MACHINE REQUIREMENTS FOR EVTHD

√ IBM or compatible personal computer: 386 processor
√ Windows 95
√ 8 Mbytes of RAM
√ VGA video display minimum
√ 12 Mbytes free space on hard disk drive
√ Mouse

INSTALLATION INSTRUCTIONS FOR EVTHD

WINDOWS 95\WINDOWS NT MODIFIED FOR CD-ROM

1) Boot up your computer.
2) Insert EVTHD PROGRAM DISK.
3) Select the "Start" button.
4) Select "RUN" from the pick list
5) Type in the phrase "A:setup" and then select "OK", if the EVTHD PRO GRAM CD-ROM is in the A: drive, otherwise insert the appropriate letter.
6) Setup will initialize. Installation should take about 8 minutes.
7) Enter a new path or accept the default path by clicking on "Continue".
8) Once the installation is complete you should reboot your computer.

After installation, EVTHD can be found in the folder labeled EVTHD. Open the folder and select the hydrocarbon icon labeled EVTHD.

TABLE OF CONTENTS FOR EVTHD USERS MANUAL

EVTHD Version 1.0 printed November, 1997.
Version 2.0 printed October, 1998.
Version 3.0 printed October, 1999.

Exxon Valdez Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database 1989 - 1995 Users Guide

Abstract/Description:

The *Exxon Valdez* Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database (EVTHD) is the collection and hydrocarbon analysis information for environmental samples obtained for the *Exxon Valdez* National Resource Damage Assessment and Restoration efforts. The data are organized into three matrix types: 4,334 tissues (representing 66 species), 3,804 sediment and 238 seawater samples collected from 350 locations in or near the spill area. The samples were derived from 38 projects administrated by investigators from 13 research organizations between 1989 and 1995. The analytical results include concentrations of 63 hydrocarbons, summary statistics for the evaluation of the hydrocarbon sources and laboratory quality control data. Features of the database include identification of replicate samples, presentation of results in dry or wet weight, correction for method detection limits (MDL) of the analytes, and easy identification of samples contaminated with *Exxon Valdez* crude oil. Individual copies of the database are available from the Auke Bay Laboratory, 11305 Glacier Hwy. Juneau, AK 99801 (attn: Bonita Nelson).

DATABASE OVERVIEW

The EVTHD was produced to facilitate access to results for hydrocarbon analysis for samples collected by State and Federal resource agencies from the area affected by the *Exxon Valdez* oil spill of March 24, 1989. Principle Investigators provided the sample collection information, and chemical analyses were performed and reported by two laboratories. These data were combined to produce this product which allows: (1) an interactive and relatively straightforward extraction of hydrocarbon data subsets, so that selected hydrocarbon data for samples collected at specific locations and dates can be easily exported into a spreadsheet; (2) ready identification of replicate samples for statistical analysis; (3) choice of wet weight or dry weight basis for data format; (4) ready application of built-in data censoring options such as sample- and analyte-specific method detection limits (MDL); and (5) access to results of hydrocarbon interpretation efforts so that samples that contain hydrocarbons from the spilled oil can be readily identified.

Samples included herein are limited to environmental samples, i.e. samples collected from the oil-spill impact area for the explicit purpose of determining the extent of oil contamination in the environment. Other kinds of samples such as samples generated by laboratory experiments, field blank samples, other quality control samples analyzed as part of the chemical analysis procedure, etc., are not included here. Also excluded are samples from unknown locations or of unknown collection dates. These standards are applied very loosely, so that any indication of field collection location (whether latitude & longitude, or geographic place name) or sampling date (i.e. year) are accepted. Results for all samples not included here are maintained in a data-archive database at the Auke Bay Laboratory, and are available on request.

A primary objective of the EVTHD is to be useful and accessible to people of widely varying technical backgrounds, ranging from college students to professional environmental chemists. For example, a user with basic knowledge of database query techniques will be able to identify the locations from which the most grossly contaminated mussels were collected in 1989. A more sophisticated user will be able to compare coefficients of variation among hydrocarbon analytes based on replicated sediment samples. However, the price of such flexibility is an abundance of choices that have consequences which may not be apparent to the general public. As a result, some of the options, filters and data presented here are suggested as appropriate for nearly all users, while others will be of interest mainly to professional chemists interested in pursuing technical details.

An important feature included in the EVTHD is an evaluation of whether hydrocarbons detected in samples came from *Exxon Valdez* oil (EVO). The evaluation procedure was applied to the samples that contained all of the most persistent hydrocarbons present in EVO. The procedure consists of measuring how closely the pattern of hydrocarbon concentrations in a sample matches the pattern predicted by a mathematical weathering (i.e. environmentally altered) model for EVO. This procedure also provides a quantitative indication of how weathered the EVO in a sample is, assuming EVO is really present. In addition, results of another evaluation procedure which estimates the probability that the patterns of hydrocarbon concentrations reported for a sample are consistent with a natural pattern characteristic of deeper sediments is included. These interpretive features of the EVTHD make it possible to isolate and retrieve samples that are contaminated with EVO, or contain hydrocarbons from natural source modeled.

The EVTHD interface consists of a series of screens that guide users through a sequence of

decisions that determine which data and what format is selected. The first set of decisions determines the kind of data that is to be selected, i.e. which specific hydrocarbon analytes, what sample collection information, and which sample matrix (water, sediments, or tissues). The second set determines the qualifiers that are to be imposed on selected samples, i.e. from which specific locations, sampling dates, projects, etc. Once it is determined what kind of data will be selected for which kinds of samples, the data format is specified, and data that fulfill all these criteria may be examined. The criteria may be modified based on successive examinations of the data until a satisfactory data set is constructed, which may then be exported to a user-identified spreadsheet for further data analysis. This allows for the database to be explored prior to data export.

A major impediment to the use of this database is the large number of abbreviations that are incorporated into it. Nearly every kind of data is identified as an abbreviation, some of which are completely opaque. A series of tables is provided with this document that decodes all of the abbreviations used. In addition, the query-builder screen of EVTHD contains pick lists that provide the complete set of abbreviations for each field. It is therefore recommended that users un-familiar with these abbreviations use the query-builder option to identify the qualifiers imposed on data to be selected.

The authors of this effort would appreciate learning of any errors discovered by users. Please communicate these as well as other comments on the utility of the database, suggestions for improvements, or requests for individual copies, to: Bonita Nelson, Auke Bay Laboratory, 11305 Glacier Highway, Juneau Alaska, 99801-8626.

USER REQUIREMENTS

The data are grouped and queried by matrix type (sediment, tissue, and water) using a series of pop-up screens that contain click boxes, hot buttons, and pull down menus (including on-line help) managed in the Window's environment. Users should be familiar with the following :

- √ Basic understanding of database structure and operation. Familiarity with SQL (Standard Query Language) is very helpful.

- √ Basic understanding of the operation of spreadsheets. This software is designed to provide users with data reports that can be viewed directly, or exported to other Windows-based software for more detailed analysis.

Understanding the motives behind the project sampling designs as well as a basic knowledge of hydrocarbon source identification procedures will be helpful for interpreting these data. Interested users should consult either principle investigators with specific questions regarding sampling designs and interpretation of analytical results or consult the final reports for these projects. Final reports are available from the Exxon Valdez Oil Spill Information Office, 645 G Street, Anchorage, AK 99501. Specific information on the procedures used to evaluate samples for the presence of EVO are found in Short et al., (1996b). Information concerning the specific methods used for hydrocarbons analysis is found in Short et al. (1996a).

The following sections review the procedures for querying the database. For users familiar with

database operations, a general overview section is provided first. A more detailed set of instructions is provided for users that are less familiar with database operations. The final section is a demonstration of how to interpret the data resulting from the evaluations of the presence of EVO. The rest of this manual contains tables that can be used to decode the abbreviations used in many of the fields. In each of the following sections, helpful hints will be highlighted with this symbol :

GENERAL OVERVIEW FOR MAKING QUERIES

I. Select fields first *then* matrix type from the Field Selection Screen

1. Fields of interest are selected by clicking on boxes next to available field names. Three categories of information are available: sample collection and analytical results for alkane and polynuclear aromatic hydrocarbons (PAH). Complete descriptions of the sample collection fields are found in Table 1. Hydrocarbon names and their abbreviated field names are found in Table 2.

2. Select matrix type (sediment, water, tissue) by clicking the appropriate hot button.

II. Select specific lines of data using the Query Screen

This screen allows the user to build conditional statements to select specific rows of data in one of two ways:

1. Clicking the "Query" button on the tool bar and selecting Query Builder. This activates the query builder, a pop-up window which prompts the user for the query conditions through a series of pick list boxes on a "Conditions" screen.

2. Typing conditional statements in the "Enter SQL Query" box using SQL (the length of the command can exceed the size of the box).

The data conforming to the conditions are returned from the database on the bottom of the Matrix Query Screen on a grid. Missing values are coded as blanks and missing dates are coded as "01/01/01". Once a query search has been activated, it can be stopped using the Windows kill process : (Ctr/Alt/Del - end task).

III. Modify data

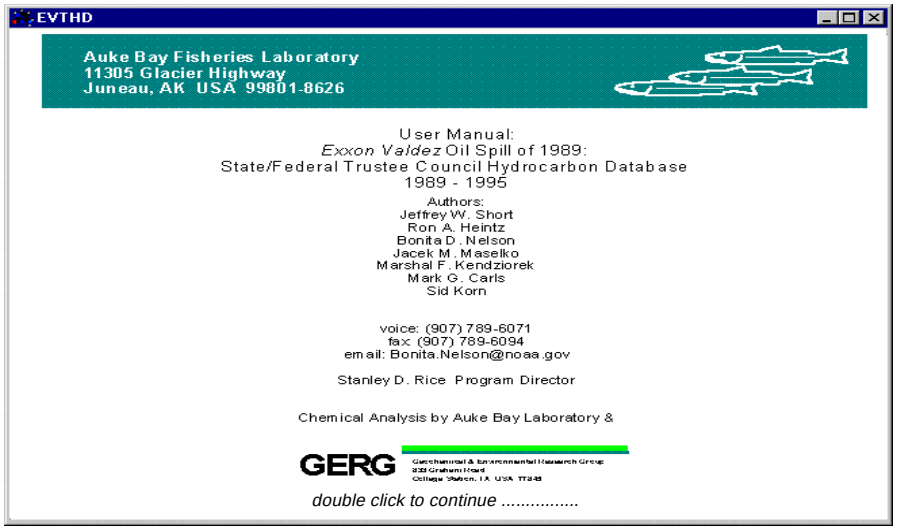
Dry Weight
Hydrocarbon concentrations are reported in nanograms analyte per g matrix (ng/g) on a wet weight basis. They can be converted to dry weight basis by clicking on the dry weight hot button.

Method Detection Limit (MDL) Filter
After data has been returned, activating this hot button filters the data for sample and analyte specific

MDL's (see p. 11), setting values below MDL = "-". This filter can be applied to data on either a dry or wet weight basis. You must select wet & dry weights and labs (and volume for the water matrix) from the fields selection screen before making the query to use this option.

IV. Save query and query results to other files

The results of the query and any modifications you have made can be saved to the clipboard and pasted into a spreadsheet or statistical package using the Windows copy and paste commands. Use the mouse to highlight the desired data in the grid, then click on Edit from the menu bar and select Copy from the pick list and paste data to new application.



Double click on the welcome screen to begin the program (Figure 1).

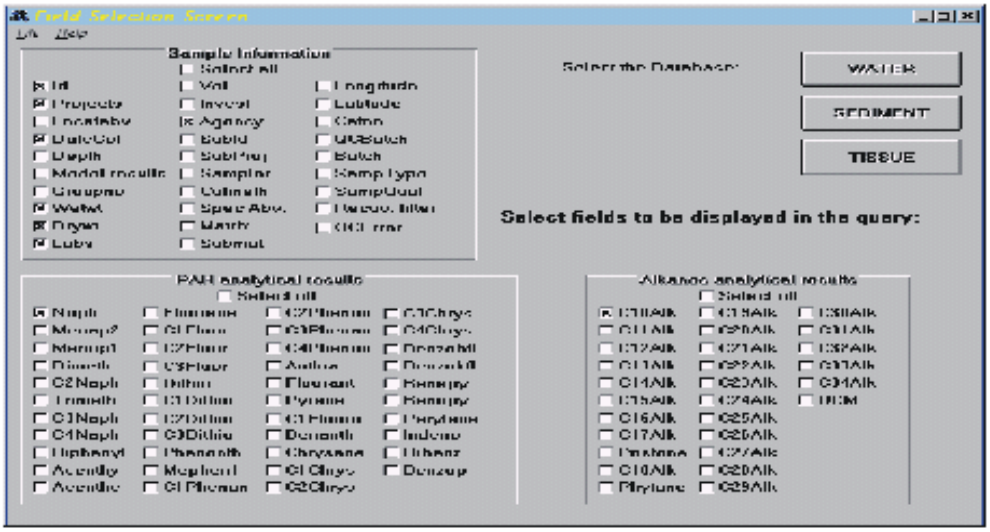
Figure 1

DETAILED INSTRUCTIONS FOR MAKING QUERIES

I. Select fields then matrix type from the Field Selection Screen

The field selection screen (Figure 2) is the first screen to be activated after the welcome screen. The data are grouped into three sections (Sample Information, PAH and Alkane analytical results). Field names can be selected or deselected by clicking on the box to the left of the field name. An entire group within a category is selected by choosing the "select all" box. Complete descriptions of the sample collection fields are found in Table 1 and hydrocarbon names and their field abbreviations in Table 2.

Sample Query: What are the concentrations of naphthalene (Naph) and n-decane (C10Alk) in mussel samples collected on Knight Island (including agency, projects and date collected information). Only concentrations above the method detection limits (MDL) are desired.



Step 1. Select appropriate* fields from the sample information and analytical results boxes.

Step 2. Click on the tissues hot button.

Figure 2

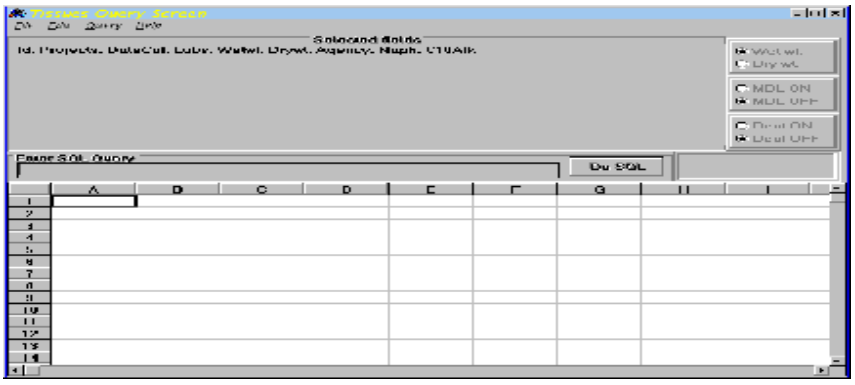
☞ The selection of fields chosen can be saved to a file *before* clicking on the matrix hot button and retrieved for future use by selecting File - Save from the menu bar. Saved files are retrieved by using the File - Load menu bar options.

☞ Conditions for queries can use any fields, and are not limited to the fields checked off on the Field Selection Screen.

*In order to use the MDL option the following columns in the Sample Information box ***must*** be selected: labs, wetwt, drywt (and volume for water samples). Data are initially returned as wet weights and are converted to dry weights by choosing the dry weight hot button on the tissue query screen (next screen) after the data have been returned. Notice that the location field did not have to be selected in order to have Knight Island samples returned because these conditions can be specified using the query screen.

II. Query specific lines of data using the QUERY SCREEN

The *(Matrix)* Query Screen (Figure 3) indicates which fields were selected in the Field Selection Screen. To view all the data representing this matrix click without specifying any conditions, select the "Do SQL" button. To see a subset of the data, you must build a conditional statement.



Query Screen

Figure 3

☞ If you need to change your field selections once you reach the query screen**,** select the Query - Select New Columns option on the Query Screen tool bar and you will return to the Field Selection Screen.

A condition statement contains a field expression (e.g. SPECABV) linked to a value expression ('MUSS') by an operator (=, >, <, >=, <=, <>). A more complicated statement can be created by linking a series of conditions with connectors (and, or). (SPECABV = 'MUSS' is the expression which represents : species = mussels).

In our example, mussels collected from Knight Island, the conditional statement must contain LOCATABV (field name for location, see Table 1) = 'KNIGI' (the abbreviation for the Knight Island see Table 4) and SPECABV = 'MUSS' (the abbreviation for mussels, see Table 8).

The condition statement can be constructed two ways: (1) clicking on Query from the menu bar and choosing the Query Builder or (2) typing in the conditional statement using SQL in the "Enter SQL Query" box and then clicking the "Do SQL" hot button.

Make the query by building the condition statement

Option 1: Building conditional statements with Query Builder option

Selecting Query Builder from the Query option on the tool bar at the top of the (*Matrix*) Query Screen initiates the query builder. A "Conditions" pop-up window (Figure 4) appears which contains a series of boxes (Connector, Field Expression, Operator, Value Expression) along the bottom. Type in an expression or use the button inside the box to choose from a pick list of valid column names, operators, or values to build the conditional statement.

You **must** click "insert" after entering each condition which causes the condition to be seen in the top box of the screen. The program automatically includes the default connector "and" between statements.

When you have finished typing in all conditions, click on OK (a hot button in the top right hand of the screen) to activate the query. Notice the default condition statement "qcerror = 'GOOD'" is automatically built into every query (see Table 1).

Conditions screen used when building a query with the Query Builder tool bar option.

Figure 4

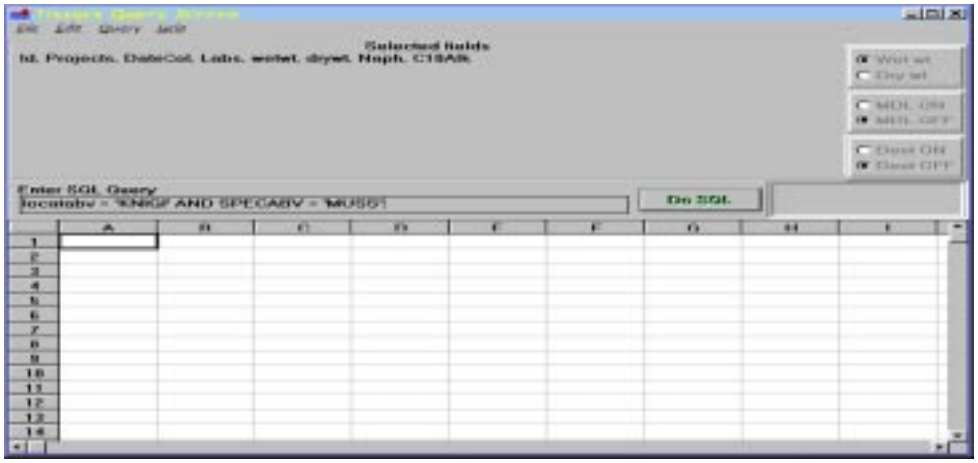
The Delete and Add Function keys are used in conjunction with the mouse to edit queries, or to create complex nested queries.

☞ In order to specify the tissue species (such as mussels) in your query, you *must* use the field selection **SPECABV** (= 'MUSS') from the list in Table 8.

Option 2: Building conditional statements with SQL

The SQL option completes a SQL command "select ... from .... where " that began when the fields were chosen on the Field Selection Screen. You only need to complete the command by entering the conditions in the "Enter SQL Query" box, and then clicking on the "Do SQL" hot button. The SQL string comparison routines are case sensitive so value expressions must be *uppercase* and enclosed in *single* quotes and dates must be enclosed in curly braces, {}. The SQL text can contain numerous comparisons, concatenated with 'and' & 'or' as well as hierarchical parentheses placed between and among the 'and' & 'or'.

Enter the SQL statement: **LOCATABV = 'KNIGI' AND SPECABV = 'MUSS'**



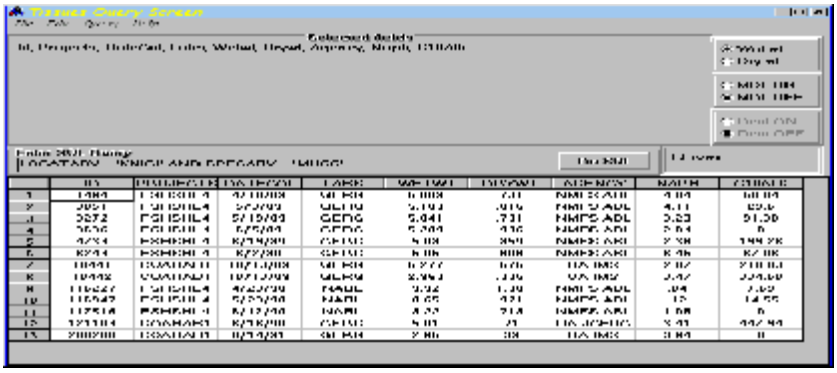
Select the "Do SQL" hot button to activate the query.

Figure 5

☞ Writing the SQL conditional statement requires the user to have an understanding of the value expressions of Table 1 and Table 2.

☞ SQL commands entered in the SQL query box, can be copied to the Windows clip board by first highlighting the command, then clicking on Edit in the menu bar at the top of the screen and file save options.

Once the select statement has been generated using either query method, data are returned in the grid part of the query screen (Figure 6) with defaults: wet weight, MDL OFF and Deut OFF.



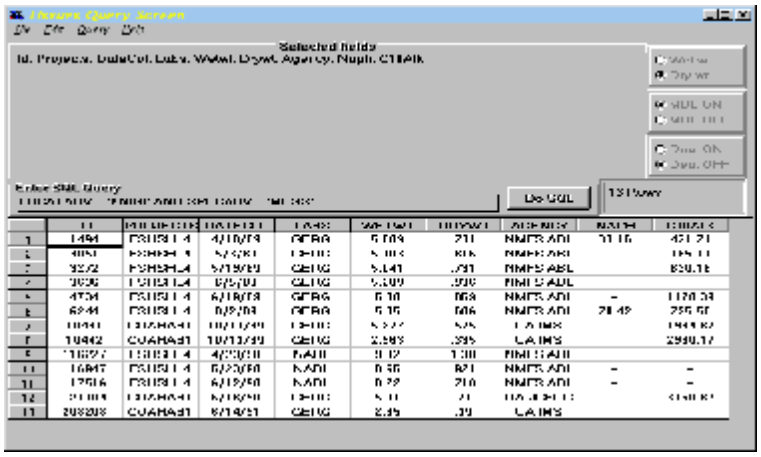
Query results appear on the grid.

Figure 6

☞ The grid screen returns 9 fields of view and 14 lines of data at a time. Additional fields and lines can be scrolled through with arrow keys which appear along the margins of the grid.

III. Modify query results with Method Detection Limit (MDL) Filter

This filter is designed to identify analytical results that are below the MDL value (which is unique to each analyte, sample and lab); results below this value may be unreliable. The analyte concentrations are initially reported on a wet weight basis (ng/g wet weight), and the MDL filter can be applied to data reported on a wet or dry weight basis.



☞ To use this option, you must select wt, drywt, labs, & vol (for water matrix) when selecting fields in field selection screen.

Values below MDL are reported as "-" (Figure 7).

Figure 7

☞ Note that once MDL filter is turned on, it cannot be switched off and the data can no longer be converted between wet and dry weight. So if the dry weight basis is desired, click dry wt. *first*, then MDL *second*.

Deuterated Recovery Filter

When groups of samples are analyzed in the laboratory, surrogate standards are included which contain known amounts of deuterated hydrocarbons. These are included in order to correct for changes in analyte concentration caused by preparation for analysis in the lab. A "perfect" analysis gives 100% recovery of deuterated surrogate samples. This filter identifies samples whose estimated recoveries range between 30 - 150% range which indicates an acceptable analysis. The deuterated hydrocarbons are identified by the "d" at the end of the analyte name. They are automatically reported when Recov. Fil option is selected from the Field Selection screen. Values outside of the acceptable range are returned as 'A'. This option is primarily used by analytical chemists only.

IV. Exporting Query Results

After viewing the data in the grid you may decide to refine your query, or save the results to some other software. Another query can be initiated at any time, and the new results will overwrite the data in the grid. To save the results, or any subset to some other software, highlight the grid area you want to save (Figure 8) and select Edit - Copy option from the menu bar. The data are now copied to the Windows clipboard and they can pasted into other software packages.

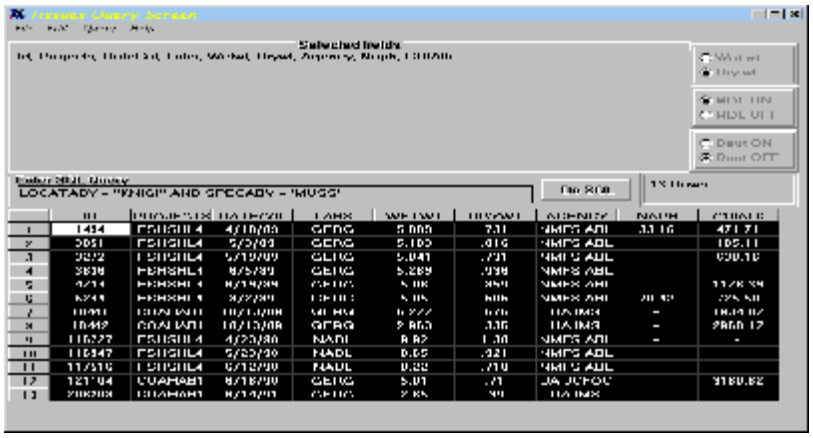


Figure 8

Data highlighted, ready to copy and paste to another software package.

☞ Note you can quickly select the whole grid by clicking on the button located above the row number 1 (just to the left of the column heading ID in Figure 8).

COMPLEX QUERY & INTERPRETING MODEL RESULTS

Only samples that had concentrations of 14 selected PAH (see Table 2) above MDL were evaluated for PAH source by fitting the analytical data to two different models. The two potential sources of PAH were *Exxon Valdez* oil (EVO), and naturally occurring "background". Complete description of the models used to identify sources of PAH are found Short et al. (1996b). The PAH source identification procedure produces a set of parameters **(W**, **OilConc**, **MSEoil**, **pOil**, **MSEbgrnd**, and **pBGRND**) for each sample that are reported when **Model Results** is selected from the Field Selection Screen. Samples that were fit to the PAH source models have values for each of these parameters, otherwise the value for each of them is set to missing (-99). Viewing the model results provides a means of identifying the source of the PAH in the sample.

☞ Samples that have been evaluated to determine hydrocarbon source are easily identified in queries by making sure that **W** is not equal to -99. The operator for not equal is: "<>".

Sample Query: The following example identifies the sediment samples collected from Knight Island that were modeled to determine the PAH source and located either above mean low tide, or deeper than 40m. You can see from the field selection screen (Figure 9) that we want to see the **id, depth**, **groupno** and **model results** for each of requested sediment samples.

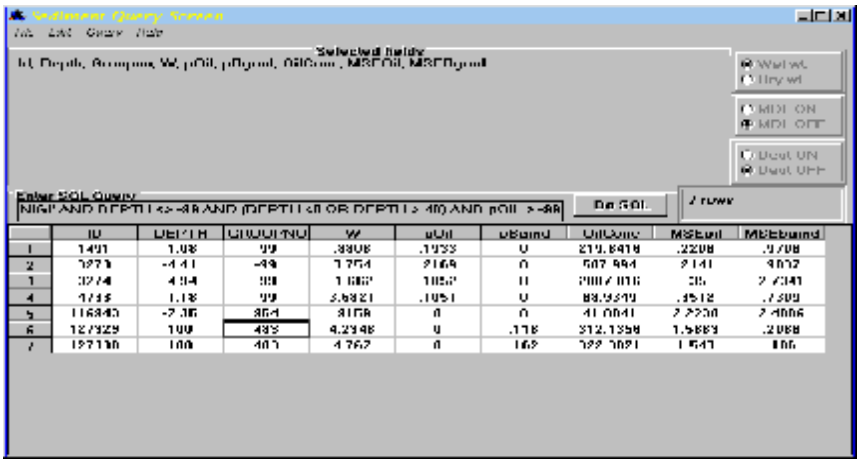
Figure 9

Field Selection Screen for query using oil model results.

The conditional statement entered into the "Enter SQL Query" box is :

LOCATABV = 'KNIGI' AND DEPTH <> -99 AND (DEPTH <0 OR DEPTH >40) AND W <>-99

The database returns 7 rows of data (Figure 10), 5 rows with depths < 0 m and 2 collected from 100 m. Since the 2 deeper samples have the same **groupno** we conclude that they are replicate samples, thus their analytical results can be combined to calculate coefficients of variation for each result. Sample 116943 is also replicated, but its replicates could not be modeled.



Oil model results.

Figure 10

Viewing **pOil** and **pBgrnd** (Figure 10) reveals that the source of the PAH in 4 of the shallow samples is most likely EVO, the PAH in the 2 deep samples is most likely from "background" sources, and the source of PAH in sample 116943 is unknown.

In technical terms, the value for **pOil** is the probability of committing a Type I error: that is, the chances of being wrong when concluding that the PAH in the sample are derived from a source other than EVO. This means that values of **pOil** reflect how well the pattern of PAH in the sample fit the pattern for the model of weathered oil, with the best fitting samples having a pOil equal to 1.0. The lowest value for pOil that indicates consistence with EVO depends on your willingness to commit a Type I error. The values for pBgrnd are interpreted the same way, only they reflect how well the pattern of PAH in the sample matches the model for the pattern in the "background" source.

The PAH source identification procedure for EVO produces two more values that are also important. **W** tells you how weathered the oil was when the sample was collected, and **OilConc** is an estimate of the initial concentration of the oil (micrograms of oil per gram of matrix: µg oil/g matrix) that contaminated the sample. These values only have meaning if the sample is contaminated with EVO. Weathering is a generic term for the physical processes that alter the composition of oil. Values of **W** average from near zero for un-weathered oil to larger positive values for EVO that is progressively more weathered. Highly weathered oil has almost no alkanes, and only the heaviest of the PAH remaining. Since the toxicity of oil decreases as it weathers, **W** can be used as an index of the toxicity of the oil in the sample.

MSEoil is the mean squared error between the sample and the EVO weathering model; it is compared with a distribution of **MSEoil** derived from a laboratory weathering experiment to determine **pOil.** Similarly, **MSEBgrnd** is the mean squared error between the sample and the "background" model.

USING SAVED SETTINGS AND SPECIFYING SAMPLES BY REGION

This example shows how to querying data selected from sampling locations within a geographic region, and also shows you a short-cut method of selecting the necessary columns needed for calculating total PAH values for each sample. The specific objective of the query is to compare the model results with the observation of total PAH in sediment samples collected along the southeast coast of Knight Island.

1. Select analytes to calculate total PAH

First, select the necessary analyte and sample information fields from the Field Selection Screen. EVTHD includes a field selection file that automatically selects the 40 analyte fields from the PAH analytical results section which are used to calculate the sum of the PAH values (total PAH) for the selected samples. To activate this option, select File, then Load Settings from the Field Selection Screen. Then highlight the file "totpah.sel" from the pop-up window (Figure 11).

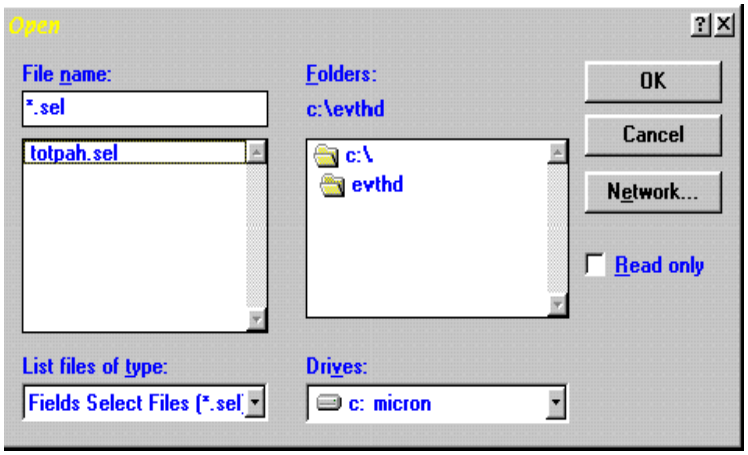


Figure 11

Pop-up window for selecting file for total PAH settings. This is activated from the Field Selection Screen

Click on the OK button and you will notice that several fields have been selected in both the Sample Information and PAH Analytical Results boxes (Figure 12).

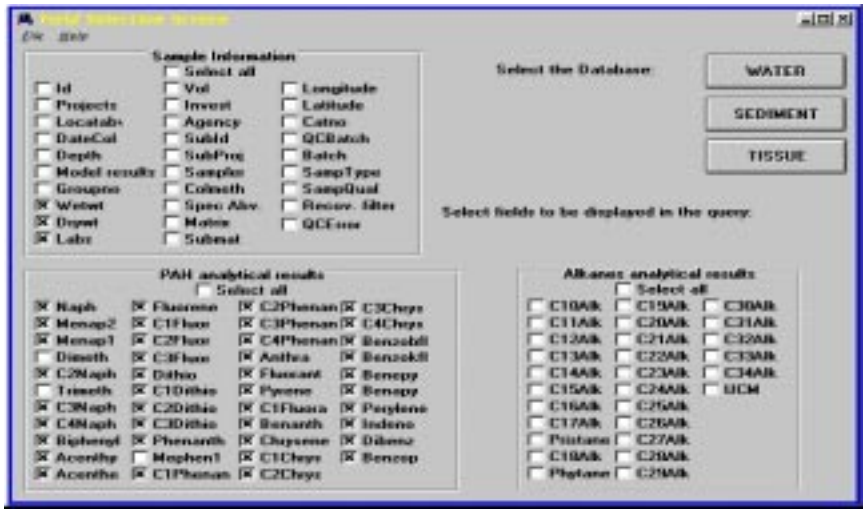


Figure 12

Fields automatically selected by activating the totalpah.sel file from Field Selection Screen.

☞ You can adjust the selections in the Sample Information Box to suit your needs, but to obtain values for total PAH consistent with values found in Trustee Reports, *you should not change the selections in the PAH Analytical Results box.*

2. Adjust the fields selected in the Sample Information box.
In this example we are also selecting the following sample fields: **id, locatabv, and model results** (not shown in Figure 12).

3. Select database hot button. (This example uses the Sediment data).

4. Describe geographic region boundaries using latitudes and longitudes & activate query.
EVTHD is text based, so the most complicated regions that can be easily identified are rectangular. Regions with irregular shapes are better identified with a geographic information system (GIS).* Identify the boundaries by reading them off of a map, and enter the limits into either Query Builder or the Enter SQL Query box. Later versions will have a built in map.

*The EVOS Research and Restoration CD includes EVTHD and the Trustee GIS for identifying locations in PWS. If you have the CD the GIS can be started by selecting Map from the menu bar on the Sediment Query Screen and selecting "GIS". Queries in the Trustee GIS will provide you with a list of sample id's found in the region you defined (see documentation for the Trustee GIS for details). Highlight the id's, copy them to the Windows clipboard. Edit the id's into the following command: ID IN (id1, id2, id3, ...). Copy this command from the Windows clipboard to the "Enter SQL Query" box and click on the "Do SQL" hot button, EVTHD will return the data that you requested on the Field.

The latitudes and longitudes that bound southeast Knight Island are identified in the following query statement which should be entered into the "Enter SQL Query" box:

lat < 60.267 and lat > 60.13 and long < 147.7 and long > 147.5 (Figure 13).

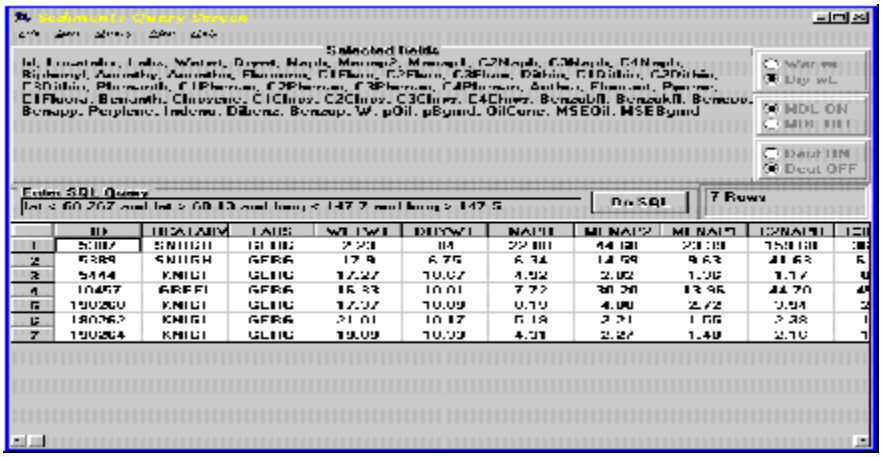


Figure 13

Example: SQL command for area which bounds Knight Island and returned data for example.

5. Convert data to dry weights, select the MDL filter option and export data to a spreadsheet. EVTHD returns 7 rows of data.

6. Calculate the value for total PAH by summing the concentrations of all the analytes in your spreadsheet across each row.

The table below (Figure 14) displays a summary of the data. The analyte concentrations have been summed for each row and the results displayed in the column labeled TotPAH, the contributing analyte concentrations as well as values for **LABS**, **WETWT**, and **DRYWT** have been deleted for simplicity's sake.

ID	LOCAT ABV	Total PAH	W	POIL	PBGR ND	OIL CONC	MSE OIL	MSEB GRND
5387	SNUGH	3999.29	1.4256	0.1814	0	618.7376	0.2247	0.9281
5389	SNUGH	1000.05	3.8743	0.099	0.018	347.2358		0.3307
5444	KNIGI	53.17						0
10457	GREEI	688.05	3.6753	0.0139	0.07	221.3779	0.9299	0.2673
190260	KNIGI	94.03						0
109262	KNIGI	21.29						0
190264	KNIGI	58.61						0

Figure 14

Note: samples collected from southern Snug Harbor (SNUGH) and Green Island (GREEI) have relatively large amounts of PAH that are apparently derived from *Exxon Valdez*.

Literature Cited

Short, J.W., T.L. Jackson, M.L. Larsen, and T.L. Wade. 1996a. Analytical Methods Used for the Analysis of Hydrocarbons in Crude Oil, Tissues, Sediments, and Seawater Collected for the Natural Resources Damage Assessment of the *Exxon Valdez* Oil Spill. Pages 140 - 148 in S. D. Rice, R. B. Spies, D.A. Wolfe, and B. A. Wright, editors. Proceedings of the *Exxon Valdez* oil spill symposium. American Fisheries Society Symposium 18.

Short J. W., R.A. Heintz and B.D. Nelson. 1996b. Hydrocarbon Data Analysis, Interpretation, and Database Maintenance for Restoration and NRDA Environmental Samples Associated with the *Exxon Valdez* Oil Spill State/Federal Natural Resource Damage Assessment Final Report (Subtidal Study Number 8), National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Auke Bay Laboratory, Juneau, Alaska.

Table 1. Field names and descriptions for sample collection fields in Exxon Valdez Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database (EVTHD).

FIELD NAME	DESCRIPTION
Id	Unique identifier assigned to each sample by the database manager used to track collection and analytical information for each sample. These are assigned in blocks depending on the date of collection (except samples collected by U.S. Fish & Wildlife Service which have numbers between 20000 and 29999.) Samples collected in 1989 have ID numbers between 1000 - 20000 & 30000 - 39999; begining in 1990 ID numbers are between 100000 - 199999, consecutivley 1991 ID numbers are between 200000 - 299999 ect.
Projects	Abbreviated names for *Exxon Valdez* Trustee Natural Resource Damage Assessment and Restoration projects, descriptions are found in Table 3.
Locatabv	Location abbreviation of sample collection site. Table 4 provides complete names along with latitude and longitudes for each abbreviation. Note: on the "Field Selection Screen" this field is referred to as "Location".
DateCol	Date sample was collected
Depth	Depth, in meters, where the sample measured are from Mean Lower Low Water (MLLW) but may be measured, or estimated by the sample collector. Depths are negative, i.e. -.66, above MLLW and positive, i.e. 1, below MLLW.
Model Results	The following field names appear in the "Selected Fields Box" when Model Results is selected on the "Field Selection Screen" (SQL commands should refer to the field names directly). The fields relate to the procedure used to evaluate samples for the presence of Exxon Valdez crude oil (EVO). Only a subset of samples that contained sufficient PAH to be analyzed by the procedure have results. The same subset of samples were also analyzed to determine how well they matched the natural PAH pattern. The specific PAH used for both models are highlighted in Table 2. Consult Short et al. (1996b) for details on the evaluation procedures. The results of the analyses are found in the fields listed below.
pOil	The probability that the hydrocarbons in the sample are derived from EVC. This number is obtained by comparing **MSEoil** to a distribution of mean squared errors for a set of experimentally weathered samples. It is a measure of the probability of Type I error when the null hypothesis is that the PAH pattern is consistent with the pattern in similarly weathered EVO. Samples with **pOil** = 1.0 are contaminated with EVO while samples with **pOil** < 0.01 are not likely to be contaminated with EVO.

Table 1, continued.

FIELD NAME	DESCRIPTION
Model Results(continued)	
pBgrnd	The probability that the hydrocarbons in the sample are derived from a natural geological source. This number is obtained by comparing **SSQbgrnd** to distribution of sums of squared errors for a set of samples collected in Constantine Harbor. Hydrocarbons in samples with **pBgrnd** = 1.0 are derived from the natural source while hydrocarbons in samples with **pBgrnd** < 0.01 are not likely to be derived from this source.
W	A value that indexes how "weathered" the oil in the sample is. Weathering refers to the process by which oil degrades. The oil in samples collected from disparate locations at different times but with equal values for **W** has degraded to the same degree. Since the toxic effects of oil persist as long as the oil is in the environment, **W** provides a measure of relative toxicity. Values for W range from near zero to 10. Lower values indicate relatively fresh and more toxic oil while greater values indicate more degraded and less toxic oil. **This value only has meaning for samples that are considered to be contaminated with EVO.**
OilConc	The estimated initial concentration of oil in the sample. The PAH evaluation technique for EVO estimates the initial concentration of oil in the sample prior to weathering by assuming that the concentrations of some PAH are invariant with time. Assuming the sample is contaminated with EVO, the initial concentration of unweathered oil in the sample is given as micrograms of oil per gram of matrix (µg oil/g matrix).
MSEoil	The mean squared error between the sample and a hypothetical sample of oil weathered to the same value of **W**.
MSEoil	This statistic measures the agreement between the sample and a hypothetical sample of oil weathered to the same state, and is compared to a distribution for **MSEoil** derived from a laboratory study (Short et al. 1996b).
MSEBgrnd	The mean squared error between the sample and the environmental sample collected from Constantine Harbor with the median value for total PAH. The PAH signature in Constantine Harbor is the archetype for the natural back ground pattern of PAH (Short et al. 1996b). This statistic measures the agreement between the sample and this archetype.

Table 1, continued.

FIELD NAME	DESCRIPTION
Model Results(continued)	
Groupno	Arbitrary number assigned to associate replicate samples (samples qualifying as replicates were collected at the same time and location) that can be used to evaluate data variability.
WetWt	Wet weight of the sample (g).
DryWt	Dry weight of the sample (g).
Labs	Abbreviation for the analytical laboratory conducting hydrocarbon analysis. NABL - Auke Bay Laboratory - National Marine Fisheries Service GERG - Geochemical Environmental Research Group - Texas A&M Univ.
Vol	Volume (ml) of the water sample.
Invest#	Alphanumeric identifier assigned to a sample by the field personnel.
Agency	Agency responsible for collecting the sample (Table 3)**.**
Subid	Identifier assigned by sample collector or number assigned to samples composited after archival.
SubProj	Coastal Habitat 1 damage assessement project agency code or restoration project numerical identifier.
Sampler	The last name of the individual responsible for the collecting, handling and the security of the samples in the field.
ColMeth	Method used to collect the sample (Table 6).
SpecAbv	Species abbreviation used for tissue samples (Table 8).
Matrix	Sample type: seawater, sediment, tissue.
SubMat	Specific additional information about matrix (Table 7).
Long	Longitude in decimal degrees calculated for the degrees, minutes and seconds, i.e. ((LONG. Degrees)+(LONG. Minutes/60)+LONG. Seconds/3600)) assigned by sample collector.

Table 1, continued.

FIELD NAME	DESCRIPTION
Lat	Latitude in decimal degrees calculated from the degrees, minutes and seconds, i.e. ((LAT. Degrees)+(LAT. Minutes/60)+LAT. Seconds/3600)) assigned by sample collector.
CatNo	Alphanumeric identifier used to track groups of samples released by the database manager to a chemistry laboratory for analysis. Catalogs may be processed separately in different batches (see "QCBatch" below).
QCBatch	Identifier supplied by the analytical laboratory used to track batches of samples which were analyzed together.
Batch	An alphanumeric identifier used for tracking samples stored in the custodian's freezer. The code reflects the year (i.e. 89, 90, etc.) and the originating agency (V or R = NOAA, F = Fish&Wildlife Service).
SampType	Identifies the type of sample: ENV = environmental, EXP = laboratory.
SampQual	Describes the quality of the sample upon receipt by the custodians. Inappropriately collected, documented, or damaged samples are identified with one of the following codes.
SampQual	This code combines the total time the sample has not been in a freezer since its collection with a letter code from the following list. 00# - Hours until sample was frozen (ex. 006 = 6h until frozen) A Archival Sample BF Arrived at archival facility broken BL Arrived at analytical facility broken D Sample questionable DE Decomposing sample F Sample not acceptable - excessive time for processing IS Insufficient sample for analysis ND Sample destroyed during analysis NO Analysis not possible for other reasons P Sample poorly labeled PQ Sample partially thawed but still cold with ice crystals Q Sample thawed in transit S Sample subsectioned immediately prior to analysis T Sample thawed, subsectioned, then frozen

Table 1, continued.

FIELD NAME		DESCRIPTION
SampleQual (continued)	X	Improper sample
	Example:	A field sample that was taken 6 hours before it was frozen then thawed during a 12 hour transit to the archival facility would receive a code of Q018 (Q = sample thawed in transit and 6h + 12 h = 18 hours).
QCERROR		Identifier of reliability of the analytical results for individual samples. GOOD = No problems with analytical data BIAS = Probable problems with analytical data (Short et al. 1996b).

Table 2. Hydrocarbon names and field name abbreviations found in the Exxon Valdez Oil Spill of 1989: State/Federal Trustee Council Hydrocarbon Database (EVTHD). All hydrocarbon results for tissues and sediments are reported in concentrations of ng of hydrocarbon/g of matrix (wet weight). Results for hydrocarbon analyses of water are reported in ng hydrocarbon per liter of water (ng/L). PAH used to evaluate samples for the presence of EVO are highlighted in **BOLD**.

HYDROCARBON NAME	**FIELD NAME**
Polynuclear Aromatics (PAH)	
Naphthalene	Naph
2-Methyl-Naphthalene	Menap2
1-Methyl-Naphthalene	Menap1
2,6-Dimethyl-Naphthalene	Dimeth
C2-Naphthalenes	C2naph
2,3,5-Trimethyl-Naphthalene	Trimeth
C3-Naphthalenes	**C3naph**
C4-Naphthalenes	**C4naph**
Biphenyl	Biphenyl
Acenaphthylene	Acenthy
Acenaphthene	Acenthe
Fluorene	Fluorene
C1-Fluorenes	C1fluor
C2-Fluorenes	**C2fluor**
C3-Fluorenes	**C3fluor**
Dibenzothiophene	Dithio
C1-Dibenzothiophenes	**C1dithio**
C2-Dibenzothiophenes	**C2dithio**
C3-Dibenzothiophenes	**C3dithio**
Phenanthrene	Phenanth
1-Methyl-Phenanthrene	Mephen1
C1-Phenanthrenes	**C1phenan**
C2-Phenanthrenes	**C2phenan**
C3-Phenanthrenes	**C3phenan**
C4-Phenanthrenes	**C4phenan**
Anthracene	Anthra
Fluoranthene	Fluorant
Pyrene	Pyrene
C1-fluoranthenes	C1Fluora
Benzo-a-anthracene	Benanth
Chrysene	**Chrysene**
C1-Chrysenes	**C1chrys**
C2-Chrysenes	**C2chrys**
C3-Chrysenes	C3chrys
C4-Chrysenes	C4chrys
Benzo-b-fluoranthene	Benzobfl
Benzo-k-fluoranthene	Benzokfl
Benzo-e-pyrene	Benepy

Table 2, continued.

HYDROCARBON NAME	FIELD NAME
Polynuclear Aromatics (PAH), Continued.	
Benzo-a-pyrene	Benapy
Perylene	Perylene
Indeno(1,2,3-c,d)pyrene	Indeno
Dibenzoanthracene	Dibenz
Benzoperylene	Benzop
Alkanes	
n-Decane	C10alk
n-Undecane	C11alk
n-Dodecane	C12alk
n-Tridecane	C13alk
n-Tetradecane	C14alk
n-Pentadecane	C15alk
n-Hexadecane	C16alk
n-Heptadecane	C17alk
Pristane	Pristane
n-Octadecane	C18alk
Phytane	Phytane
Nonadecane	C19alk
n-Eicosane	C20alk
n-Heneicosane	C21alk
n-Docosane	C22alk
n-Tricosane	C23alk
n-Tetracosane	C24alk
n-Pentacosane	C25alk
n-Hexacosane	C26alk
n-Heptacosane	C27alk
n-Octacosane	C28alk
n-Nonacosane	C29alk
n-Triacontane	C30alk
n-Hentriacontane	C31alk
n-Dotriacontane	C32alk
n-Tritriacontane	C33alk
n-Tetratriacontane	C34alk
Unresolved Complex Mixture	UCM
Deuterated Acenaphthene	Acend10
Deuterated Phenanthrene	Phend10
Deuterated Chrysene	Chryd12
Deuterated Perylene	Peryd12
Deuterated Naphthalene	Naphd8
Deuterated n-Dodecane	C12Alkd
Deuterated n-Hexadecane	C16Alkd
Deuterated n-Eicosane	C20Alkd
Deuterated n-Tetracosane	C24Alkd

Table 2, continued.

HYDROCARBON NAME	**FIELD NAME**
Dueterated Surrogates (Recovery Filter)	
Deuterated Triacontane	C30Alkd
Deuterated Benzo-a-pyrene	Benad12

Table 3. Abbreviated project names (PROJECTS) and descriptions for Natural Resource Damage Assessment and Restoration Projects contributing samples to EVTHD. Detailed descriptions and listings of investigator's names and addresses can be found in the documents listed at the end of this table.

Natural Resource Damage Assessment Projects

PROJECTS	**DESCRIPTION OF THE PROJECT**
AIRWAT2	Petroleum hydrocarbon induced injury to subtidal marine sediment resources
AIRWAT3	Geographic and temporal distribution of dissolved and particulate petroleum hydrocarbons in the water column
BIRD 1	Beached bird survey to assess injury to water birds
BIRD3	Population surveys of seabird nesting colonies in Prince William Sound (PWS) and outside coast of the Kenai Penninsula, the Barren Islands
BIRD4	Assessment of bald eagles
BIRD5	Assessment of Peale's peregrine falcons
BIRD6	Assessment of abundance of marbled murrlets
BIRD7	Assessment of fork-tailed storm petrel reproduction
BIRD8	Assessment of blacklegged kittiwakes reproduction
BIRD9	Assessment of pigeon guillemots reproduction
BIRD11	Assessment of sea ducks
BIRD12	Assessment of injury to shorebirds staging and nesting in rocky intertidal habitats
CHENEGA	
COAHAB1	Prespill/postspill concentrations of hydrocarbons in sediments and mussels
FSHSHL1	Salmon spawning area injury
FSHSHL2	Injury to salmon eggs and pre-emergent fry in PWS
FSHSHL4	Impact of oil spill on juvenile pink & chum salmon & their prey
FSHSHL11	Injury to herring
FSHSHL13	Injury to clams
FSHSHL14	Injury to crabs
FSHSHL15	Injury to shrimp
FSHSHL16	Injury to oysters
FSHSHL18	Impacts of oil spill on bottomfish & shellfish in PWS
FSHSHL22	Injury to crabs outside PWS
FSHSHL24	Demersal fish injury
FSHSHL25	Scallop mariculture injury
FSHSHL26	Sea urchin injury
KATALLA	
MARMAM1	Assessment of humpback whales in PWS, SE Alaska and Kodiak Archipelago
MARMAM2	Assessment of killer whales in PWS, Kodiak and Southeastern Alaska
MARMAM4	Assessment of steller sea lions in Gulf of Alaska
MARMAM5	Assessment of harbor seals in PWS & adjacent areas
MARMAM6	Assessment of impacts on Sea Otter populations in spill zone
MARMAM7	
PSTOX	
RHERR	

Table 3, continued.

Restoration Project List

PROJECTS	DESCRIPTION OF THE PROJECT
RHERR95	
RARCH	Effects of contamination of crude oil on archaeological sites in the Gulf of Alaska
RDH	Harlequin duck assessment
RMB	Recovery monitoring of intertidal oiled mussel beds
RSLA	Shoreline assessment
RSUB	Subtidal monitoring of the recovery of sediments & eelgrass communities
TERMAM1	Assessment of Sitka black-tailed deer in PWS
TERMAM4	Assessment of brown bear populations in PWS
TERMAM6	
THOMAS	

The following documents provide descriptions of all the projects listed above, these descriptions include the name of the investigators and their associated agencies, as well as sampling designs and objectives. They can be obtained from:

Oil Spill Information Office
645 G. Street
Suite 401
Anchorage, AK 99501-3451
Phone in Alaska: 1-800-478-7745
Phone outside Alaska: 1-800-283-7745
Email ospic@calvino.alaska.net
Web Site http://www.alaska.net/~ospic/

State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill. August 1989.

The 1990 State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill. Vol I: Assessment and Restoration Plan Appendices A, B, C

The 1991 State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill. Vol I: Assessment and Restoration Plan Appendices A, B, C

Exxon Valdez Oil Spill Restoration. Volume II. 1992 Draft Work Plan. April 1992.

Exxon Valdez Oil Spill Restoration. 1993 Final Work Plan. July 1993.

Exxon Valdez Oil Spill Restoration. Draft 1994 Work Plan. (With Brief Project Descriptions) December 1994.

Fiscal Year 1995 Work Plan. December 1994.
Draft Fiscal Year 1995 Work Plan. Supplement Volume I. Brief Project Descriptions.

Table 4. Location abbreviations (LOCATABV), site names, latitude and longitude for sampling sites for samples in EVTHD. Latitudes and longitudes are expressed in decimal degrees, minutes and seconds, i.e. ((Long. degress) + Long. minutes/60) + long seconds/3600)) as assigned by the sample collector.

Cr = Creek B = Bay I = Island L = Lake R = River Pa = Peninsula

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
106GL	Gladhough Cr	60.88617	146.6912
107BL	Black Cr	60.90733	146.7223
115MI	Millard Cr	60.9215	146.588
116DU	Duck R	60.92472	146.5911
117IN	Indian Cr	60.95284	146.6238
11HU	Humpy Cr	60.60833	145.6733
120DO	Donaldson Cr	60.98717	146.6888
121LE	Levshakoff Cr	61.02133	146.6395
122NN	No Name Cr	61.01983	146.6097
123GR	Gregorieff Cr	61.0185	146.6018
131GO	Gorge Cr	60.67167	146.4883
133SA	Sawmill Cr	61.084	146.43
143SI	Siwash Cr	60.95833	147.6833
153ST	Stellar Cr	61.05167	146.8058
19TL	Twin Lakes Cr	60.6355	145.8052
213BE	Bench Mark Cr	60.99267	147.2043
214LO	Long Creek	61.00783	147.222
216VA	VanIhing Cr	60.99166	147.2752
21RO	Rogue Cr	60.64611	145.8086
221EI	Eickelberg Cr	60.9325	147.3283
224BA	Backyard Cr	60.90028	147.3794
229CE	Cedar Cr	60.97267	147.3703
234WE	Wells R	60.02667	147.4088
258JO	Jonah Cr	61.01222	147.6744
259JO	Johah Cr	60.00733	147.6712
264SI	Siwash R	60.95861	147.6814
265UN	Unakwik Cr	60.95028	147.6122
276BL	Black Bear Cr	60.90333	147.705
278CO	Comeback Cr	60.92283	147.7317
282GO	Good Cr	60.93567	147.7422
283BA	Bad Cr	60.92017	147.7523
303TR	Triple Cr	60.90167	147.9317
307VI	Village Cr	60.93056	148.0305
35KO	Koppen Cr	60.70417	145.8918
370CH	China Poot Cr	59.3323	151.25
37AL	Allen Cr	60.66917	146.0225
414HA	HarrIon Cr	60.98833	148.1907
41PA	Pass Cr	60.65983	146.2087
421MI	Mill Cr	60.95233	148.3235
424OL	Old Cr	60.90667	148.3083

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
425HU	Hummer Cr	60.85633	148.309
428PI	Pirate Cr	60.85667	148.3043
430ME	Meacham Cr	60.8565	148.3867
432SW	Swanson Cr	60.8425	148.406
450TE	Tebenkoff Cr	60.754 17	148.4733
454HA	Halferty Cr	60.7175	148.4139
455PA	Paulson Cr	60.70111	148.3953
469WI	Wickett Cr	60.6865	148.2833
46CO	Comfort Cr	60.706	146.075
479CU	Culross Cr	60.624	148.2033
480MI	Mink Cr	60.59167	148.2517
484EF	E. Finger Cr	60.55967	148.338
485WF	W. Finger Cr	60.591	148.3912
48BE	Beartrap R	60.78617	146.97
493MO	Most Cr	60.5175	148.2244
495CH	ChimevIky L	60.48389	148.1919
498MC	Mcclure Cr	60.4925	148.1685
506LO	LoomI Cr	60.48833	147.9697
507GU	Gumboot	60.47133	147.9902
508SO	Solf	60.4585	148.0517
510EL	ElIhansky	60.45716	148.0703
51OL	Olsen Cr	60.74117	146.1433
52CO	Control Cr	60.74183	146.2208
54CA	Carlsen Cr	60.74183	146.2208
56SM	St. Matthews	60.77433	146.2688
601PA	Paddy Cr	60.40867	148.0925
602NA	Nacktan Cr	60.42667	148.0922
603EW	Ewan Cr	60.40083	148.1706
604ER	Erb Cr	60.40083	148.1706
610KO	Kompkoff R	60.35783	148.2578
611JA	Jackpot Cr	60.355	148.2593
613JA	Jackson	60.32233	148.2723
618ES	E. Shore Chen	60.36967	147.9892
621TO	Totemoff Cr	60.3395	148.0967
623BR	Brizgaloff	60.33694	148.1006
628CH	Chenega	60.3325	148.0119
630BA	Bainbridge Cr	60.20528	148.2964
632CL	Claw Cr	60.21472	148.2092
633PA	Pablo Cr	60.15861	148.2178
637PC	Point Countess	60.225	148.1217
653HO	Hogg Cr	60.08972	148.1844
655JO	Johnson Cr	60.12583	148.1211
656HA	Halverson Cr	60.12833	148.107
663SH	Shelter B	60.125	147.9311

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
665BJ	Bjorn	60.835	147.935
666OB	O'Brien Cr	60.0775	147.9961
673FA	Falls Cr	60.98933	147.9738
677HA	Hayden Cr	60.33633	147.9055
678SB	Sleepy B	60.5095	147.8358
681HO	Hogan B	60.21	147.7581
682SN	Snug Harbor	60.26111	147.77
692HE	Herring B	60.44028	147.785
695DR	Drier B	60.35167	147.7667
699DR	Drier B	60.28333	147.8392
707MA	Macleod Cr	59.89778	147.7375
710HA	Hanning Cr	59.95	147.6889
711QU	Quadra Cr	59.97361	147.6592
739SW	Swamp Cr	60.19167	147.3039
740KE	Kelez Cr	60.20611	147.3667
744WI	Wilby Cr	60.24833	147.22
745WI	Wild Cr	60.24278	147.1972
746SC	Schuman Cr	60.24217	147.1863
747CA	Cabin Cr	60.27222	147.1847
749SH	Shad Cr	60.27833	147.1953
754DR	Dry Cr	60.30433	147.1733
758RO	Rocky B	60.33767	147.139
759RO	Rocky Cr	60.33528	147.1239
76IR	Irish Cr	60.75555	146.4319
770UD	Udall Cr	60.2625	147.0958
774RO	Rosswog Cr	60.27467	147.0265
775PA	Pautze Cr	60.29067	147.0042
788GR	Green Cr	60.28867	147.3717
806DO	Dog Salmon Cr	60.31833	146.5739
80WH	Whalen Cr	60.81833	146.1765
810GA	Garden Cr	60.3385	146.5083
812NU	Nuchek Cr	60.36583	146.4825
815CO	Constantine Harbor	60.37117	146.5882
827CA	Captain Cr	60.45417	146.5667
828CO	Cook Cr	60.45639	146.5342
831DO	Double Cr	60.45972	146.4481
83KE	Keta Cr	60.86806	146.1744
844MA	Makaka Cr	60.4875	146.2686
847HA	Hawkins Cr	60.51445	146.2239
849RO	Rollins Cr	60.51417	146.1144
850CA	Canoe Cr	60.5075	146.0833
851ZI	Zillesenoff	60.54972	146.0211
856WL	W. Lagoon Cr	60.54972	146.0211
857EL	E. Lagoon Cr	60.55695	146.0036

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
861BE	Bernard Cr	60.5555	146.9248
863OR	Orca Cr	60.58333	145.9125
87SU	Sunny R	60.88528	146.2345
89FC	Fish Cr	60.84167	146.3811
92SH	Shale Cr	60.8375	146.407
93KI	Kirkwood Cr	60.83639	146.41
99LA	Lagoon Cr	60.85833	146.5183
AGENC	Agnes Cove	59.76667	149.5733
AGULI	Aguliak I	60.3625	147.8755
ALFI	Alf I	57.39417	153.8533
ALUK	Aluklik Bay	60.02333	148.1333
AMALH	Amalga Harbor	58.49166	134.7889
AMOOP	Amook Passage	57.51667	153.8333
ANCOP	Anchor Point	59.80917	152.2531
ANTOL	Anton Larson	57.86666	152.6283
APPLI	Applegate I	60.35	146.4167
AUGUS	Augustine	59.32967	153.4782
AXELI	Axel I	60.76667	147.7833
BAINI	Bainbridge I	60.01333	148.2667
BAINP	Bainbridge P	60.14333	148.0933
BALBB	Balboa B	55.55667	160.5758
BARNC	Barnes Cove	60.30861	147.7619
BERGB	Berger B	58.33417	150.7333
BERGL	Berg L	60.56917	143.8675
BERRC	Berring R.-Chilkat	60.415	144.1773
BERRL	Berring L	60.32722	144.3372
BERRV	Berring R	60.19333	144.2014
BIGFI	Big Fort I	58.50361	152.4211
BISHR	Bishop Rk.	60.1222	147.9306
BLACB	Black B	59.54111	150.215
BLACL	Black Lagoon	56.41667	158.95
BLIGI	Bligh I	60.83694	146.9169
BLOCI	Block I	60.51783	147.6007
BLONI	Blonde I	60.99861	147.645
BLUEF	Blue Fos B	58.44695	152.6769
BOISL	Bay of Isles	60.36333	147.7
BOSWR	Boswell R	60.41667	146.1
BUSKR	Buskin R	57.75722	152.485
CABIB	Cabin B	60.67528	147.455
CANPA	Canoe Passage	60.53333	146.1333
CCHIN	Cape Chiniak	58.51433	153.9092
CDOUG	Cape Douglas	58.88222	153.2889
CEDAB	Cedar B	60.93333	147.4333
CGULL	Cape Gull	58.235	154.1531

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
CHANI	Channel I	60.24028	147.3792
CHENI	Chenega I	60.26667	148.1
CHIBA	Chiginagak B	56.57	156.46
CHICI	Chicken I	60.045	148.925
CHIEC	Chief Cove	57.70889	153.8997
CHIGB	Chignik B	56.305	158.4047
CHINC	Cape Hinchinbrook	60.2	146.1181
CHISI	Chislwell I	59.65222	149.5617
CHNTN	Chinitna	59.88	152.8967
CHUGI	Chugach I	58.91667	151.95
CHUGB	Chugach B	59.18528	151.6247
CKUNM	Cape Kunmik	56.76667	157.1833
CLAMB	Clam B	60.65028	147.3681
CLAMC	Clam Cove	59.88334	152.9567
CLAMG	Clam Gulch	60.23333	151.4
CNOME	Cape Nome	64.46667	164.95
CNUKS	Cape Nukshak	58.39167	153.9808
COLUG	College Fjord	60.89	147.7617
COLLF	Columbia Glacier	60.65667	147.3733
CONST	Constantine Harbor	60.34889	146.7606
COPRD	Copper R	60.36666	145.1833
COROI	Coronation I	55.95	134.1167
CPROV	E. Amatuli I	58.91667	151.95
CRABB	Crab B	60.07222	147.9972
CRAFI	Crafton I	60.48333	147.9333
CRESR	Cresent R	59.88	152.8967
CULLB	Culross B	60.75	148.1533
CULRI	Culross I	60.66667	148.1667
CULRP	Culross Passage	60.6925	148.2283
CYAKA	C. Yakataga	60.08333	142.5111
DAKAB	Dukauak B	58.04722	154.6478
DAYVI	Dayville	61.08694	146.2778
DEEPB	Deep B	60.58611	145.7833
DEERC	Deer Cove	60.24333	147.8917
DELEI	Delania I	60.33333	148.1167
DISCB	Discover B	58.33917	152.3433
DISKI	Diski I	60.48466	147.6512
DOUBB	Double B	60.45945	146.4692
DOUGI	Douglas I	58.30139	134.6875
DRIEB	Drier B	60.31333	147.82
EAGLE	Eaglek	60.815	147.7183
EKAYI	E. of Kayak I	59.71917	144.0022
ELEAI	Eleanor I	60.53517	147.6083
ELIZI	Elizabeth I	59.16667	151.8333

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
ELLAM	Ellamar	60.88361	146.771
ELRII	Elrington I	59.96667	148.1667
ELRIP	Elrington Point	59.97167	148.1167
ESHAB	Eshamy B	60.44833	147.975
EVANI	Evans I	60.06667	147.95
EWANB	Ewan B	60.40278	148.14
FAIRB	Fairbanks	64.84583	147.7208
FAIRI	Fairmont I	60.88	147.4583
FALLB	Falls B	60.52778	147.987
FLEMI	Fleming I	60.17305	148.0369
FOULB	Foul B	58.31667	152.7667
FOULP	Foul Passage	60.505	147.6533
FOXFA	Fox Farm	59.96667	148.1667
GALEB	Galena B	60.94333	146.64
GEOGB	Geographic B	58.06778	154.4881
GIBBO	Gibbon	60.27111	147.435
GLACS	Glacier Spit	59.86167	153.1417
GOLBA	Norton Sound	64.4	163.00
GOLDC	Gold Cr	61.13472	146.4469
GOOSB	Goose B	60.70467	148.227
GOOSI	Goose I	60.73833	146.7192
GOREP	Gore Point	59.195	150.9717
GRANB	Granite B	60.41472	147.9564
GRAVB	Gravina B	60.60861	146.3031
GREEI	Green I	60.19056	147.9061
GULLI	Gull I	60.725	146.7028
HALLB	Hallo B	58.421	54.0311
HARRB	Harbor I	59.73972	149.8417
HARTB	Hartney B	60.48333	145.9
HAWKI	Hawkins I	60.51667	146.0833
HEATB	Heather B	60.985	147.0222
HELLH	Hells Hole	60.70222	146.3833
HERRB	Herring B	60.38334	147.8533
HERRP	Herring Point	60.44333	147.819
HINCI	HinchinbR I	59.345	146.0175
HORNC	Horn Cr	59.875	153.07
HORSB	Horseshoe B	60.01611	147.9578
ICYP	Icy Point	58.21861	137.4331
IKTUB	Iktua B	60.1	147.9944
INGOI	Ingot I	60.54333	147.6483
ITALB	Italian B	60.21833	147.9014
IVANB	Ivanof B	55.80528	159.478
JAKAB	Jakalof B	59.47	151.5358
JEANC	Jeanie Cove	59.83333	147.5833

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
JOHNC	Johnson Cove	60.06194	147.977
JUNCI	Junction I	60.39167	147.9917
KALSB	Kalsin B	57.62722	152.34
KASHB	Kashvik B	57.90667	155.0703
KATMB	Katmai B	57.88667	155.0917
KATNM	Katmai N.M.	57.95	147.952
KATOS	Katalla Oil Seep	60.18583	144.4192
KETCH	Ketchikan	55.33333	131.65
KIUKP	Kiukpalik	58.58556	153.5542
KIZHB	Kizhuyak B	57.73034	152.937
KNIGI	Knight I	60.13983	147.681
KOBUG	Kobugakli	57.86666	155.1333
KODIA	Kodiak	57.71833	152.4333
KUIUI	Kuiu I	57.6334	136.1667
KUKAB	Kukak B	58.29445	154.26
KULIB	Kuliak B	58.172	154.2815
KUPRS	Kupreanof Str	57.96111	153.1294
KUSHL	Kushtaka L	60.40611	144.1325
LARSB	Larsen B	57.51667	153.9183
LATOI	Latouche I	60.0625	147.8158
LATOP	Latouche Pa	59.95	148.055
LGREI	Little Green	60.205	147.5083
LHERR	Low Herring B	60.38667	147.8156
LILJP	Ljegren Pa	60.70833	147.4022
LISMI	Lit. Smith I	60.52167	147.433
LITTB	Little B	60.16917	147.7967
LONEI	Lone I	60.68333	147.75
LONGB	Long B	60.67667	148.28
LOUIB	Louis B	60.47167	147.6783
LPW	Little Port Walter	56.37556	134.66111
LUCKB	Lucky B	60.23	147.8583
MACLH	Macleod Harbor	59.71667	148.1083
MAINB	Main B	60.54361	148.0681
MALLB	Mallard B	60.29167	147.8133
MARSB	Marsha B	60.32028	147.6706
MCARP	McArthur Pas	59.46222	150.3797
MCCLB	McClure B	60.48333	148.185
MCDOL	McDonald's Lagoon	58.15278	152.3278
MCPHP	McPherson Pg	60.662	147.3815
MIDDP	Middle Point	60.31333	147.0183
MINEC	Mineral Cr	61.12917	146.4061
MISSB	Mislsak B	58.135	154.3295
MONAB	Monashka B	57.8175	152.4217
MONAC	Monashka Cr	57.8175	152.4217

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
MONTI	Montague I	60.04167	147.76
MONTL	L. Montague	60.00417	147.8314
MONTG	Montague Coast	59.345	147.0175
MONTP	Montague P	60.3678	147.1
MONTS	Montague Str	60.07633	147.68
MONTT	Montague Tr	59.70055	147.6364
MONTU	Montague	60.43167	147.0183
MOOSL	Moose Lips B	60.18778	147.4378
MORNC	Morning Cove	59.44972	150.3303
MUMMB	Mummy B	60.23333	147.8
MUMMI	Mummy I	60.31667	147.9167
MUSKB	Muskomee B	58.07117	153.1133
NAKEI	Naked I	60.49583	147.5922
NEARI	Near I	57.78	152.3933
NECPT	Nec Point	59.81	47.6833
NEDDL	Needle	60.1175	147.5725
NEKIT	Nekita B	58.62944	152.3542
NELSB	Nelson B	60.51667	145.8667
NEWYI	New Years I	60.31667	147.9333
NHINC	North Hinchinbrook	60.46889	146.688
NINAI	Ninagiak I	58.455	153.9981
NINIL	Ninilchik	60.325	151.6639
NORTI	North I	60.63334	145.7333
NUKAI	Nuka I	59.39	150.6217
NWBAY	Northwest B	60.54361	147.6025
OGDPA	Ogden Passage	57.6334	136.1667
OLSEN	Olsen B	60.7055	146.2168
ONEHB	One Hand B	59.21722	151.2239
OPALC	Opal Cr	60.49683	147.6958
ORCAB	Orca B	60.51667	145.8417
OUTSI	Outside B	60.39333	147.4333
PADDB	Paddy B	60.4175	148.0958
PASSB	Passage B	60.13334	148.0833
PAULB	Paul's B	58.34833	152.38
PBAIL	Point Bailey	57.42	152.9964
PCHAL	Port Chalmers	60.23333	147.25
PCHAT	Port Chatham	59.21472	151.7608
PDICK	Port Dick	59.25555	151.1081
PEAKI	Peak I	60.69833	147.3967
PELLC	Pellen Cove	60.85972	147.6589
PEREI	Perevalnie I	58.63055	152.3633
PEREP	Peravalnie Passage	58.53056	152.3625
PERLI	Perl I	59.12167	151.6267
PERRI	Perry I	60.66806	147.8667

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
PETCH	Port Etches	60.37167	146.7958
PETRP	Petrof Point	59.3775	150.765
PFIDA	Port Fidalgo	60.77472	146.5042
PGRAH	Port Grahm	59.37	151.89
PGRAV	Port Gravina	60.63334	147.25
PHELE	Point Helen	60.16333	147.7558
PLEII	Pleiades I	60.27833	148.0667
PNELJ	Port Nellie	60.61666	148.1033
POLLC	Polly Cr	60.28333	152.4467
PUALE	Paule B	57.73333	155.3967
PUFFB	Puffin B	60.73333	147.4167
PUFFC	Puffin Cr	60.18444	148.3208
PWALE	P. of Wales Pass.	60.1605	148.0515
PWELL	Port Wells	60.83083	148.1911
PWHIT	Point Whitshed	60.16667	145.7883
QUICC	Quicksand Cr	59.78611	149.7867
RASBS	Raspberry St	58.045	153.0417
REDRI	Red R	59.97667	152.6686
ROCKB	Rocky B	59.21056	151.3103
RUACO	Rua Cove	60.34861	147.6408
RUGGI	Rugged I	59.85833	149.3833
RUTHB	Ruth B	59.32972	153.4781
SADIC	Sadie Cove	59.465	151.3383
SALMP	Salmo Point	60.59167	145.8
SANTF	Santa Flava	57.29945	152.865
SAWMB	Sawmill B	60.05556	148.015
SAWMC	Sawmill Cr	61.08472	146.4367
SEALB	Seal B	58.45	152.2833
SEALI	Seal I	60.43	147.4067
SELDB	Seldovia B	59.42333	151.7078
SEWAR	Seward	60.1	149.4433
SGREE	S.Green I	60.24983	147.39
SHARB	Sharatin B	57.79633	152.7827
SHECS	Shepherd Cr	60.3044	144.24306
SHEEB	Sheep B	60.61666	145.9833
SHEEP	Sheep Point	60.61666	145.9833
SHELB	Shelter B	60.12733	147.9169
SHOUB	Shoup B	61.12083	146.5917
SHUYI	Shuyak I	58.50889	152.6292
SIMPB	Simpson B	60.62167	145.925
SITKA	Sitka	57.14	135.4233
SITPA	Sitka Passage	57.00	135.5
SIWAB	Siwash B	60.95417	147.6806
SLEEB	Sleepy B	60.06583	147.8392

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
SLOPM	Slope Mt.	60.08167	152.5717
SMITI	Smith I	60.51472	147.4256
SNUGC	Snug Corner	60.745	146.6947
SNUGH	Snug Harbor	60.06694	147.8361
SPIRB	Spiridon B	57.70195	153.8836
SPIRP	Spring Point	59.875	152.86
SQUIB	Squire B	60.23222	147.9528
SQUII	Squire I	60.21667	147.9333
SQURB	Squirrel B	60.01167	148.14
SQURI	Squirrel I	60.33194	147.8978
STOCH	Stockdale H.	60.29417	147.2081
STORI	Storey I	60.72028	147.407
SUNNC	Sunny Cove	59.91139	149.3308
TAGNI	Tagness I	60.61833	147.3833
TAKLI	Takli I	58.06778	154.4881
TAYLB	Taylor B	59.31194	151.0217
TEEHR	Tee Harbor	58.4233	134.7567
TERRB	Terror B	57.7265	153.2165
TETRP	Tetrakof Point	58.515	152.3933
THUNB	Thunder B	59.5775	154.1039
TONSB	Tonsina B	59.21722	151.2239
TONSR	Tonsina R	58.21	151.95
TUGII	Tugidak I	56.56889	154.53
TURNA	Turnagain Arm	60.84667	148.975
TUXEB	Tuxedni B	60.16	152.6675
TWOAB	Two Arm B	59.58556	150.0672
TWOMB	Two Moon B	60.73333	146.5733
UGAKB	Ugak B	56.44278	153.0333
UGANB	Uganik B	57.51722	152.9358
UNAKW	Unakwik	60.99667	147.5444
USHAI	Ushagat I	58.9	152.2833
UYAKB	Uyak B	57.51667	153.8333
VALDA	Valdez Airport	61.13334	146.2792
VALDE	Valdez	61.1	146.4167
VERDC	Verdant Cove	59.69667	149.7389
WAMAI	West Amatuli	58.91667	151.95
WELLB	Wells B	60.93667	147.4822
WELLP	Wells Pass	60.755	148.1767
WESTB	West B	60.86267	146.7747
WHALB	Whale B	60.205	148.297
WIDEB	Wide B	57.43945	156.2303
WILSB	Wilson B	60.03389	147.9286
WINDB	Windy B	59.22	151.4703
WKAYI	W. of Kayak I	59.91667	145.0817

Table 4, continued.

LOCATABV	SITE NAME	LATITUDE	LONGITUDE
WOMAB	Woman's B	57.70861	152.5539
WOODI	Wooded I	59.86666	147.4
YAKUT	S. of Yakutat B	59.23417	140.3503
YALIB	Yalik B	59.45472	150.6067
ZAIKB	Zaikof B	60.2675	147.0892

Table 5. Abbreviations for agencies (AGENCY) responsible for collecting EVTHD sample information.

AGENCY	AGENCY NAME
ADEC	Alaska Department. Of Environmental Conservation
ADFG	Alaska Department. of Fish and Game
FWS	U. S. Fish & Wildlife Service
NBS	National Biological Service
NMFS ABL	NMFS*-Auke Bay Laboratory (Juneau, AK)
NMFS ECD	NMFS*-Environmental Conservation Division (Seattle, WA)
NMFS KOD	NMFS*-Kodiak Laboratory (Alaska)
NMFS MML	NMFS*-Marine Mammal Laboratory (Seattle, WA)
NPS	National Park Service
UA IAB	Univ. of Alaska Fairbanks - Institute of Arctic Biology
UA IMS	Univ. of Alaska Fairbanks - Institute of Marine Science
UA JCFOS	Univ. of Alaska Fairbanks - Juneau Center for Fisheries and Ocean Science
UAF	Univ of Alaska Fairbanks

* NMFS National Marine Fisheries Service

Table 6. Abbreviations used to describe sample collection methods (COLMETH) for samples in EVTHD.

COLMETH	METHOD
BSEI	Beach Seine
CAMU	Caged Mussel
COCU	Cookie Cut-spatula
CORE	Core Sample
CSEI	Cliff Seine
DCAP	Died in Capativity
DIVE	Diver
DNET	Dip Net
FDEA	Found Dead
FORC	Forceps
GNET	Gillnet
GRAB	Grab Sampler
HAND	Taken by Hand
POT	Underwater Pot
PSEI	Purse Seine
PUMP	Pump
RAKE	Rake
SEIN	Seine (General)
SHOT	Shotgun
SHOV	Shovel
SPEA	Spear
SPOO	Spoon
SSAM	Special Hydrocarbon
STRA	Sediment Trap
SUBM	Submersible
TPDR	Tongue Depressor
TRAW	Trawl
VGRB	Van Veen Grab (Dredge)

Table 7. Submatrix abbreviations (SUBMAT) used to more clearly define types of tissues sampled and reported in EVTHD. Only abbreviations are shown, many other entries in this field completely describe the submatrix.

SUBMAT	TYPE OF SUBMATRIX
EGG C	Egg Contents
EGG S	Egg Shell
GUT C	Gut Contents
HEPAT	Hepatopancreas
INTESTIN	Intestines
OVARYC	Ovary Contents
RUMENCON	Rumen Contents
SED/FIL	Sediment Trap Filtrate
STOM OIL	Stomach Oil
STOMCON	Stomach Contents
SUBSTRAT	Substrate

Table 8. Species abbreviations (SPECABV), common and Latin names for organisms whose tissues were sampled for hydrocarbons and reported in EVTHD. Table is sorted by SPECABV.

SPECABV	COMMON NAME	SPECIES
ANMU	Anciet Murrelet	*Synthliboramphus antiquus*
BACA	Barnacle	*Balanus cariosus*
BAEA	Bald Eagle	*Haliaeetus leucocephalus*
BAGO	Barrow's Goldeye	*Bucephala islandica*
BLEN	Blenny Fish	Unknown
BLKI	Black Leg Kittiwake	*Rissa tridactyla*
BLOY	Am. Blk. Oyster	*Haematopus bachmani*
BLSC	Black Scoter	*Melanitta nigra*
BLTU	Black Turnstones	*Arenaria melanocephala*
BRBE	Brown Bear	*Ursus arctos*
CHIT	Chiton	*Neolaricata*
CLAM	Clam	Bivalvia (Class)
CLIN	Nattall's Cockle	*Clinocardium nuttalii*
COGO	Common Goldeneye	*Bucephala clangula*
COHO	Coho Salmon	*Oncorhynchus kisutch*
COLO	Common Loon	*Gavia immer*
COMU	Common Murre	*Uria aalge*
CSCA	Scallop Chlamys	Chlamys Ssp.
DROC	Dusky Rock	*Sebastes ciliatus*
DSOL	Dover Sole	*Microstomus pacificus*
DUNG	Dungeness Crab	*Cancer magister*
EELG	Eel Grass	*Zostera marina*
FISH	Unidentified Fish	
FLAT	Unidentified Flatfish	
FSOL	Flathead Sole	*Hippoglossoides elas*
FTSP	Forked Tail Storm Petrel	*Oceanodroma furcata*
FUCU	Fucus	Fucus Spp.
GARI	Bivalve	*Garia californica*
GURC	Green Sea Urchin	*Strongylocentrotus droebachiensis*
GW	Gray Whale	*Eschrichtius robustu*
HADU	Harlequin Duck	*Histrionicus histrionicus*
HASE	Harbor Seal	*Phoca vitulina*
HERR	Pacific Herring	*Clupea harengus*
HOPU	Unidentified Bird	
HP	Harbor Porpoise	*Phocoena phocoena*
HUMI	Bivalve	*Humilaria kennerleyi*
KCRA	Red King Crab	*Paralithodes camtschatica*
KIMU	Kittlitz Murrele	*Brachyramphus brevirostris*
KW	Killer Whale	*Orcinus orca*
LIMP	Limpet	Acmaeidae (Family)
LISP	Periwinkle Snail	Littorina Spp.
MAMU	Marbled Murrelet	*Brachyramphus marmoratus*

Table 8, continued.

SPECABV	COMMON NAME	SPECIES
MCLA	Macoma Clam	*Macoma balthica*
MINK	Mink	*Mustele vison*
MUSS	Pacific Blue Mussel	*Mytilus trossulus*
MW	Minke Whale	*Balaenoptera acutorostrata*
OYST	Pacific Oyster	*Crassostraea gigas*
PCLA	Little Neck Clam	*Protothaca staminea*
PCOD	Pacific Cod	*Gadus macrocephalus*
PEFA	Peregrine Falcon	*Falco peregrinus*
PIGU	Pigeon Guillemot	*Cepphus columba*
PINK	Pink Salmon	*Oncorhynchus gorbuscha*
PR	Prey Remains	
PRIC	Prickleback	*Anoplarchus purpurescens*
PSCA	Weather Scallop	*Patinopecten caurinus*
RCLA	Pacific Razor Clam	*Siliqua patula*
ROSA	Rock Sandpiper	*Calidris ptilocnemis*
SBTD	Sitka Deer	*Odocoileus hemionus*
SCLA	Butter Clam	*Saxidomus giganteus*
SCUO	Tidepool Sculpin	*Oligocottus maculosus*
SEOT	Sea Otter	*Enhydra lutris*
SL	Sea Lion	*Eumetopias jubatus*
SNAI	Unidentified Snail	
SSHR	Spot Shrimp	*Pandalus platyceros*
STSH	Short-Tailed She	*Puffinus tenuirostris*
SURF	Surfbird	*Aphriza virgata*
SUSC	Surf Scoter	*Melanitta perspicillata*
TANN	Tanner Crab	*Chionoecetes bairdi*
TUPU	Tufted Puffin	*Fractercula cirrharta*
WGRE	White Spotted Greenling	*Hexagrammos stelleri*
WWSC	White Winged Scoter	*Melanitta fusca*
XIPH	Black Prickelback	*Xiphister atropurpureus*