Yes (Duplicates OK)
9	AreaSampled	Number, Single	4	Area of sediment sampled for benthic infauna (m2).	☐	No
10	AgencyCode	Text	4	Code for the laboratory the conducted the work from luList01.	☐	Yes (Duplicates OK)
11	TaxaStd	Text	10	Source of sample date; SQO 2005 refers to data normalized by SQO team.	☐	No
12	Comments	Text	80	Additional comments.	☐	No

SQO Database
Part B: List of Fields

Table Fields
Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblSampleMaster						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	SampleID	Text	20	Identifier for the composite sample used for analysis.	☑	No
4	SampleMethod	Text	15	Code used for the sample collection device from luList03.	☐	Yes (Duplicates OK)
5	SampleType	Text	10	The type of sample from luList04, refers to reference, control, and field replicate samples.	☐	Yes (Duplicates OK)
6	Composite	Text	1	Is the sample a composite? Restricted to Y/N/U.	☐	No
7	Date	Date/Time	8	The date the sample was taken expressed as dd/mmm/yyyy.	☐	No
8	UpperMeasure	Number, Single	4	Upper sediment depth, measured from the sediment water interface, expressed in cm (average for multiple cores).	☐	No
9	LowerMeasure	Number, Single	4	Lower sediment depth, measured from the sediment water interface, expressed in cm (average for multiple cores).	☐	No
10	SedComp	Text	50	Composition of the sediment from luList06.	☐	Yes (Duplicates OK)
11	SedColor	Text	20	Description of color of sediment from luList26.	☐	Yes (Duplicates OK)
12	DataCode	Text	5	Code for the type of data, see luList15_SampleDataCodes.	☐	Yes (Duplicates OK)
13	DepthCode	Text	10	Code for the type of sediment sample (Surface, Subsurface, CNEG, or NA for non-sediment samples).	☐	Yes (Duplicates OK)
14	Comments	Text	80	Additional comments.	☐	No

SQO Database
Part B: List of Fields

Table Fields
Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblStation						
1	StudyID	Text	15	Unique ID for the study.	☑	Yes (Duplicates OK)
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	Description	Text	50	A general description of the location of the station.	☐	No
4	Latitude	Number, Single	4	Latitude of the station in decimal degrees (NAD83).	☐	No
5	Longitude	Number, Single	4	Longitude of the station in decimal degrees (NAD83).	☐	No
6	Area	Yes/No	1	Are the data associated with an area (non-point location)?	☐	No
7	HabitatCode	Text	4	Location of the station by habitat, linked to luList48.	☐	Yes (Duplicates OK)
8	Country	Text	25	Location of the station by Country name, linked to luList40.	☐	Yes (Duplicates OK)
9	RegBoard	Text	25	Location of the station by California Regional Water Quality Control Board, linked to luList41.	☐	Yes (Duplicates OK)
10	Hydrounit	Text	25	Location of the station by Watershed name, linked to luList42.	☐	Yes (Duplicates OK)
11	County	Text	25	Location of the station in or near the noted County, linked to luList43.	☐	Yes (Duplicates OK)
12	WaterBody	Text	50	Location of the station by large scale water body name, linked to luList44.	☐	Yes (Duplicates OK)
13	Locality	Text	50	Location of the station by local, small-scale water body, linked to luList45.	☐	Yes (Duplicates OK)
14	PortName	Text	25	Location of the station by Port name, linked to luList46.	☐	Yes (Duplicates OK)
15	Salinity	Number, Single	4	Salinity of station if available.	☐	No
16	Comments	Text	50	Station occupation comments.	☐	No
Table: tblStudy						
1	StudyID	Text	15	A unique identifier for each study. Linked to metadata dataset ID.	☑	No
2	StudyName	Text	50	Name of the study.	☐	No
3	AgencyCode	Text	4	The agency that paid for the study from luList01.	☐	Yes (Duplicates OK)
4	Contact	Text	50	Contact name for the study.	☐	No
5	StudyType	Text	4	Defines the type of study and the data types included in the study, linked to luList02.	☐	Yes (Duplicates OK)
6	StudyGapCode	Text	5	Code for the summary of information missing from a study, linked to luList05.	☐	Yes (Duplicates OK)
7	Comments	Text	50	Additional comments.	☐	No
Table: tblStudyReference						
1	StudyID	Text	15	Unique ID for the study.	☑	Yes (No Duplicates)
2	Year	Text	4	Year of publication, if applicable.	☐	No
3	Authors	Text	80	Authors of the publication.	☐	No
4	Title	Text	255	Title of the publication.	☐	No
5	Source	Text	80	Other reference or source information.	☐	No

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblToxicityResults						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	SampleID	Text	20	Identifier for the composite sample used for analysis.	☑	No
4	QABatch	Text	50	Code for all samples processed in the same batch (commonly includes matrix, species, method for uniqueness).	☑	No
5	Dilution	Number, Single	4	The dilution factor expressed as a proportion.	☑	No
6	EPCode	Text	10	The type of test end point from luList23.	☑	Yes (Duplicates OK)
7	LabRep	Number, Single	4	Lab replicate number.	☑	No
8	Initial	Number, Integer	2	Initial number of test organisms.	☐	No
9	Units	Text	10	The units of the end point.	☐	No
10	SpeciesCode	Text	5	Code of species or type of biological system used for the toxicity test; refer to luList20.	☐	Yes (Duplicates OK)
11	SampleType	Text	10	Sample type from luList04.	☐	Yes (Duplicates OK)
12	Value	Number, Single	4	Numerical result of the test.	☐	No
13	AcceptCode	Text	5	Quality assurance code from luList25.	☐	Yes (Duplicates OK)
14	AgencyCode	Text	4	The four digit agency code from luList01.	☐	Yes (Duplicates OK)
15	Comments	Text	80	Additional comments.	☐	No

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblToxicitySumResults						
1	StudyID	Text	15	A unique identifier for each study, from the Study table.	☑	No
2	StationID	Text	15	A geographic location label from the station table.	☑	No
3	SampleID	Text	20	Unique identifier for the core composite within the study.	☑	No
4	QABatch	Text	50	Identifier to match samples analyzed as a group.	☑	No
5	Dilution	Number, Single	4	The dilution factor expressed as a proportion.. When not required, complete with -99.	☑	No
6	EPCode	Text	10	The type of endpoint for the test. Refer to luList23.	☑	Yes (Duplicates OK)
7	Units	Text	10	The units for the endpoint.	☐	No
8	SpeciesCode	Text	5	Code of species or type of biological system used for the toxicity test; refer to luList20.	☐	Yes (Duplicates OK)
9	SampleType	Text	10	Type of sample. Refer to luList04.	☐	Yes (Duplicates OK)
10	Mean	Number, Single	4	The mean value for the test and sample generated from the lab replicates in tblCoreToxicityResults.	☐	No
11	N	Number, Long Integer	4	The number of replicates used to calculate mean and standard deviation from the lab replicates in tblCoreToxicityResults.	☐	No
12	StdDev	Number, Single	4	The standard deviation for the test and sample generated from the lab replicates in tblCoreToxicityResults.	☐	No
13	PctControl	Number, Single	4	The mean expressed as a percentage of the mean for the control (i.e., mean of the lab replicates divided by the mean for the control and multiplied by 100).	☐	No
14	SigEffect	Text	5	Statistically significant effect based on reference. Refer to luList50.	☐	Yes (Duplicates OK)
15	Alpha	Number, Single	4	Alpha level for reported SigEffect.	☐	No
16	NormSigEffect	Text	5	Standardized significance of result compared to negative control.	☐	Yes (Duplicates OK)
17	Stat_Test	Text	50	Statistical test used in determining final toxicity significance (reported).	☐	No
18	Control_Stat	Yes/No	1	Was this negative control used for statistics and calculation of percent control?	☐	No
19	LC50	Text	10	Concentration that results in the mortality of 50 percent of the most sensitive test organisms (lethal concentration).	☐	No
20	EC50	Text	10	Concentration resulting in sublethal effects in 50 percent of the test organisms (effects concentration).	☐	No
21	AcceptCode	Text	5	Quality assurance code from luList25.	☐	Yes (Duplicates OK)
22	Comment	Text	255	Note comments on statistical test used if known (e.g. ANOVA, t-test, etc.).	☐	No

SQO Database	Table Fields
Part B: List of Fields	Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblToxicityWaterQuality						
1	StudyID	Text	15	Unique ID for the Study from tblStudy.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	SampleID	Text	20	Identifier for the composite sample used for analysis.	☑	No
4	EPCode	Text	10	The type of test end point from luList23.	☑	Yes (Duplicates OK)
5	QABatch	Text	50	Code for all samples processed in the same batch (commonly includes matrix, species, method for uniqueness).	☑	No
6	WQCode	Text	8	Standard water quality parameter code, from luList24.	☑	Yes (Duplicates OK)
7	MaterialCode	Text	4	Code for the matrix analyzed for toxicity results, from luList17.	☑	Yes (Duplicates OK)
8	Dilution	Number, Single	4	The dilution factor expressed as a proportion.	☑	No
9	SpeciesCode	Text	5	Code of species or type of biological system used for the toxicity test; refer to luList20.	☐	Yes (Duplicates OK)
10	MinValue	Number, Single	4	Minimum measured water quality parameter.	☐	No
11	MinQualifier	Text	5	Qualifier for the minimum measured parameter from luList13.	☐	No
12	MaxValue	Number, Single	4	Maximum measured water quality parameter.	☐	No
13	MaxQualifier	Text	5	Qualifier for the maximum measured parameter from luList13.	☐	No
14	Mean	Number, Single	4	Mean measured water quality parameter.	☐	No
15	StdDev	Number, Single	4	Standard deviation of the measured water quality parameter.	☐	No
16	Comments	Text	50	Comments.	☐	No
Table: tblToxRefSigEffect						
1	StudyID	Text	15	A unique identifier for each study, from the Study table.	☑	No
2	StationID	Text	15	A geographic location label from the station table.	☑	No
3	SampleID	Text	20	Unique identifier for the core composite within the study.	☑	No
4	QABatch	Text	50	Identifier to match samples analyzed as a group.	☑	No
5	Dilution	Number, Single	4	The dilution factor expressed as a proportion.. When not required, complete with -99.	☑	No
6	EPCode	Text	10	The type of endpoint for the test. Refer to luList23.	☑	Yes (Duplicates OK)
7	Reference Code	Text	8	Reference code for area used to calculate sigeffect, currently linked to luList47.	☐	Yes (Duplicates OK)
8	SpeciesCode	Text	5	Code of species or type of biological system used for the toxicity test; refer to luList20.	☐	Yes (Duplicates OK)
9	SigEffect	Text	5	Statistically significant effect based on reference. Refer to luList50.	☐	No
10	Stat_Test	Text	50	Statistical test used in determining final toxicity significance (reported).	☐	No

SQO Database
Part B: List of Fields

Table Fields
Sorted by Table Name

#	Field Name	Data Type	Size	Description	Primary Key	Indexed
Table: tblTrawlEvent						
1	StudyID	Text	15	Unique ID for the study.	☑	No
2	StationID	Text	15	Station or area name with a specific geographic location or center point.	☑	No
3	TrawlNumber	Number, Integer	2	Number of trawl taken at station.	☑	No
4	Date	Date/Time	8	The date the sample was taken expressed as dd/mmm/yyyy.	☐	No
5	StartTime	Date/Time	8	Time of the start of the trawl in 24 hour time hh:mm.	☐	No
6	StartLat	Number, Single	4	Latitude at the trawl start time.	☐	No
7	StartLong	Number, Single	4	Longitude at the trawl start time.	☐	No
8	StartDepth	Number, Double	8	Water depth at the start of trawl expressed in meters	☐	No
9	EndTime	Date/Time	8	Time of the end of the trawl in 24 hour time hh:mm.	☐	No
10	EndLat	Number, Single	4	Latitude at the trawl end time.	☐	No
11	EndLong	Number, Single	4	Longitude at the trawl end time.	☐	No
12	EndDepth	Number, Single	4	Water depth at the end of trawl expressed in meters	☐	No
13	Comments	Text	80	Comments.	☐	No